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* The articles which appear in this and succeeding volumes over the name of Dr. Schaff were completed and in the publishers' hands some months before his death.

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PECULIAR PHONETIC SYMBOLS

USED IN THE WRITING OR TRANSLITERATION OF THE DIFFERENT LANGUAGES.

- ā, ē, etc.: long vowels; in the Scandinavian languages the accent (*á, é*, etc.) is used to denote length.
 ą: a nasalized *a*; so used in the transliteration of the Iranian languages.
 â: labialized guttural *a* in Swedish.
 æ: open *a* of Eng. *hat*, used chiefly in O. Eng.
 aí: used in Gothic to denote *e* (open), in distinction from *ái*, the true diphthong.
 aú: used in Gothic to denote *o* (open), in distinction from *áu*, the true diphthong.
 bh: in Sanskrit a voiced labial aspirate (cf. *ch*).
 ʙ: voiced bilabial (or labio-dental?) spirant, used in discussions of Teutonic dialects.
 ç: voiceless palatal sibilant, similar to Eng. *sh*, used especially in transliteration of Sanskrit.
 ċ: frequently used, e. g. in Slavonic languages, to denote the sound of Eng. *ch* in *cheek*.
 c: voiceless palatal explosive, commonly used in transliteration of Sanskrit and the Iranian languages.
 ch: as used in the transliteration of Sanskrit, a voiceless palatal aspirate, an aspirate being an explosive with excess of breath; as used in German grammar, the symbol for a voiceless palatal or guttural spirant.
 dh: voiced dental aspirate (cf. *ch*) in Sanskrit.
 ɖ: voiced cerebral explosive, so used in transliteration of Sanskrit.
 ɗh: voiced cerebral aspirate (cf. *ch*) in Sanskrit.
 ɗ: voiced dental (interdental) spirant, equivalent to Eng. *th* in *then*; so used in the Teutonic and Iranian languages and in phonetic writing.
 ě: a short open *e*, used in Teutonic grammar, particularly in writing O. H. G.
 e: the short indefinite or "obscure" vowel of Eng. *gardener*; used in the reconstruction of Indo-Eur. forms, and in transliterating the Iranian languages.
 gh: in Sanskrit a voiced guttural aspirate (cf. *ch*).
 g: voiced velar (back-guttural) explosive, used most frequently in Indo-Eur. reconstructions.
 ȝ: voiced guttural (or palatal) spirant, equivalent to Mod. Greek *ȝ*, and used in transliteration of Iranian languages and O. Eng.
 ħ: a voiceless breathing, the Sanskrit *visarga*.
 ʰ: a labialized *h*, similar to *wh* in Eng. *what*; used in transliteration of Gothic and the Iranian languages.
 ʎ: voiceless guttural (or palatal) spirant, equivalent to German *ch*, and used in transliteration of the Iranian languages.
 ĵ: the semi-vowel *y*, or consonant form of *i*; used in phonetic writing and reconstructions of Indo-Eur. forms.
- j: in the transliteration of Sanskrit and the Iranian languages a voiced palatal explosive; in the Teutonic languages a semi-vowel (= *y*), for which in Indo-Eur. reconstructions *i* is generally used.
 jh: in Sanskrit a voiced palatal aspirate (cf. *ch*).
 kh: in Sanskrit a voiceless guttural aspirate (cf. *ch*).
 ʀ: the guttural ("thick" or "deep") of the Slavonic and some of the Scandinavian languages.
 ʁ: vowel *l*; used in transliterating Sanskrit, in reconstructing Indo-Eur. forms, and in other phonetic writing.
 ŋ: nasal vowel; used in reconstruction of Indo-Eur. forms and in phonetic writing.
 ɲ: in Sanskrit the cerebral nasal.
 ñ: in Sanskrit the guttural nasal (see following).
 ɳ: the guttural nasal, equivalent to Eng. *n* in *longer*; used in transliteration of Iranian languages.
 ñ: palatal nasal, similar to *gn* in Fr. *regner*; used in transliterating Sanskrit and in phonetic writing.
 ö: palatalized *o*; used in German and in phonetic writing.
 ɔ: short open *o* in Scandinavian.
 ø: short palatalized *o* (ö) in Scandinavian.
 ɸh: in Sanskrit, voiceless labial aspirate (cf. *ch*).
 ɸ: voiceless velar (back-guttural) explosive; used in reconstructions of Indo-Eur. forms and in other phonetic writing.
 ɹ: vowel *r*; used in transliterating Sanskrit, in reconstructions of Indo-Eur. forms, and in other phonetic writing.
 š: voiceless cerebral sibilant, equivalent to Eng. *sh*; used in transliterating the Iranian languages and in phonetic writing.
 ʃ: voiceless cerebral spirant; used in transliterating Sanskrit.
 th: in Sanskrit a voiceless dental aspirate (cf. *ch*).
 ʈh: in Sanskrit a voiceless cerebral aspirate (cf. *ch*).
 ʈ: in Sanskrit a voiceless cerebral explosive.
 ʈ: a form of dental spirant used in transliterating the Iranian languages (represented in Justi's transliteration by ʈ).
 ʈ: voiceless dental (interdental) spirant, equivalent to Eng. *th* in *thin*; used in Teutonic dialects and in phonetic writing.
 ʉ: consonant form of *u*; used in phonetic writing.
 ʒ: voiced cerebral sibilant, equivalent to *s* in Eng. *pleasure*, and to *j* in Fr. *jardin*; used in Iranian, Slavonic, and in phonetic writing.
 ʒ: a symbol frequently used in the writing of O. H. G. to indicate a voiced dental sibilant (Eng. *z*), in distinction from *z* as sign of the affricata (*ts*).

EXPLANATION OF THE SIGNS AND ABBREVIATIONS USED IN THE ETYMOLOGIES.

>, yielding by descent, i. e. under the operation of phonetic law.

<, descended from.

=, borrowed without change from.

:, cognate with.

+, a sign joining the constituent elements of a compound.

*, a sign appended to a word the existence of which is *inferred*.

ablat.	ablative	Dan.	Danish
accus.	accusative	Eng.	English
adjec.	adjective	Fr.	French
adv.	adverb	Germ.	German
cf.	compare	Goth.	Gothic
conjunc.	conjunction	Gr.	Greek
deriv. of	derivative of	Heb.	Hebrew
dimin.	diminutive	Icel.	Icelandic
fem.	feminine	Ital.	Italian
genit.	genitive	Lat.	Latin
imper.	imperative	Lith.	Lithuanian
impf.	imperfect	Mediæv. Lat.	Mediæval Latin
indic.	indicative	Mod. Lat.	Modern Latin
infin.	infinitive	M. Eng.	Middle English
masc.	masculine	M. H. Germ.	Middle High German
nomin.	nominative	O. Bulg.	Old Bulgarian (= Church Slavonic)
partic.	participle	O. Eng.	Old English (= Anglo-Saxon)
perf.	perfect	O. Fr.	Old French
plur.	plural	O. Fris.	Old Frisian
prep.	preposition	O. H. Germ.	Old High German
pres.	present	O. N.	Old Norse
pron.	pronoun	O. Sax.	Old Saxon
sc.	scilicet, supply	Pers.	Persian
sing.	singular	Portug.	Portuguese
subst.	substantive	Prov.	Provençal
vocat.	vocative	Sanskrit.	Sanskrit
		Sc.	Scottish
Anglo-Fr.	Anglo-French	Span.	Spanish
Arab.	Arabic	Swed.	Swedish
Avest.	Avestan	Teuton.	Teutonic

KEY TO THE PRONUNCIATION.

aa..... as <i>a</i> in <i>father</i> , and in the second syllable of <i>armada</i> .	ö..... as in <i>Göthe</i> , and as <i>eu</i> in French <i>neuf</i> , <i>Chintreui</i> .
ã..... same, but less prolonged, as in the initial syllable of <i>armada</i> , <i>Arditi</i> , etc.	ü..... as in <i>but</i> , <i>hub</i> .
a..... as final <i>a</i> in <i>armada</i> , <i>peninsula</i> , etc.	ũ..... obscure <i>o</i> , as final <i>o</i> in <i>Compton</i> .
ä..... as <i>a</i> in <i>fat</i> , and <i>i</i> in French <i>fin</i> .	û..... as in German <i>süd</i> , and as <i>u</i> in French <i>Buzançais</i> , <i>vu</i> .
ay or ä.. as <i>ay</i> in <i>nay</i> , or as <i>a</i> in <i>fate</i> .	y or l.... see <i>l</i> or <i>y</i> .
äy or ä.. same, but less prolonged.	yu..... as <i>u</i> in <i>mule</i> .
ã..... as <i>a</i> in <i>welfare</i> .	yü..... same, but less prolonged, as in <i>singular</i> .
aw..... as <i>a</i> in <i>fall</i> , <i>all</i> .	ch..... as in German <i>ich</i> .
ee..... as in <i>meet</i> , or as <i>i</i> in <i>machine</i> .	g..... as in <i>get</i> , <i>give</i> (never as in <i>gist</i> , <i>congest</i>).
ë..... same, but less prolonged, as final <i>i</i> in <i>Arditi</i> .	hw..... as <i>wh</i> in <i>which</i> .
e..... as in <i>men</i> , <i>pet</i> .	kh..... as <i>ch</i> in German <i>nacht</i> , <i>g</i> in German <i>tag</i> , <i>ch</i> in Scotch <i>loch</i> , and <i>j</i> in Spanish <i>Badajos</i> , etc.
é..... obscure <i>e</i> , as in <i>Bigelow</i> , and final <i>e</i> in <i>Heine</i> .	ñ..... nasal <i>n</i> , as in French <i>fin</i> , <i>Bourbon</i> , and nasal <i>m</i> , as in French <i>nom</i> , Portuguese <i>Sam</i> .
ê..... as in <i>her</i> , and <i>eu</i> in French <i>-eur</i> .	ñ or n-y.. Spanish ñ, as in <i>cañon</i> , <i>piñon</i> , French and Italian <i>gn</i> , etc., as in <i>Boulogne</i> .
î..... as in <i>it</i> , <i>sin</i> .	l or y.... French <i>l</i> , liquid or mouillé, as (-i)ll- in French <i>Baudrillart</i> , and (-i)l in <i>Chintreuil</i> .
ï..... as in <i>five</i> , <i>swine</i> .	th..... as in <i>thin</i> .
ĩ..... same, but less prolonged.	th..... as in <i>though</i> , <i>them</i> , <i>mother</i> .
ō..... as in <i>mole</i> , <i>sober</i> .	v..... as <i>w</i> in German <i>zwei</i> , and <i>b</i> in Spanish <i>Cordoba</i> .
õ..... same, but less prolonged, as in <i>sobriety</i> .	sh..... as in <i>shine</i> .
o..... as in <i>on</i> , <i>not</i> , <i>pot</i> .	zh..... as <i>s</i> in <i>pleasure</i> , and <i>j</i> in French <i>jour</i> .
oo..... as in <i>fool</i> , or as <i>u</i> in <i>rule</i> .	
oč..... as in <i>book</i> , or as <i>u</i> in <i>put</i> , <i>pull</i> .	
oi..... as in <i>noise</i> , and <i>oy</i> in <i>boy</i> , or as <i>eu</i> in German <i>Beust</i> .	
ow..... as in <i>now</i> , and as <i>au</i> in German <i>haus</i> .	

All other letters are used with their ordinary English values.

NOTE.

The values of most of the signs used in the above Key are plainly shown by the examples given. But those of ö, ü, ch, kh, ñ, and v, which have no equivalents in English, can not be sufficiently indicated without a brief explanation, which is here given.

ö. The sound represented by this symbol is approximately that of -u- in *hurt* or -e- in *her*, but is materially different from either. It is properly pronounced with the tongue in the position it has when ä is uttered and with the lips in the position assumed in uttering ö.

ü. This vowel is produced with the lips rounded as in uttering oo and with the tongue in the position required in uttering ee, into which sound it is most naturally corrupted.

ch and kh. These are both rough breathings or spirants made with considerable force, ch being made between the flat of the tongue and the hard palate, and kh between the tongue and the soft palate. ch approaches in sound to English sh, but is less sibilant and is made further back in the mouth; kh is a guttural and has a hawking sound.

l or y. These are both used to represent the sound of French *l* mouillé, in (-i)ll- and (-i)l, which resembles English -y- in *lawyer*. Final *l*, that is, (-i)l, may be approximated by starting to pronounce *lawyer* and stopping abruptly with the -y-.

ñ or n-y. The consonants represented by ñ (Spanish ñ, French and Italian gn, etc.) are practically equivalent to English -ni- or -ny- in *unión*, *bunyon*, *onion*, etc., and, except when final, are represented by n-y. Final ñ, as French -gn(e), may be produced by omitting the sound of -on in the pronunciation of *onion*.

v. This may be pronounced by attempting to utter English v with the use of the lips alone.

See PREFACE (vol. i., p. xxiv.) and the article PRONUNCIATION OF FOREIGN NAMES.

JOHNSON'S UNIVERSAL CYCLOPEDIA.



Mozarab'ic Liturgy [*mozarab'ic*, deriv. of *mozarab*, from Span. *mozarab*, from Arab. *mozarab*, deriv. of *al-mozarab*, become an Arab, deriv. of *arab*, Arab]; the liturgy of the Christian subjects of the Saracens in Spain, called *Mozarabes*, Arabs by adoption. Ephesine in its type, if not in its origin, and not called Mozarabic till after

the Mohammedan conquest in the eighth century, it is, in its groundwork at least, coeval with the introduction of Christianity into Spain. At Braga, in 538, it was set aside for the Roman liturgy, but restored at Toledo in 589; and at the Fourth Council of Toledo in 633, after some improvements by Leander of Seville (d. 595) and Isidore of Seville (d. 636), the use of it was extended to all Spain. Further improvements were introduced by Ildefonso of Toledo (d. 667), but in the eleventh century (in Aragon 1071, and in Castile 1074) it gave place, by royal authority, to the Roman liturgy. Through the influence and example of Cardinal Ximenes (1436-1517) the use of it was revived in Toledo (after 1502), in Salamanca (1517), and in Valladolid (1567). By the concordat of 1842 provision was made for its continuance at Toledo, but nowhere else. It has been pronounced "the richest, the fullest, the most varied of all known liturgies." It bears great resemblance to the Gallican liturgy, and is noted for its use of Scripture. It has been edited by Leslie (1755), Lorenzana (1774), and Arevalus (1804). See Migne's *Latin Patrology* (vols. lxxv., lxxvi., 1850), and John Mason Neale's *Eastern Church, General Introduction* (1850), and *Liturgiology and Church History* (2d ed. 1867).

Revised by S. M. JACKSON.

Mozart, Germ. pron. mō'tsaart, LEOPOLD: the father of Wolfgang Amadeus Mozart; b. Nov. 14, 1719; was himself a voluminous composer, and was kapellmeister to the Archbishop of Salzburg. He deserves remembrance for two reasons: First, for having excellently conducted the early education of the son who was to become one of the greatest composers of all time. Second, for his own great *Violin School* (Augsburg, 1756), which may be termed the first theoretical and practical method for that instrument ever published. It passed through numerous editions in various languages, and was for a long time the only work of its kind. D. at Salzburg, May 28, 1787.

DUDLEY BUCK.

Mozart, WOLFGANG AMADEUS, sometimes called JEAN CHRYSOSTOME THEOPHILE STRATSMEND, pianist and composer; b. at the city of Salzburg, Germany, Jan. 27, 1756. At four years of age he played the violin with astonishing ease and expression, and composed minuets and simple pieces. When the boy was six years of age his father, Leopold Mozart, visited Munich and Vienna with his son and daughter, Marianne, whose performances excited great admiration. In 1763 Leopold made a second tour with the children, visiting the most important cities of Europe, and although only eight years of age Wolfgang composed most of the symphonies which were played at the concerts. The family visited England in 1764 and remained until late in 1766, when Wolfgang returned home to study composition under his father for a few months. The works of Handel, which he brought from London, and those of Bach, became his classical models.

He studied also some of the best Italian masters, getting from them his marvelous skill in making each of his vocal parts melodious and graceful even in the most constrained harmonic situations. In 1767 Leopold and the children went to Vienna, and remained there more than a year, hoping to improve their fortunes, but they reaped only loss and disappointment, owing chiefly to the jealousy of the Italian court musicians, and gladly left Austria for Italy. While in Rome Wolfgang wrote from memory, after hearing it but once, the Easter music performed in the Sistine chapel. At Milan an opera by young Mozart, *Mitridate*, was brought on the stage and repeated twenty times. The whole tour was a success, and on his return he was appointed court organist to the Archbishop of Salzburg. From 1777 to 1779 he resided in Paris. In 1780 he was called to Munich by Prince Charles Theodore of Bavaria to write the opera *Idomeneo*. In this entirely new creation Mozart laid the cornerstone of dramatic composition—a service which the most eminent of his successors fully acknowledge. Its originality and beauty became at once the delight of his audience, and earned him even more than his usual praises. The Archbishop of Salzburg at once had Mozart return with his honors from Munich, and in 1781 move with him to Vienna as a member of his household, but treated him as a menial. After a fruitless remonstrance Mozart resigned, and gave lessons for a living in Vienna, which thereafter was his home. In 1782 he married Constance Weber, a pianist, whose care and love were his greatest help and happiness. Joseph II., fond of Italian music and of his Italian masters, the enemies of Mozart, was slow in granting him any privileges. Finally, *Die Entführung aus dem Serail* was ordered, and paid for with fifty ducats. The originality of this work at first hid its beauties from the people of Vienna, but the opera made a deep impression on the musicians there and on all classes in other parts of Europe. The emperor gave him the office of composer to the court and a salary of 800 florins, but with astonishing indifference made his office a sinecure. To sustain his family Mozart was obliged to give lessons, write waltzes and contredanses for balls, and give concerts in neighboring cities. It was not till his twenty-eighth year (1784) that these ephemeral labors were followed by uninterrupted industry in composition. The opportunity which wealth and royalty refused to give came unsought in the libretto of *Il Nozze di Figaro*, written for Mozart by the poor poet Da Ponte in 1786. This opera, finished in six weeks, had great success throughout Europe. Many offers came to him then from various courts, but Mozart was fond of Vienna, and even of his indifferent emperor. The people of Prague asked for an opera, and *Don Giovanni* was written for them in 1787. In 1788 Mozart began to feel depressed by his disease of the lungs and the nerves. A mysterious messenger (commissioned by Count Walsegg) came to him and engaged him to write a *Requiem*, refusing any information as to its destination. This mystery, some presentiment, and his melancholy fancies gave him the opinion that he was writing his own funeral service. In the single year of 1791 Mozart wrote *The Magic Flute*, *The Clemenza di Tito*, and *La Fanciulla del Telemaco*. He died Dec. 1 the same year, and was buried in St. Mark's churchyard, but the situation of his grave is unknown.

Mozart is considered the greatest composer of the world from the combined versatility and power of his genius. In every kind of composition he produced works of greatest excellence. He was the best pianist of his time in Germany. His execution was precise, elegant, fervid, and delicate in expression. He wrote 626 published works, and 294 compositions either unfinished or unpublished. *Don Giovanni*, *Il Nozze di Figaro*, *Die Zauberflöte*, the *Requiem*, the symphony in G minor, the quartets Nos. 10 and 18, are but a few of his great productions. See the *Life* by Jahn (1856-59; 2d ed. 1867; Eng. trans. 1882); that in English by Holmes (1845; 2d ed. 1878); and that by Fischer (1888). His *Correspondence* was edited by Nohl (2d ed. 1877).

Revised by DUDLEY BUCK.

Moz'ley, JAMES BOWLING, D. D.: theologian; b. at Gainsborough, Lincolnshire, England, Sept. 15, 1813; graduated at Oriel College, Oxford, 1834; became a fellow of Magdalen 1840, vicar of Shoreham 1856, canon of Worcester 1869, Regius Professor of Divinity, Oxford, 1871; author of a work on *Predestination* (1855); works on *Baptismal Regeneration* (1856-62); *Eight Bampton Lectures on Miracles* (1865); *Ruling Ideas in Early Ages* (1877); *Essays* (1878); and other theological works. D. at Shoreham, Jan. 4, 1878.

Mucilage [= Fr., from Lat. *mucilago*, a mouldy, musty juice, deriv. of *mucus*, mucus, slime, and *mucere*, be mouldy or musty]: a name applied in the arts to solutions of vegetable gums (see GUM) in water, or to other soluble preparations possessing adhesive qualities. The best mucilage is prepared by dissolving gum arabic in water in closed copper boilers surrounded by steam-jackets, the temperature of the water being raised to and kept at the boiling-point by superheated steam until the solution is effected, the process being hastened and facilitated by brass agitators run by machinery. The hot solution is drawn off, filtered under pressure through cloth, to remove the dirt and other foreign matter contained in the gum; oil of cloves or some other suitable antiseptic is added to prevent fermentation and the growth of mould, which impair the adhesive properties of mucilage, and the solution is allowed to stand for some time until such impurities as were not removed on the cloth filter have settled out, when it is bottled.

One of the most common substitutes for gum arabic is DEXTRIN (*q. v.*). The objectionable brown color of its solution can be removed by filtering through animal charcoal, but its adhesive properties, as indicated by its viscosity, are only equal to those of a third-rate gum arabic. It is used to form the adhesive surface of postage-stamps, labels, and envelopes. Fish-glue (see GLUE) is also much used on labels, and dilute solutions of this material are widely sold as mucilage, and are, except for the characteristic and disagreeable odor and taste, a satisfactory substitute for the gum-arabic mucilage. Other gums are also largely imported for the uses to which gum arabic was almost exclusively used. Of these the principal ones are the other African gums from Senegal and the Cape, and the Ghatti gums from India.

Dextrin is somewhat hygroscopic, more so than gum arabic or gum Ghatti, which explains the tendency of postage-stamps to stick together in damp weather. H. B. HODGES.

Mucora'ceæ [Mod. Lat., from Lat. *mucor*, mould, mustiness, deriv. of *mucere*, be musty]: a family of fungi, popularly known as Moulds or Black Moulds, in which the oöspores are solitary and produced by a process of conjugation, and whose conidia are produced in sacs containing one to many spores. The species of this order are very widely distributed, and among them are many fungi known as common moulds. They frequent articles of food, excrement of animals, and, in short, are found on nearly all decaying animal and vegetable matter. One species, *Phycomyces nitens*, grows on oily substances, an unusual habitat of fungi. As a rule, the members of this order are quite small, although *P. nitens* has been known to attain the height of a foot. The mycelium, which is often found in large masses in some of the commoner moulds of this group, frequently presents a shiny appearance, whence the common German word for plants of this order, *Schimmel*, glitter, is derived.

Inasmuch as the species of this family conform tolerably closely to the type, we may select *Mucor mucedo*, a common mould growing on dung and other substances, as an illustration of the whole order. *M. mucedo* has occupied the attention of many botanists, but the most complete account of its development was given by Dr. Oscar Brefeld in a work entitled *Botanische Untersuchungen über Schimmel-*

pilze, part i., published in 1872. In this publication there appeared for the first time an account of the oöspores, as well as the conidial spores of the plant in question. If fresh horse-dung be placed in a moist place, it will soon be covered by a coating of white glistening fibers, which are the hyphæ or mycelial threads of *M. mucedo*. They soon cover the surface of the dung with a cotton-wool-like mass, more or less dense according to the moisture and amount of nitrogenous matter in the dung, from which mass projects certain threads, whose tips, at first white, afterward black, are the conidia or asexual fruit, consisting of sacs containing a large number of spores. The threads, which grow upward to bear the spore-sacs, exhibit in *M. mucedo* a marked tendency to turn toward the light. In *Rhizopus nigricans*, the common bread-mould, a nearly related species, the stalks of the spore-cases, on the contrary, seem to be indifferent to the action of light. A microscopic examination of the hyphæ or threads composing the mycelium shows that, as in most fungi, they branch in all directions, and are occasionally divided by cross-partitions. The contents are colorless or slightly tinged with brown or gray, and the cell-wall, although, according to de Bary, it sometimes shows the blue color given by cellulose on the application of iodine and sulphuric acid, often fails to give that color. If submerged, the hyphæ live, at least for a certain length of time, but undergo certain changes; the cross-partitions become more numerous, and the cell-walls sometimes bulge a little. It has been sometimes supposed that yeast-cells were nothing but the altered mycelium of submerged plants of *M. mucedo*. This view is not generally accepted, and it must be admitted that we have no proof that yeast-cells either come from *Mucor* or are changed into it. When, however, the mycelium of *M. mucedo* is kept quite moist, it undergoes a modification, and we have the production of what are known as chlamydospores (Fig. 1). These are formed in the following way: The cross-partitions increase in number, and some of the cells thus formed swell until they become nearly spherical. The protoplasmic contents of the cells then roll themselves up into round masses resembling spores, which afterward are capable of germinating. The filaments, or hyphæ, which rise above the common mass of mycelium to bear the conidia, are generally from an eighth to half an inch high, but under exceptionally favorable circumstances may be as high as 6 inches. The ends of the hyphæ swell into a globular-shaped sac shown in Fig. 2. The contents of the sac are at first continuous with those of the rest of the filament, but are afterward cut off by a partition, which is not flat, like the cross-partitions found in the ordinary mycelium, but arched, as shown in section in Fig. 3. The expanded tip of the mycelium, which projects into the spore-sac, is known as the *columnella*. In *M. mucedo* (Figs. 2, 3) it is very prominent. In most of the Mucoraceæ it is smaller, and in a few cases is entirely wanting. In the sporangium or spore-sac the spores are formed by free-cell formation. In *M. mucedo* they are very numerous and of an oval shape, 0.0066-0.0099 mm. long and 0.0033-0.0040 mm. broad. Their color is grayish brown, and when seen in mass they often appear black. The external wall of the sporangium is composed of two layers, the outer of which is beset with short hairs. Within the sporangium is an expandable elastic substance, whose presence can be demonstrated before the spores are ripe by bursting open the outer wall, when the elastic substance projects as a globular mass, in which the young spores are imbedded. When ripe the spores are discharged with some violence by means of the sudden swelling of the elastic substance; the whole outer wall breaks away and disappears, except a small portion which remains, forming a rim about the base. This is some-



FIG. 1.—c, culture-growth; b, chlamydospores. (Magnified.)

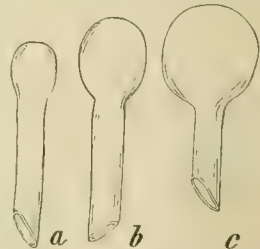


FIG. 2.—Successive stages of spore-sacs. (Magnified.)



FIG. 3.

times so small that it can be seen only on close examination, and at first sight it appears as though the colony as a whole remains were the young state of a sporangium. In *Rhizopus*

the second consists of connective or "areolar" tissue with some elastic fibers, and contains the capillary blood-vessels and nerve-filaments by which the secretory surface is nourished and vitalized. The functions of mucous surfaces differ very greatly with the situation. In the nose, for example, the function is merely the heating and warming of the air of respiration; in the oesophagus and lower urinary tract the mucous surface acts merely as a protective surface, offering no obstacle to the ready passage of the substances normal to the parts in question. In the stomach, intestines, and in certain other situations the mucous membrane secretes complex substances of the greatest importance in physiological processes, and by its corrugated structure, numerous reduplications, and villous processes it affords an extensive surface for the great functional processes of nutritive absorption and the elimination of effete excretory products. It is the common property of all mucous membranes to secrete a viscid liquid called mucus, which acts as a lubricant and protective. It consists of a viscid fluid part, containing mucin and cellular constituents derived from the mucous surface. Its free surface is lined with epithelial cells of various shapes, according to the function of the part, whether merely protective or whether secretive. These epithelia are constantly exfoliated, and as constantly reproduced by young cells formed by proliferation in the cellular structures beneath. The secreted matter called mucus contains a limited number of mucous corpuscles, which are cast-off epithelia or escaped products of rapid cell-formation, but the homogeneous fluid portion is the peculiar secretion of the mucous follicles. It is clear, colorless, has nearly a semi-solid consistency, and consists of water, mucin, and salts, especially chloride of sodium. When rich in corpuscles and mucin, mucus is viscid and tenacious. It is thin and watery when salines are chiefly present, and often a rapid serous flow is scarcely more than transuded blood-serum. The mucous membrane is also the seat of glands of special function, as those producing the saliva, the gastric and intestinal digestive juices. Inflammation of mucous surfaces is called *catarrh*, and is nearly always attended with increased secretion of mucus. Catarrh of mucous surfaces has many causes. When the skin is chilled, or its circulation is sluggish by reason of uncleanness or neglect of exercise, blood is determined to the internal parts. Rapid circulation of the blood and the elevated temperature of the body produce catarrhs in most acute inflammatory or febrile disorders. When large organs, as the lungs or liver, are diseased, the obstruction they offer to the circulation favors congestion of the extensive mucous surfaces of the stomach and intestines, and catarrhs result. They are greatly congested when the heart is incapable of maintaining proper circulation. Direct irritation more often causes catarrhs, as dust in the bronchi, or errors in diet producing the catarrhs of gastric and intestinal indigestion.

Revised by WILLIAM PEPPER.

Mucuna: See COWHAGE.

Mucus: See MUCOUS MEMBRANE.

Mudfish: a book-name for the African *Protopterus annectens* (see DIPNOI) and for the bowfin, or dog-fish (*Amia calva*) of the Great Lakes of the U. S.

Mudge, ENOCH: preacher; b. in Lynn, Mass., June 21, 1776; joined the New England conference in 1793. He traveled and preached through most of Massachusetts, Rhode Island, Connecticut, and Maine. He was prominent in founding Methodism in Maine, which was then a province and a wilderness, and endured severe and romantic trials. He was twice elected to the Legislature of Massachusetts. The latter years of his life were spent in New Bedford, Mass., as chaplain to its mariners' chapel. He published a volume of excellent *Sermons for Mariners* and many poetical pieces of some merit. D. at Lynn, Mass., Apr. 2, 1850.

Mud-hen: See GALLINIE.

Mud-puppy, or Water-dog (*Necturus maculatus*): a batrachian of the order *Amphipneusta*, found in the fresh waters of the eastern parts of the U. S., especially abundant in the Great Lake system. It has the head and mouth large; the upper jaw and palate thickly set with small sharp teeth; a short neck, with three branchial tufts on each side; tail compressed laterally, and fringed with a delicate membrane; four limbs, each having four toes without nails; small eyes, without lids; thick and fleshy lips; a large tongue, immovable except at the tip and edges; small nostrils; and a smooth skin. It has rudimentary lungs, and is able to support life

out of water for several hours. Its color is brown, and it is marked by numerous blackish spots of various sizes. It reaches a length of about a foot. The name *Menobranchus* is a synonym of *Necturus*. The name mud-puppy is sometimes applied to a similar salamander, the HELLBENDER (*g. v.*). This batrachian is found chiefly in the head-waters of the Ohio and Tennessee rivers, not in the Great Lakes, and is larger and duller in color than the true mud-puppy; but the most striking difference is in the absence of gills in the hellbender, a round opening or spiracle occupying their place. Both animals are absolutely harmless.

Revised by D. S. JORDAN.

Muez'zin [Arab., also *muazzin*, deriv. of 'azzana, inform (cf. 'azan, the call to prayer), deriv. of 'azana, hear]: the Mussulman official who chants the ezann or call to prayer five times every twenty-four hours from the minaret or some prominent part of a mosque. While chanting he stands erect, a finger in each ear, his face turned toward Mecca. He is expected to possess great strength and melodiousness of voice; if blind, so much the better, as he will not see into neighboring houses and gardens. Mohammed was unwilling to use bells or trumpets in calling the faithful to worship, as these were employed by the Christians and Jews, so he chose the human voice. The ezann is in the following words: "God most high! [four times]. I attest there is no God but God; I attest that Mohammed is the prophet of God; come to prayer; come to the temple of salvation [twice]. There is no God but God." To the morning ezann the words "prayer is better than sleep" are added after "temple of salvation."

E. A. GROSVENOR.

Muffling, FRIEDRICH FERDINAND KARL WEISS, Freiherr von: general; b. in Halle, Westphalia, June 12, 1775; entered the Fusiliers while a mere lad, and was with them in the campaign against France 1792-94. In 1806 he entered the service of the Duke of Weimar, and after the battle of Jena joined Blücher and was appointed to conclude the capitulation of Rattkau. Two years later, as member of the so-called secret council, he entered the service of the Duke of Weimar, but in 1813 he re-entered the Prussian army and was assigned to Blücher's staff. He was repeatedly promoted, and after the first Peace of Paris was made chief of the general staff of the army stationed at the Rhine. In 1815 he was assigned to the British army under Wellington, and after the second surrender of Paris was made governor of the city. Five years later he became chief of the general staff of the Prussian army, and in 1832 was appointed general of the Seventh Army-corps. He retired in 1847 with the title of general field-marshal. D. in Erfurt, Jan. 16, 1851.

Muf'ti [= Arab. *muf'ti*, expounder], or **Sheikh-ul-Islam** [Arab., lord of the faith (liter., of the submission, which takes in Islam the place of faith in Christianity)]: the highest Ottoman ecclesiastical functionary, representative of the sultan in religious affairs, as is the grand vizier in temporal matters. His chief duty is to expound Mussulman religion and law. Though appointed and removable like any officer of state, he while in power exercises a peculiar and anomalous influence upon the throne. No Ottoman sultan was ever deposed until after the muf'ti had issued a *fatva* (official opinion) against him; such a *fatva* once issued, it would be very difficult if not impossible for the sovereign to retain his place. The title muf'ti is often applied to jurisconsults attached to general or local Ottoman government councils.

E. A. GROSVENOR.

Müg'ge, THEODOR: author; b. in Berlin, Nov. 8, 1806; became a soldier, determined to go to South America and fight under Bolivar, but the war was over when he reached London; returned to Berlin; studied natural sciences, history, and philosophy for some time; devoted himself finally to literature. D. in Berlin, Feb. 18, 1861. Of his political writings, *France and the Bourbons* (1830), *England and the Reform* (1831), and *The Censure in Prussia* (1845), attracted much attention. The best of his traveling sketches are *Die Schweiz* (1847; Eng. trans. by Mrs. Percy Sinnet, London, 1848) and *Nordisches Bilderbuch* (1856); of his romances, *Toussaint* (1840) and *Afraja* (1854; Eng. trans. by E. J. Morris, Philadelphia, 1854). His works were published at Berlin in 33 vols. (1862-67).

Revised by J. GOEBEL.

Mühl'bach, LOUISE (pseudonym of **Klara Mundt**): novelist; b. at Neubrandenburg, Germany, Jan. 2, 1814; married Theodor Mundt 1839; died Sept. 26, 1873. She was the author of numerous novels, mostly historical, which, on account of their sensational contents, were for a long time

devoured by the patrons of the German circulating libraries. The fecundity of her imagination is illustrated by the fact that in one year she was able to furnish a dozen volumes to these libraries. As a consequence, her stories lack entirely artistic finish, though some of them show considerable descriptive talent. J. E. JACOBS.

Mühlberg, mühl bärch: town; in the province of Saxony; on the Elbe; 36 miles S. E. of Wittenberg (see map of German Empire, ref. 4-G). It is famous on account of the battle fought here on Apr. 24, 1547, in which the army of the allied Protestant princes under Johann Friedrich was totally defeated by the imperial army, and which changed entirely the course of the Reformation. Pop. (1890) 3,443.

Muhlenberg, FREDERICK AUGUSTUS: first Speaker of the House of Representatives of the U. S.; son of Henry Melchior Muhlenberg; b. at Trappe, Montgomery co., Pa., June 2, 1750; was a grandson of the distinguished Indian agent, Conrad Weiser; was educated in the University of Halle, Germany; was ordained in 1770, and began his pastorate in Lebanon co., Pa.; was pastor of Christ's church (German Lutheran), New York, from 1773 until the British occupancy of the city in 1776 determined his removal, and he became his father's assistant in Montgomery co., Pa. In 1777 he became pastor at New Hanover, Oley, and Goschenhoppen, all in the same county, serving also for a time at Reading, Pa. He became a member of the Continental Congress in 1779, and in 1780 a member of the General Assembly of Pennsylvania, of which he was Speaker 1781-82; was delegate to the Pennsylvania convention to ratify the Federal Constitution in 1787, and was chosen its president; was a member of the 1st, 2d, 3d, and 4th Congresses, and Speaker of the 1st and 3d; receiver-general of Pennsylvania 1800. D. at Lancaster, Pa., June 4, 1801. After retiring from the ministry Mr. Muhlenberg was an active lay member of the Lutheran Church, and bore a very important part in the revision of the constitution of the Ministerium of Pennsylvania in 1792. H. E. JACOBS.

Muhlenberg, HEINRICH MELCHIOR, D. D.: the organizer of the Lutheran Church in America; b. at Einbeck, Hanover, Sept. 6, 1711; studied at Göttingen, where, as a student, he founded an orphan-house, still in existence; was teacher in the orphan-house at Halle 1738-39; pastor in Grosshennersdorf, Saxony, 1739-42. The Lutheran congregations in Philadelphia, New Hanover, and Trappe having applied to the Lutheran pastors in London and the professors in Halle for a pastor, Muhlenberg responded to the call in 1742, and, on his arrival in Philadelphia, Nov. 25, began a career of unwearied activity extending throughout all the German settlements on the Atlantic coast from Nova Scotia to Georgia. He not only gathered the scattered people into congregations and saw that they were provided with pastors, but gave the congregations the organized form they have maintained; founded in 1748 the first synod (the Ministerium of Pennsylvania) and provided it with a constitution, and prepared the first liturgy and in a large measure the first hymn-book. The congregations of the General Synod and United Synod of the South, most of the congregations of the General Council and of the Joint Synod of Ohio, with many of those in the Synodical Conference, are the direct outgrowth of his labors. Dr. Muhlenberg laid the foundations of the Lutheran Church of America upon a confessional basis embracing all the symbolical books, to which he unwaveringly held, although cultivating friendly and even cordial relations with the representatives of the Episcopal, Presbyterian, and German Reformed Churches. He advocated the early introduction of the English languages into the German churches, and set the example by preaching, while pastor in New York, every Sunday in three languages—German, Dutch, and English. The form of church government which he sought to introduce provided for the systematic oversight of pastors and congregations through an adaptation of the Lutheran episcopal system to the synodical organization. The liturgical service which he prepared in 1748 is essentially the same as the Common Service, now agreed upon by all English-speaking Lutheran bodies in the U. S. D. at Trappe, Pa., Oct. 7, 1787. See Munn, *Life and Times of Henry Melchior Muhlenberg* (Philadelphia, 1887). H. E. JACOBS.

Muhlenberg, JOHN PETER GABRIEL: clergyman, soldier, and legislator; b. at Trappe, Pa., Oct. 1, 1746; a son of Dr. Heinrich M. Muhlenberg; was educated in Halle, but ran away from college and enlisted in the dragoons; became in 1772 minister of a Lutheran church at Woodstock, Va.; was much in public life, and soon after the outbreak of the

Revolution threw off his gown in the pulpit, displaying a military uniform, read his commission as colonel, and ordered the drums to beat for recruits; served with great distinction at Charleston, Brandywine, Germantown, Monmouth, Stony Point, and Yorktown; became a brigadier-general in 1777, and afterward a major-general; was vice-president of Pennsylvania 1785; member of Congress 1789-91, 1793-95, and 1799-1801; U. S. Senator 1801-02; became in 1802 U. S. supervisor of revenue for Pennsylvania, and in 1803 collector of the port of Philadelphia. D. near Philadelphia, Oct. 1, 1807. See the *Life* by Henry A. Muhlenberg (Philadelphia, 1849).

Muhlenberg, WILLIAM AUGUSTUS, S. T. D.: composer, organist, and hymn-writer; great-grandson of Heinrich Melchior Muhlenberg; b. in Philadelphia, Sept. 16, 1796; graduated at the University of Pennsylvania in 1814, and entered the Episcopal ministry in 1817. From 1817 to 1821 he was assistant rector of Christ church in Philadelphia under Bishop White. From 1821 to 1828 he was rector of St. James's church in Lancaster, Pa. From 1828 to 1846 he was at the head of a school, afterward called St. Paul's College, founded by him at Flushing, L. I. From 1846 to 1858 he was rector of the Church of the Holy Communion, erected by his sister, corner of Sixth Avenue and Twentieth Street, New York. In 1852 he organized the first Protestant sisterhood in the U. S.; he also promoted the establishment of a Christian settlement, called St. Johnland, on Long Island. In 1858 he became the first superintendent and pastor of St. Luke's Hospital, which owes its existence to him. He published *Church Poetry* (1823); *Mosiacs of the Church* (1852); *People's Psalter* (1858); *Evangelical Catholic Papers* (2 vols., 1875-77); and other works. He distinguished himself both as a philanthropist and a promoter of Christian union, but will be longest remembered as the author of the hymns *I would not Live Alway* (1823; revised in 1865); *Like Noah's Weary Dove* (1826); and *Saviour, who thy Flock art Feeding* (1826). D. in New York, Apr. 8, 1877.

Muhlenberg College: an institution at Allentown, Pa., founded in 1867, and named in honor of Heinrich Melchior Muhlenberg, the patriarch of the Lutheran Church in America. Its curriculum of studies embraces all the branches given in the best colleges for the degree of A. B., German being a required study throughout the four years' course. About 50 per cent. of its graduates prepare for the Lutheran ministry. The institution is endowed (\$150,000), and has a valuable property in the best part of the city. The number of the faculty is 11, exclusive of lecturers; students, 150; alumni, 330; books in library, 10,000. It possesses the usual apparatus and cabinets, together with a laboratory for scientific work. It has had three presidents; Rev. T. L. Seip, D. D., the present president, was inaugurated in 1886. T. L. SEIP.

Mühlhausen: town of Prussia; province of Saxony; on the Unstrut; 25 miles by rail N. N. W. of Gotha (see map of German Empire, ref. 5-E). It has large manufactures of woolen and cotton goods, furniture, hosiery, leather, sewing-machines, etc. It is surrounded by walls, and originally was a free city of the empire. In the Peasants' war of 1525 it was the headquarters of Thomas Münzer, and also the scene of his execution. Pop. (1890) 27,538.

Muir, myur, JOHN, D. C. L.: Orientalist; b. in Glasgow, Scotland, Feb. 5, 1810; was educated at Glasgow University and at the East India College at Haileybury; proceeded to Bengal as a writer in the civil service 1828; filled several important posts in the revenue and judicial departments; made a profound study of Indian languages, history, and antiquities; wrote some religious tracts in Sanskrit verse, and, after retiring from the service in 1853, devoted his time and his fortune to the promotion of Oriental studies, especially such as have a religious bearing. In 1862 he endowed with £5,000 a chair of Sanskrit and Comparative Philology in the University of Edinburgh. Besides various contributions to the *Transactions of the Asiatic societies* and other learned associations, Dr. Muir published five volumes of *Original Sanskrit Texts on the Groundwork of History of the People of India, their Religions and Institutions* (1858-70; 2d ed. 1868-73)—a work of the utmost value to the students of Indian antiquities, mythology, and literature, particularly of the Vedic age. Noticeable among his other works are *A Sketch of the History of the Religion of the Hindus* (1829); *Remarks on the Conduct of the British in Calcutta* (1852-54); *Remarks on the Conduct of the British in the Affair of the*

1853). He was also the author of *Metrical Translations from the Sanskrit*, many essays in *The Journal of the Royal Asiatic Society*, and an anonymous work on *Inspiration*. D. in Edinburgh, Mar. 7, 1882.—Dr. Muir's brother, Sir WILLIAM MUIR, b. in 1819, rose to high rank in India, and on his return to England sat in the Council of India 1876-85, and was then chosen principal of the University of Edinburgh. He is author of a valuable *Life of Mahomet* (4 vols., 1858-61); *Extracts from the Corān* (1880); and other works.

Revised by BENJ. IDE WHEELER.

Muk'den, or Mouk'den: city; capital of Manchuria, and chief city of the province of Shingking, and as such known to the Chinese as Fūng-t'ien-foo and Shinyang. *Mukden* is the Manchu name, and means prosperity. The city, whose walls have a circuit of 3 miles, and are pierced by nine gates, stands in a comparatively treeless plain, watered by the Hwūn, a west-flowing affluent of the Liao river; about 430 miles N. E. of Peking and 80 N. of Ying-tse (Niuchwang), its port; lat. 41° 50' 30" N., lon. 123° 37' E. (see map of China, ref. 2-L). It is modeled after Peking, and contains several palaces and official buildings erected about the year 1625, when Nurhachu made it his capital. The suburbs, where most of the business is transacted, are inclosed by another wall, 11 miles in circuit. About 3 miles to the E. is the tomb of Nurhachu. The tombs of most of the Manchu rulers, however, are at Yung-ling and Foo-ling, in the vicinity of the small palisaded city of Hingking, the original home of the Manchus. Pop. of Mukden about 180,000.

R. LILLEY.

Mulberry [M. Eng. *moolberry*, *murberie*, whose first part is from Lat. *mo rum*, mulberry. Cf. Germ. *maulbeere*; also from Lat., and like the Eng. with dissimilation of *l* to *r* before the following *r*]; a name of trees and fruits of the genus *Morus*, now generally referred to the *Urticaceæ* or Elm family. The genus comprises a few species of Asiatic and North American trees, mostly of small size and short trunk. The leaves are mostly large and ovate, alternate upon the stem, and are variously toothed and lobed, although not compound. A remarkable feature of mulberry foliage is its variability, leaves upon the same tree often differing widely in shape. The flowers are borne in axillary catkin-like short spikes, and they are small and greenish and unisexual. The sexes are borne upon different plants in some cases and upon different catkins on the same plant (monœcious) in others. The fruit itself is a very small, ovate achenium, which is ordinarily called a seed, while the fleshy and edible portion is the succulent enlarged calyx. The mass of thickened flowers comprising the spike is the so-called fruit of the mulberry.

The mulberry is chiefly known through its use as a food-plant for the silkworm. For this purpose it has been grown from the earliest times, particularly in China. Probably there is no single plant which enjoys such a voluminous literature as this white or silk-yielding mulberry, and there are few plants, perhaps, more variable or more confusing to systematic botanists. In the U. S., however, the mulberry is chiefly known as a fruit-bearing tree, and even in this capacity it is nowhere largely grown. The fruit resembles a blackberry in form and size, although more slender, and the flavor is sweet and in some varieties slightly vinous. It has never found its way into the market as a salable commodity, and there are no commercial preparations of it. It is worthy and capable of more extended use, however. The fruit varies from a half to 2 or even nearly 3 inches in length, and in color from amber white to violet, purple, and black. Although the two commonest species of mulberry are known as the white and the black, the color of the fruit does not afford characteristic differences between them. Mulberries begin to ripen early in summer, and some species or varieties mature their fruits successively through two or three months, a circumstance which adapts them to dessert use, but greatly lessens their adaptability for marketing. The fruits fall as they ripen, and the trees are therefore usually grown in sod, that the fruit may not be soiled. In Europe cresses or other quick-growing small plants are sometimes sown under the trees in order to catch the dropping fruits. Birds, poultry, and swine are very fond of mulberries, and in the southern parts of the U. S. certain varieties are planted for the express purpose of affording food to fattening hogs, for which the fruit is said to be well adapted. There are several kinds of mulberries grown for their ornamental foliage or curious habit. The Russian mulberry, a form of the white mulberry, is also planted for

hedges, and mulberry timber is considered to be good for uses which require a light, strong, and durable wood.

At various times during the eighteenth century attempts were made to rear the silkworm in North America (see *SILK*), and the mulberry was grown to feed it. About 1830 a new species, called *Morus multicaulis*, was introduced into the U. S. from France, a fever of speculation set in, and millions of trees were planted. As a result, the market was overstocked, climate and disease affected the trees, nurserymen lost their fortunes, and in 1839 the bubble burst. *Morus multicaulis* is no longer grown, unless for stocks upon which to graft other kinds. The fruit-bearing mulberries of the U. S. have been referred to *Morus nigra*, but they really belong to *M. alba* and to the native *M. rubra*, while the true black mulberry is grown only in the Southern States and on the Pacific slope. The fruit-bearing mulberries of the U. S. therefore are essentially different in type from those of other countries. Apparently the first-named variety of mulberry originating upon American soil was the Johnson, springing from the native red mulberry, *M. rubra*. The Hicks and Stubbs mulberries also belong to this species, and these two varieties are much prized in the South, especially for swine. The best mulberry for the North is probably the New American, a variety of *Morus alba*, although it is commonly, but erroneously, sold under the name of Downing. The Russian mulberry is the *Morus tatarica* of Linnaeus,



Mulberry.

but botanists now agree in referring it to *M. alba*, of which it is a hardy descendant. Two or three fruit-bearing varieties have sprung from this Russian stock, but they have not gained prominence. The *Nervosa* mulberry, grown in gardens for its curious narrow and jagged ribbed leaves, is a monstrous form of *M. alba*. The chief groups of mulberries now grown in North America may be divided as follows: 1. The white mulberry group. The white mulberry is supposed to be a native of China. It is nearly or quite as hardy as the plum-tree when well established. 2. The *Multicaulis* group. *Morus latifolia*, Poir. (*M. multicaulis*, Perrottet, *M. alba* var. *multicaulis* of Loudon.) 3. The Japanese group. *Morus japonica*, Audibert. (*M. alba* var. *stylosa*, Bureau.) The fruit is short-oblong and red. 4. The black mulberry group. *Morus nigra*, Linn. The black mulberry is a native of Asia, probably of Persia and adjacent regions. It is not hardy, except in protected places, in New England and New York. 5. The red or native mulberry group. *Morus rubra*, Linn. The native mulberry is generally distributed from Western New England to Nebraska and southward to the Gulf. It is more abundant and attains a larger size in the South.

L. H. BAILEY.

Mulcaster, RICHARD: schoolmaster; b. about 1530; educated at Eton, Cambridge, and Oxford; became in 1561 first head master of Merchant Taylors' School, in which position he remained until 1586. Some years later he was head master of St. Paul's School, where he labored for twelve years. In 1598 he was appointed by the queen rector of Stanford Rivers, in Essex, but began to live there

only in 1608. He died in 1611. In Merchant Taylor's School Edmund Spenser was one of his pupils, and among the others were nine who in later years acted in making a translation of the Bible (King James Version). His reputation has recently been increased through the attention attracted to his two works, *Positions for the Teaching of Children, either for Skill in their Booke or Health in their Bodies* (1581), and *Elementarie*, or first steps in education (1582). The former has been reprinted with excellent notes by R. H. Quick. In the *Positions* Mulcaster outlines an excellent course of training for body and mind that is in accord at many, if not most, points with the best thought of our day. The *Elementarie* is in the main a vigorous plea for the use and study of English. He especially defends the use of English by the learned, and writes his own book in the vernacular to show his faith. He also had advanced views on the education of women. See reprint of *Positions*, edited by R. H. Quick; Williams, *History of Modern Education*; Quirk, *Educational Reformers*, C. II, THURBER.

Mulder, GERARDUS JOHANNES: chemist; b. at Utrecht, Holland, Dec. 27, 1802; studied medicine; practiced in 1825 at Amsterdam; lectured in 1827 at Rotterdam on botany and chemistry, and became in 1840 Professor of Chemistry at the University of Utrecht. His *Chemistry of Vegetable and Animal Physiology* (translated into German by Kolbe in 1844, and into English by J. T. W. Johnston in 1849) occasioned a hot controversy with Liebig concerning the existence of PROTEIN *q. v.* as an independent compound. His *Chemistry of Wine* was translated into English by H. Bence Jones (1857). He also wrote the *Chemistry of Beer*, *De Vinding in Nederland*, *De Vinding van den Neger in Suriname*, *Chemical Researches*, etc., all translated into German, some into French. D. at Utrecht, Apr., 1880.

Revised by IRA REMSEN.

Mule [viâ O. Fr. from Lat. *mulus*, mule (*mu'la*, she-mule), whence O. Eng. *mūl*, mule]: a name in its widest sense synonymous with hybrid, but more commonly denoting the offspring of the male domestic ass and the mare; the corresponding offspring of the male horse and female ass is the jennet or HINNY (*q. v.*). The mule is more difficult to breed than the horse and matures more slowly, but its working life is longer and it is less liable to disease. The male is sterile, and although the female sometimes can be impregnated by the horse or ass, she rarely brings forth offspring alive. The mule is a hardy, strong, sure-footed, serviceable animal, peculiarly adapted to hard work in hot weather, and to use on steep and rough roads. Mules were much employed by the ancient Romans, and are now used in nearly all parts of the world, especially in North and South America, Spain, Southern France, Italy, and the East. In Spain, Spanish America, and parts of Africa and the East mules are highly prized as saddle animals. For military transport purposes they are decidedly superior to horses and much more used. In the U. S., Washington was instrumental in introducing the use of mules on Southern plantations, and at present they occur most extensively in the South. The total number in the U. S. in 1894 was 2,352,231, valued at \$146,232,811. Very nearly half of these were possessed by the States of Missouri, Texas, Tennessee, Georgia, Mississippi, and Kentucky, named in order of numbers.

Mule-deer: See DEER.

Mulford, ELISHA, LL. D.: philosophical writer; b. at Montrose, in Susquehanna co., Pa., Nov. 19, 1833; graduated at Yale College in 1855; his education in law, theology, and philosophy was continued at the Union Theological School, at Andover, and at Halle and Heidelberg, Germany. He held various charges, but after 1881 made his home in Cambridge, Mass. In 1870 he published *The American*, a profound treatise on the philosophy of the state; in 1880 *The Republic of God*, a similar work on the philosophy of religion. He lectured on the philosophy of law at Columbia Law School, and on theology and philosophy at Cambridge Theological (Episcopal) School. D. at Cambridge, Mass., Dec. 9, 1885.

Mulgrave, CONSTANTINE JOHN PHILIPS, B. C.: officer and politician; b. in England, May 30, 1734; entered the navy at an early age; became post-captain 1765; commanded an exploring expedition in search of a northwest passage 1773; reached lat. 80° 48' N., whence an impenetrable field of ice stretched northward; published *A Journal of a Voyage toward the North Pole* (1774); succeeded to the title 1775; was commissioner of the admiralty under Lord

North's administration, and an ardent politician; was raised to the English peerage in 1784, and died Oct. 10, 1792.

Mulhall, MICHAEL G.: statistician; b. in Dublin, Ireland, in 1836; was educated at the Irish College, Rome; removed to South America and founded the Buenos Ayres *Standard* 1861; contributed to *The Contemporary Review*. Is the author of *Handbook of the River Plata* (5th ed. 1885; trans. in Spanish); *The Progress of the World* (1880); *Dictionary of Statistics* (1891).

Mulhausen, mül-how-zen (in Fr. *Mulhouse*): town and railway center of Germany; province of Alsace-Lorraine; on the Ill, which divides it into the old and the new city; 61 miles S. S. W. of Strassburg (see map of German Empire, ref. 7-D). The old town is rather indifferently built, the new town is very elegant; there is, besides, a workingmen's quarter of 1,000 well-built houses. Mulhausen has manufactures of cotton (525,000 spindles), woollens, linens, muslins, watered silks, chemicals, printing and dye works, etc., and is one of the most flourishing manufacturing towns of Germany. The town and its territory originally belonged to the Swiss confederation, but in 1798 it was incorporated with France, and by the Treaty of Frankfurt, 1871, it was ceded to Germany. Since that time it has increased very rapidly, principally by immigration from Germany. Pop. (1890) 76,892.

Mulheim-am-Rhein, mül him-aam-rin': town of Prussia, Rhine province; on the right bank of the Rhine; 3 miles above Cologne; has large manufactures of velvet, silk, and thread (see map of German Empire, ref. 4-C). Its prosperity dates back to the beginning of the seventeenth century, and was due to the settlement there of a number of Protestant emigrants from Cologne. Pop. (1890) 30,996.

Mulheim-an-der-Ruhr, -där-roor': town of Prussia, Rhine province; on the Ruhr; 16 miles N. of Düsseldorf; has extensive manufactures of iron and leather, and a trade in coal and iron from the mines in the vicinity (see map of German Empire, ref. 4-C). The Ruhr becomes navigable here, and a large number of vessels for the navigation of that river and the Rhine are built. The trade of the town is principally with Holland. Pop. (1890) 27,903.

Mull: one of the Inner Hebrides; off the west coast of Scotland. It is 30 miles long and 25 miles broad, high, rugged, but fertile, though not fit for agriculture on account of climate; cattle and sheep are reared. Pop. about 7,000.

Mullein, mül'in [M. Eng. *moleyn* < O. Eng. *molegn*]: the common name of a plant of the family *Scrophulariaceæ* or figworts (*Verbascum thapsus*), belonging to a widely distributed genus which includes more than eighty varieties. The common mullein of the U. S. is biennial, attaining a height of from 4 to 6 feet, with oblong-acute leaves 8 or 10 inches long, covered with a soft wool-like pubescence. It is found in Europe and Asia, whence it was introduced into North America, where it is a troublesome weed.

Muller, mü'lär, CHARLES LOUIS: historical and portrait painter; b. in Paris, Dec. 22, 1815; d. there Jan. 10, 1892. He was a pupil of Baron Gros and of Léon Cogniet; was awarded medals at the Salons of 1838 and 1846; first-class medal, Paris Exposition, 1855; became an officer of the Legion of Honor 1859; member of the Institute 1864. He is best known by his celebrated *Roll-call of the Last Victims of the Reign of Terror*, formerly in the Luxembourg Gallery, Paris. His *Charlotte Corday in Prison* (1875) is in the Corcoran Gallery, Washington. W. A. C.

Müller, M. [Dr. LUDWIG FRIEDRICH HERMANN L. MÜLLER]: Latinist; b. at Merseburg, Germany, Mar. 17, 1836; studied in Berlin, and in 1867 became privat docent in Bonn; since 1870 has been Professor of Roman Literature at the Philological Historical Institute of St. Petersburg. His works display great learning and high critical talent, but are vitiated by virulent invective against eminent scholars who do not hold his views. With the exception of a very unsatisfactory *History of Classical Philology in the Netherlands* (1869), his work has been confined chiefly to Old Latin poetry. His masterpiece is the *De re metrica prater Plautum et Terentium* (1861), the most exhaustive and best treatment of the subject we possess. Besides this, Müller has edited *Lucilius* (1872); a literary monograph on this poet's *Life and Works* (1876); *Plautus* (1877); *Terentius*, *Lucius*, and *Propertius*; a German commentary to Horace's *Satires and Epistles* (2 vols., 1892-93); *Nonius* (2 vols., 1892); monographs on *Ennius* and *Horace*, etc.

Müller, Baron FERDINAND, von, M. D., F. R. S.: botanist; b. at Rostock, Germany, June 30, 1825; was educated at Kiel; investigated the botany of Schleswig and Holstein; emigrated to Australia 1847; made extensive botanical explorations in South Australia at his own expense 1848-52; was then made government botanist for the colony of Victoria; explored many mountain ranges previously unknown 1852-55; was naturalist to Gregory's exploring expedition 1855-56; was director of the botanical garden at Melbourne 1857-73; published *Fragmenta Phytographiæ Australiæ* (10 vols., London, 1862-77); *Plants of Victoria* (2 vols., Melbourne, 1860-65), *Flora Australiensis* (7 vols.), and other works. He was ennobled by the King of Württemberg in 1870. D. at Melbourne, Oct. 9, 1896.

Müller, FREDERICK MAX, Ph. D., knight of the *Ordre pour le mérite*: philologist; b. at Dessau, Germany, Dec. 6, 1823; studied at Leipzig, Berlin, and Paris; since 1854 has been Professor of Comparative Philology in the University of Oxford, England; is foreign member of the French Institute. He has a high reputation as a popular interpreter of the most recondite subjects of learning. Among his most important works may be mentioned *Rig-Veda Samhitā* (6 vols., 1849-73; 2d ed. 4 vols., 1889-92); *Rig-Veda Samhitā, Translated and Explained* (vol. i., 1869; 2d ed. *Sacred Books of the East* (1892); *Rig-Veda Pratiśākhya, das älteste Lehrbuch der vedischen Phonetik* (1869); *Hitopadesa, in das Deutsche übersezt* (1844); *Hitopadesa, Text with Interlinear Transliteration, Gramm. Analysis, and English Translation* (1866); *Meghadūta, dem Kālidāsa nachgedichtet* (1847); *Upanishads, Translated from the Sanskr., Sacred Books of the East* (vols. i. and xv., 1879, 1884); *Dhammapada, Translated from Pāli, Sacred Books of the East* (vol. x., 1881); *Buddhist Texts from Japan* (1881-85); *History of Ancient Sanskrit Literature* (2d ed. 1859); *Sanskrit Grammar for Beginners* (2d ed. 1870); *India, What can it Teach Us?* (1883; new ed. 1892); *Kant's Critique of Pure Reason, Translated* (1881); *Introduction to the Science of Religion* (1870; last ed. 1882); *On the Origin and Growth of Religion*, Hibbert Lectures (1878; new ed. 1882); *Chips from a German Workshop* (4 vols., 1867-75); *Selected Essays on Language, Mythology, and Religion* (2 vols., 1881); *Biographical Essays* (1884); *Lectures on the Science of Language* (1861-63; rewritten 1891); *The Science of Thought* (1887); *Biographies of Words and Home of the Aryas* (1888); *Gifford Lectures, i. Natural Religion* (1890), ii. *Physical Religion* (1891); *Anthropological Religion* (1892). BENJ. IDE WHEELER.

Müller, FRIEDRICH (Maler Müller): poet; b. at Kreuznach, Germany, Jan. 13, 1749; studied art, and attracted by his talent the attention of influential persons. Aided by these, and especially by Goethe, he was enabled to go to Rome in 1778. His paintings did not, however, meet with success; he lost his interest in his art and supported himself finally as a guide and second-hand bookseller in Rome, where he died Apr. 23, 1825. As a poet and writer Müller is to be classed among the members of the Storm and Stress school. He has been called the romanticist among these writers on account of his love for the Middle Ages. He gained his first reputation as a writer by his *Idyllen* (1775), but his talent was more of a dramatic nature. Of the many dramas which he planned, he finished but a few, and among these *Golo und Genoveva* is his best work. He also wrote a *Faust*, but the published fragments of this drama give sufficient evidence that Müller was not equal to a theme of the proportions of the Faust legend. See B. Seuffert, *Maler Müller* (1877); A. Sauer in vol. lxxxi. of *Kürschners Nationalalliteratur*. JULIUS GOEBEL.

Müller, FRIEDRICH, Ph. D.: philologist; b. at Jemnik, in Bohemia, Mar. 5, 1834; studied at Vienna; since 1869 has been Professor of Comparative Philology at Vienna; is a member of the Imperial Academy of Vienna; author of a great number of most important ethnographical and linguistic treatises, among which are *Grundriss der Sprachwissenschaft* (7 vols., 1876-88); *Allgemeine Ethnographie* (1873; 2d ed. 1879); *Reise der österr. Fregatta Novara um die Erde: linguistischer Theil* (1867), *ethnographischer Theil* (1868); various treatises on Pāli, Zend, Modern Persian, Afghan, Kurd, Ossetan, Armenian, the African, and American languages in the *Mittheilungen der anthropologischen Gesellschaft in Wien*; editor of the *Wiener Zeitschrift für die Kunde des Morgenlandes*, and author of numerous articles therein, as well as in the journals *Ausland* and *Globus*. BENJ. IDE WHEELER.

Müller, GEORG ELIAS, Ph. D.: psychologist; b. in Grimma, Saxony, 1850; educated at Grimma, Leipzig, Berlin, and Göttingen; became privat docent at the University of Göttingen in 1876; assistant professor in the University of Czernowitz in 1880; Professor of Philosophy at Göttingen in 1881. His principal works are *Zur Theorie der sinnlichen Aufmerksamkeit* (1873); *Zur Grundlegung der Psychophysik* (1878); *Ueber die Maassbestimmungen des Orts-sinnes der Haut* (1879); *Theorie der Muskelcontraction* (with Dr. Fr. Schumann, vol. i., 1891); *Ueber die psychologischen Grundlagen der Vergleichung gehobener Gewichte* (1889); *Experimentelle Beiträge zur Untersuchung des Gedächtnisses* (1893). J. M. B.

Müller, JOHANNES, von: historian; b. at Schaffhausen, Switzerland, Jan. 3, 1752; studied theology and history at Göttingen; devoted himself to the preparation of a *History of Switzerland*, of which the first volume appeared at Berne in 1780; was Professor of Statistics at Cassel 1781-83, but retired and lived at Geneva till 1786. In this year he was appointed court councilor and librarian at Mentz, and when the city was taken by the French in 1791 he repaired to Vienna, where he stayed till 1804, and was treated with much courtesy, but he was forbidden to continue his Swiss history. In 1804 he went to Berlin; was appointed historiographer to the King of Prussia, and received permission to use the Prussian archives for a history of Frederick II. Nevertheless, after the battle of Jena and the occupation of Berlin by the French, Napoleon succeeded in winning him over to his side, and in 1808 he accepted a position as minister of state to the King of Westphalia. This act, and the pronounced manner in which he extolled Napoleon, excited great indignation in Germany, and other circumstances, pecuniary embarrassments, political disappointments, etc., were added, making his last days melancholy. D. at Cassel, May 29, 1809. Besides his great works, the *History of Switzerland* and *Twenty-four Books of Universal History*, he wrote a number of monographs and pamphlets rich in ideas and elegant in style.

Müller, JOHANNES: physiologist; b. at Coblenz, Germany, July 14, 1801, in humble circumstances; began to prepare himself for the Roman Catholic Church, but abandoned in 1819 his theological studies, and devoted himself exclusively to medicine; took his degree in 1822, and became Professor of Physiology and Anatomy in 1826 at Bonn, and in 1833 at Berlin, where he died Apr. 28, 1858. As the founder of the physico-chemical school of physiology he enjoyed the fame of being one of the greatest physiologists of his age, and his publications brought new facts and new ideas to every point of his science. His principal works are *Elements of Physiology* (1833; translated by Dr. W. Baly, 2 vols., London, 1837-42); *De Respiratione Fœtus* (1823, his first publication); *De Glandularum Secernentium Structura* (1830); *Vergleichende Anatomie der Myzinoïden* (1835-45, etc.). J. M. B.

Müller, JOHANN FRIEDRICH WILHELM: engraver; son of Johann Gotthard Müller; b. at Stuttgart, 1782; d. at Pirna, Saxony, May 3, 1816; was educated partly by his father, partly in Paris; became an equally celebrated engraver, and was professor at the academy in Dresden. His engraving after the statue *La Jeunesse* attracted great attention by the manner in which he undertook to imitate marble, but his most celebrated works are the engraving of the *Madonna di S. Sisto*, by Raphael, and the portraits of Jacobi and Schiller, after the busts by Danneker.

Müller, JOHANN GOTTHARD, von: engraver; b. at Bernhausen, near Stuttgart, Germany, May 4, 1747; received his first artistic education at the school of art in Stuttgart; went in 1770, with the support of Duke Charles, to Paris, where he studied engraving under Wille, and was appointed professor in 1776 at the academy of art at Stuttgart, where he exercised a great influence, and had many pupils. D. Mar. 14, 1830. Among the most celebrated engravings by him are *The Battle of Bunker Hill*, by Trumbull; *St. Cecilia*, after Domenichino; *St. Catharine*, after Leonardo da Vinci; and the portraits of Louis XVI., Dalberg, and Jerome Bonaparte.

Müller, KARL OTFRIED: Greek scholar and archæologist; b. in Brieg, Silesia, Aug. 28, 1797; studied in Breslau and under Boeckh in Berlin. At the early age of twenty-two, he was appointed professor extraordinary at Göttingen, professor ordinary in 1823. In Sept., 1839, he undertook what was to prove a fatal journey to Greece, for he died Aug. 1, 1840 of a fever which he contracted at Delphi, while copying in-

scriptions. Müller may be said to have permanently established the study of archaeology inaugurated by Winkelmann. Many problems which it was reserved for later scholars to solve were first suggested by him. His best known works are *Orechomenus und die Mäurer* (1820); *Die Dorier* (2 vols., 1824); *Die Etrusker* (2 vols., 2d ed. by W. Doerke, 1877); *Prolegomena zu einer altclassischen Mythologie* (1825); *Handbuch der Archäologie der Kunst* (1818; 3d ed. by F. G. Welcker; *Aschepus's Etrusker*, Greek and German, with exhaustive essays on scenic antiquities, still of interest, because of the polemical introduction which gave rise to the famous quarrel with G. Hermann; *Varro de lingua Latina* (1831); *Festus* (1836), until recently (1891) the standard edition of this work; and finally the *History of Greek Literature* to the time of Alexander (2 vols., 1841; 3d vol. added by E. Heitz, the Hellenistic period by I. W. Donaldson; fourth edition in German 1883), still one of the best works on the subject, both in style and treatment. Cf. K. Hillebrand, in the French translation of Müller's *Varro*, pp. xvii.-ccclxxx.; *Briefwechsel zwischen August Baezel and O. M.* (1883, pp. 142); Bursian, *Geschichte der classischen Philologie in Deutschland*, pp. 1007-1028.

ALFRED GUDMAN.

Müller, Wilhelm: poet; b. at Dessau, Germany, Oct. 7, 1794; studied philology and history at Berlin; fought as a volunteer in the wars of liberation against Napoleon; went to Rome in 1817, where he stayed for nearly two years, and was in 1819 appointed Professor at the Gymnasium of Dessau, and librarian of the duke's library at the same place. D. Sept. 30, 1827. There are few German poets who have succeeded in reproducing the spirit of the Volkslied with such naïve originality as Müller did in his graceful, melodious *Gedichte eines Walpurgisten* (1821), *Lieder des Lebens und der Liebe* (1824), *Lipische Rosen* (1827). Many of these which were set to music by the greatest German composers like Schubert have again become popular songs; besides, they exerted a great influence on Heine's lyrics, according to the latter's own confession; but Müller was also capable of vigorous political pathos, as is shown by his excellent *Griechenlieder*, which he sang in defense of the liberation of Greece. Müller's complete works were published by G. Schwab, 1830. His *Gedichte* were edited with an excellent introduction and notes by his son, Max Müller (Leipzig, 1868).

JULIUS GOEBEL.

Müller, Wolfgang: poet; b. at Königswinter, Prussia, Mar. 5, 1816; studied medicine at Bonn and Berlin; lived at Düsseldorf, Cologne, and Wiesbaden. D. June 29, 1873. He was the author of several charming epic poems, e. g., *Die Malibonque* (1852); *Prosa Minnaden* (1854); *Der Rattenfänger von St. Gaur* (1854); *Jahann von Werth* (1858), etc. Much of his poetry is based on the legends of the romantic Rhine valley, as may be seen from his collections *Dichtungen eines rheinischen Poeten* (4 vols., 1871-74) and *Erzählungen eines rheinischen Dichters* (2 vols., 1860-61). He was less successful as a dramatist, though some of his smaller pieces, like *Sie hat ihr Herz entdeckt*, still charm us with their exquisite simplicity.

JULIUS GOEBEL.

Müller's Glass: See HYALITE.

Mullet [from O. Fr. *mulet*, dim. of *mulle* = Lat. *mullus*, red mullet]: a name common to the fishes of the family *Mugilidae* (group Percosces), and often extended to the

of Europe is the finest. The red mullet of the Gulf of Mexico (*Upeneus maculatus*) is an abundant fish, caught



The striped red mullet.

extensively for table use, but its flesh is not excellent. See FISHERIES.

Mullion: in architecture, a vertical bar or slender pillar dividing a window into two or more parts. In Gothic tracery the earliest mullions seem to have been slender columns, sometimes single and sometimes clustered. In the Geometric, Decorated, or Rayonnant period (fourteenth century) these columnar mullions were of extraordinary slenderness and height; they soon, however, gave way to barmullions, mere slender bars molded to the profiles of the moldings of the arched heads of each division or light of the window. In the enormous windows of the English Perpendicular period the mullions were intersected by frequent horizontal bars or transoms. Long after mullioned windows had been given up in France, under the influence of the Renaissance, we find in the Elizabethan mansions of England vast square windows of many lights divided by simple vertical mullions with one or more transoms in the upper portion. The early Renaissance in Florence, Bologna, Venice, and Milan also shows examples of arched windows divided into two subordinate arched lights by a central colonnette of Corinthian type. Mullions of stone or wood are commonly used in large windows of modern buildings. See ARCHITECTURE.

A. D. F. HAMLIN.

Müllner, AMADEUS GOTTFRIED ADOLF: dramatist; b. at Langendorf, Prussian Saxony, Oct. 18, 1774; studied law at Leipzig, and practiced from 1798 as an advocate at Weissenfels, where he died June 11, 1829. He wrote on juridical subjects, novels, dramas, and critical essays, and became famous as the author of the two tragedies *Februar* (1812) and *Die Schuld* (1816), both of which are notorious samples of the so-called *Schicksalstragödie*, a literary aberration at the beginning of the nineteenth century. In imitation of the misapprehended Greek tragedy, the writers of the *Schicksalstragödien* introduced "fate" (*Schicksal*) into their plot as an invisible power which arbitrarily determined the destiny of the characters of the play. The absurdity of this undertaking was effectually ridiculed by Platen in his classic parody *Die verhängnissvolle Gabel*.

Revised by JULIUS GOEBEL.

Mulock, DINAH MARIA: See CRAIK.

Mulready, WILLIAM: landscape and genre painter; b. at Ennis, County Clare, Ireland, Apr. 30, 1786. He studied at the Royal Academy, London, where he first exhibited in 1803; was elected a Royal Academician 1816. His illustrations for *The Vicar of Wakefield* are among the best things of their kind in British art, and he painted several pictures from the same subjects. *Snow Scene* and *Seashore Scene* are in the National Gallery, London; *The Bathers* is in the National Gallery, Edinburgh. D. in London, July 7, 1863.

W. A. C.

Multan': town of British India; in the Punjab (see map of N. India, ref. 4-B). It is interesting on account of the surrounding ruins; is of much commercial and manufacturing importance; and its magnificent Hindu temple and the graves of two Mohammedan saints draw many pilgrims from all parts of India. Pop. (1891) 74,510. C. C. A.

Multiple Point [from *multiple*, i. e., many, and *point*, i. e., a point]: in geometry, a point at which a curve intersects itself. If the curve passes twice through the same point it is a *double point*; if three times, a *triple point*; and so on. It is a characteristic property of a multiple point that the first differential coefficient of the ordinate at that point has as many values as the number of times that the curve passes through the point. Thus the curve whose equation is $x^4 + 2ax^2y - ay^3 = 0$ has a triple point at the origin, at which point the first differential



The gray mullet.

very different family *M. tele* or salmon, and to other fishes. Of the true mullets of the American Atlantic and Gulf waters, the striped mullet (*Mugil cephalus*) and the white mullet (*M. curema*) are small but esteemed food-fishes. The waters of the Old World abound in true mullets of many species. They often ascend rivers, and can be naturalized in fresh water. They are caught and cured extensively in Europe. The gray mullet (*M. capito*) is one of the best. The *Mullidae* or surmulletts are popularly called mullets, red mullets, etc. Of the typical genus, *Mullus*, there are several varieties, including food-fishes. *Mullus barbatus*

coefficient of the ordinate has the three values, 0 , $+\sqrt{2}$, and $-\sqrt{2}$. It may happen that two or more branches of a curve are tangent to each other at some point; this point is a species of multiple point, at which the corresponding differential coefficient of the ordinate has two or more equal values.

Multiple Proportion, Law of: See CHEMISTRY.

Multituberculata: an order of mammalia, appearing in the Triassic period and becoming extinct in the Eocene. They are characterized by having the incisor teeth much enlarged, and the molars with tubercular grinding surfaces and distinct roots. It is supposed by Cope that they were closely allied to the strange order of *Monotremata*, represented to-day by the duckbill and the spiny ant-eaters of Australasia.

Mum'mius: a Latin writer of the early empire who wrote *fabulæ Atellanæ*. Only a few fragments are extant. See Ribbeck, *Com. Rom. Frag.*, p. 273.

Mummius, LUCIUS, surnamed **ACHÆICUS**: the conqueror of Greece and the destroyer of Corinth; was prætor in 154 B. C., and became consul in 146. The Achæan League was just running its mad course of wild, hazardous policy under the leadership of Critolaus and Diæus. Metellus had defeated the league several times, but had not been able to suppress it completely; perhaps he did not wish to suppress it. At the moment of Mummius's arrival in Greece the league had gathered an army on the isthmus of Corinth, but it proved very easy for Mummius to defeat and disperse it, and after the victory he entered Corinth, bent upon establishing an example which should deter other Greek cities from attempting resistance to the Roman supremacy. Many of the inhabitants had fled; the rest were either massacred or sold as slaves. The city was then pillaged and burned. Its enormous treasures of art and luxury were either sold to the King of Pergamos, carried to Rome, or ruined.

Mummy [from O. Fr. *mumie* (> Fr. *momie*), from Pers. and Arab. *mūmiyā*, mummy, deriv. of *mūm*, wax (used in embalming)]; an embalmed human or animal body, preserved dry, in semblance of its original shape, by artificial means. The Egyptian name was *sāhu*. Mummifying has been practiced by various peoples for a variety of reasons, mainly religious. The art was most developed in Egypt, where it had distinct connection with the very ancient belief in a future revivification of the body, a belief of whose existence we have monumental proof from the second dynasty, and one which took its rise in the conception of the nightly journey of Ra, the sun-god, in the nether world, and from the Osiris myth. At death the soul and body are separated, and, according to Egyptian belief, in order to the continued existence of the soul in its separate state and to its reconnection with the body, the latter must be preserved as nearly intact as possible (see KA), the idea apparently being that the bodily organs continued of service to the dead in the journey through Amenti, the region of the departed. Hence came the care bestowed upon the mummy and the provision against harm by placing it in hidden pits, pyramids, and other tombs. (See MASTABA.) The antiquity of the process is great (bodies impregnated with pitch having been preserved from the earliest dynasties), but its source is unknown. It is disputed whether it is Egyptian in its origin or whether it was brought from Asia by the original invaders, who are supposed to have come in by way of the Wadi Hammamat from Southern Arabia. In the earliest native burials the bodies were not mummified, and were placed in a sitting posture or in a contracted lying position. It is thought that these distinctions in mode correspond to a difference in race. (Cf. Petrie, *Medum*, p. 21.) What is known of the process is derived from observation and from the accounts of Herodotus (ii., 85), Diodorus (i., 91), and others. In the main these sources confirm each other.

Egyptian mummifying was performed with more or less elaborateness, according to the wealth and position of the deceased. Diodorus speaks of three methods, which varied in price; the most expensive costing about \$1,250, the second about \$300, while the last was very cheap. Every particular in the process was accompanied with ceremonials, symbolic acts, or recitations, more or less elaborate according to the wealth or poverty of the dead. Many papyri are more or less devoted to these details. When mummification was completed the body was delivered to the friends, placed in its human-shaped coverings, cartonnages or sarcophagus,

and transported to the west side of the Nile where, as a rule, the necropolis was located. The dead, meantime, had become an Osiris, received an Osiris-name, and had begun the career of the departed Egyptian. Cf. Maspero, *Études de mythologie et d'archéologie égyptiennes* (Paris, 1893, i., p. 283 ff.). See EMBALMING and RITUAL OF THE DEAD.

The literature of the subject is quite large, though scattered, but the best book on the entire subject is that of E. A. Wallis Budge of the British Museum, *The Mummy* (Cambridge, 1893). CHARLES R. GILLET.

Mumps [probably derived from verb *to mump*, to mumble, be sulky, in allusion to the appearance of the patient; cf. *mumpish* and *mumps* in sense of the sulks. An Eng. dialectal word *mump*, lump, protuberance, may, however, also have aided in determining the use of the term]; an infectious and contagious disease, belonging to the same general class as measles, scarlatina, whooping-cough, etc., and characterized by an acute inflammation with enlargement of the parotid gland. In some localities, especially those with a moist and cold climate, it is very frequently seen (endemic). Children from seven to fourteen years of age, principally males, are most liable; adults, however, are not exempt. Its period of incubation, or preparatory development, lasts from one to three weeks; its chief symptoms are moderate fever; pain on pressure over the affected gland, in front of and below the ear, most frequently the left, sometimes the right and occasionally both sides; considerable swelling of that region and the whole cheek and chin; difficulty in mastication, deglutition, and respiration is in proportion to the amount of swelling; change of voice; fullness of the head and dizziness. In some cases the spleen and numerous other glands are also enlarged. In males the testicles and seminal glands, in females the ovaries and breasts, may also swell, and catarrh of the mucous membranes of the eyelids, nose, and mouth, is frequent. The duration of the disease is from a few days to a week. The swelling will gradually subside; in some cases, however, the gland may remain large and hard, and in a few an abscess will form. The treatment is simple, but should be under the guidance of a physician. It consists of regulation of diet—less meat, more milk, gruels, fruit, etc.; vegetable acids (lemonade), or dilute hydrochloric acid, ten to fifteen drops in a tumblerful of water as a beverage; mild purgatives, such as Rochelle salts, Seidlitz powder, or cream of tartar. Locally, it is best to use cold applications, reserving warm water or poultices for those cases in which an abscess is forming. Internal medication can generally be restricted to a mild antipyretic when indicated by excessive fever, and the iodides, should induration remain. In case of abscess, incision, free drainage, and antiseptic treatment are indicated. A. JACOB and F. E. SONDERN.

Munch, PETER ANDREAS: historian; b. at Christiania, Norway, Dec. 15, 1810; studied law at the university of his native city, but at the same time gave a great deal of his time to the study of history and of Old Norse language and antiquities, a study he had begun while at school. Munch was, together with Rudolf Keyser, the founder of what is called the modern Norwegian historical school, and his historical writings are alike distinguished by critical acumen, thorough learning, and ingenious combination. Munch was in 1837 appointed an associate professor, and in 1841 Professor of History at the University of Christiania. He made several voyages abroad in order to study foreign archives and libraries, and from 1858 to 1861 lived in Rome, studying the papal archives, to which he gained an access that rarely has been granted to non-Catholics. His principal work is *Det norske Folks Historie* (History of the Norwegian People, in 8 vols., Christiania, 1852-63), treating of Norwegian history until the Calmar Union. Munch published a great many works of a linguistic nature (Old Norse Grammar, *Det Oldnorske Sprogs Grammatik*, by P. A. Munch and C. R. Unger, 1847; *Forn-Svenskans och Fornnorskans Språkbyggnad*, Stockholm, 1849; *Det Gothiske Sprogs Formlære* 1848), and on historic and mythologic subjects (*Nordmændenes ældste Gude- og Helte-sagn*, 1854; new edition 1880). He also translated and edited several Old Norse sagas, including Snorri Sturluson's *Heimskringla* and *Odd*, the monk's *Saga of Olaf Trygvason*, and with C. R. Unger the *Saga of St. Olaf*, *Chronicon Regum Manniæ*, *Speculum Regale* (1848), and the *Elder Edda* (1847). A complete collection of Munch's essays (*Samlede Afhandlinger*, 4 vols., Christiania, 1873-76), was edited by Dr. Gustav Storm. D. in Rome, May 25, 1863. P. GROTH.

Munch, Peter Andreas: poet; b. at Christiania, Norway, Oct. 19, 1811; studied law at the University of Christiania without finishing his course; was editor of a newspaper, *Den Christenvennlig* (1841-46); was in 1850 the assistant librarian of the university library, and in 1860 given a position as extraordinary lecturer in the university without obligation of lecturing. After 1860 he spent most of his time abroad, and from 1866 he had his residence in Copenhagen. Among his numerous writings may be mentioned *Sing og Trøst* (Grief and Consolation, a collection of poems, 1852; 7th ed. 1891); *Salmene de Cæsar*, a lyric drama (1854); translated by John Chapman, London, 1855; *En Aften paa Hæder*, a historical drama (1855); *Lord William Russell*, a tragedy (1857); translated by John Hay, 2d Ed., London, 1862, under the title *William and Rachel Russell*; *Kongedatterens Brudefart* (The Princess's Bridal Journey, twelve romanzas, 1861; 3d ed., illustrated, 1878); *Pigen fra Norge* (The Maid of Norway, a romance, 1861; translated by Mrs. Robert Parkes, London, 1875); *Jesu Billede* (The Picture of Jesus, a cycle of poems after a Roman legend, 1865; 6th ed. 1885). Munch translated into Norwegian several of Tennyson's poems, among them *Knave's Arden* (1866), and Walter Scott's *The Lady of the Lake* (1871). His *Historie om Ridderskipet Hvidebjørn* (The White Bear, a procession in Hardanger), after the famous picture by A. Tidemand and H. Gude, and with music by Halfdan Kjerulf, is one of the most popular of Norwegian songs. D. at Copenhagen, June 27, 1884. P. GROTH.

Munchausen, Hieronymus Karl Friedrich, Baron von: romancer; b. of noble family at Bodenwerder, Hanover, in 1720; served in the Russian cavalry against the Turks 1737-39; died at Bodenwerder in 1797. The baron was throughout life accustomed to entertain his friends (in a singularly modest way and with an air of truthfulness) with wonderful tales of his exploits in the wars, and had the reputation of being the greatest liar in Germany. The first published collection of his stories appeared in English, and was written by Rudolph Erich Raspe, a German exile, and published in 1785 in Oxford under the title *Baron Munchausen's Narrative of his Marvellous Travels and Campaigns in Russia*. This collection was translated into German in the following year by G. A. Bürger, the famous German poet, and with many additions has since then been printed very often as one of the most popular books. See introduction to the reprint by E. Griesebach (Stuttgart, 1890), and Carl Müller-Frauenfeldt, *Die deutschen Lügenphantasten des 18ten Jahrhunderts*, Halle, 1881. Revised by J. GÖTTKE.

Munch-Bellinghansen, Eligius Franz Joseph, Baron von: dramatist; b. at Cracow, Apr. 2, 1806; studied law, and held different government offices in Vienna at the imperial library, the Burgtheater, etc. He is best known in German literature by his pseudonym of *Friedrich Halm*. In 1834 his first drama, *Griseldis*, was performed at the Burgtheater, and had a great success. Then followed in 1836 *Die Adelp.* in 1837 *Caracalla*, in 1838 *Die drei Letztgeburtigen*, in 1843 *Der Sohn der Wildtiss* (Hugener), in 1844 *Sampiero*, in 1847 *Maria de Molina*, in 1854 *The Gladiator from Ravenna*, etc. The last-mentioned drama is his best work; his subsequent ones are rather weak. As a dramatist, he belongs to the school of Schiller. He was famous in his time, and several of his pieces have been translated into English. He treated extraordinary psychological problems in his dramas, and by using strong contrasts in the characters and situations produced powerful effects. He also wrote some lyrical poems of inferior quality. His collected works were published at Vienna in 8 vols. (1857-64). D. in Vienna, May 22, 1871. Revised by J. GÖTTKE.

Muncie: city; capital of Delaware co., Ind. (for location of county, see map of Indiana, ref. 5-F); on the White river, and the Lake Erie and W., the Cleve., Cin., Chi. and St. L., and the Ft. W., Cin. and Louis. railways; 54 miles E. of Indianapolis, 110 miles N. W. of Cincinnati. It is in an agricultural region, and has important manufactures, including glass, nails, iron, steel, handles, pulp, and paper. It is also in the center of the great Indiana natural-gas belt, which gives the factories free fuel. There are electric lights, electric street-railway, public library (founded 1874) which contains over 10,000 volumes, 3 national banks with combined capital of \$250,000, and 3 daily and 1 weekly newspapers. Pop. (1880) 2,000; (1890) 4,000; (1894) estimated, 20,000. Location on Map of Indiana, N. E.

Muncy: borough; Lycoming co., Pa. (for location of county, see map of Pennsylvania, ref. 3-F); on the Susque-

hanna river, and the Phila. and Reading and the Penn. railways; 14 miles E. by S. of Williamsport. It is in an agricultural and lumbering region, and has flour, saw, and planing mills, French burr feed-mill factory, large wooden-mill, foundry, and machine-shops. Pop. (1880) 1,174; (1890) 1,295; (1894) estimated on enlargement of borough, 2,000.

Location on Map of Pennsylvania, N. E.

Mundé, Paul Fortunatus, M. D.: gynecologist; b. at Dresden, Saxony, Sept. 7, 1846; was taken to the U. S. in 1849. He studied medicine at Yale and Harvard Medical Colleges, graduating M. D. from the latter in 1866; served as volunteer assistant surgeon in the war between Prussia and Austria in 1866; from 1867 to 1870 was resident physician in the Würzburg Maternity Hospital and assistant to Scanzoni; in 1870 was surgeon in the Bavarian army during the Franco-German war; settled in New York in 1872; is Professor of Gynecology, New York Polyclinic, gynecologist to several New York hospitals, and a fellow of numerous societies. He was editor of *The American Journal of Obstetrics* 1874-92. Among his writings are *Minor Surgical Gynecology* (New York, 1880). He edited the sixth edition of Thomas's work on *Diseases of Women*.

S. T. ARMSTRONG.

Mundella, Anthony John, M. P.: British statesman; b. 1825 of Italian ancestry; engaged in business in Nottingham; was sheriff of Nottingham 1852; organized the first courts of arbitration for the settlement of trade disputes 1859; entered Parliament as a Liberal 1868; was vice-president of the council on education and charity commissioner 1880-85; president of the Board of Trade in the Gladstone ministry 1886 and again in 1892; resigned in 1894 under Lord Rosebery.

C. H. T.

Munger, Theodore Thornton, D. D.: clergyman and author; b. in Bainbridge, N. Y., Mar. 5, 1830; graduated at Yale College in 1851, and from the Yale Theological School in 1855; was pastor of Congregational churches at Dorchester, Mass., 1856-60, Haverhill 1862-70, and Lawrence 1871-75; was in San José, Cal., where he established a Congregational church, 1875-76; was pastor at North Adams, Mass., from 1877 to 1885, when he became pastor of the United Society (Congregational), New Haven, Conn. He has published *On the Threshold* (1884), which has been issued in numerous editions; *Lamps and Paths* (1885); *The Freedom of Faith* (1883); *The Appeal to Life* (1887); and numerous literary and theological essays in reviews and magazines.

GEORGE P. FISHER.

Mun'go (Saint), or Kentigern: one of the three earliest missionaries who introduced Christianity into Scotland. While his associates, St. Columba and St. Ninian, devoted themselves respectively to the tribes of the south, west, and north, Mungo was the apostle of the Welsh or British races inhabiting the districts between the Clyde and the northern boundaries of Cumberland. The son of a British prince, he was born at Culross, on the Forth, about 518, and died at a monastery he had founded on the site of the cathedral of the modern Glasgow, Jan. 13, 603. Many miracles were ascribed to him, and numerous fabulous biographies are preserved. See Forbes, *Historians of Scotland*, vol. v.

Revised by S. M. JACKSON.

Mungoos [the native name; variously written mongoos, mongoose, or mungoose]; a carnivorous mammal of India (*Herpestes griseus*) belonging to the family *Viverridae*, and related to the African *Ichneumon* (q. v.). It is about the size of a cat, but is lower and longer bodied. The tail is long, hair harsh, of a gray color, with blackish markings. In India the mungoos is domesticated, and kept about houses to free them of rats, and, above all, to kill venomous serpents. It is popularly believed to eat some plant which renders it poison-proof, but really owes its immunity to its habits. F. A. L. GAS.

Mung Tse, or Mêng Tse: see MONG TSE.

Mun'ich (Germ. München): capital of Bavaria; on the Isar, here crossed by three bridges; 1,868 feet above the sea, at the southern extremity of an extensive plain (see map of German Empire, ref. 7-F). The city proper is situated on the left bank of the Isar; only some suburbs extend along the right bank. In architectural respects it is the most beautiful and interesting city in Germany, and one of the richest in sculptures and paintings. Nearly in the center of the city, on the Max Joseph Place, which contains the bronze statue of King Max (1825) by Rauch, is the royal palace, containing the famous picture-gallery.

queting-house, and the old residence. The king's house was built by Klenze 1826-35, and is an imitation of the Palazzo Pitti in Florence. Its interior is very rich in marbles and frescoes, among which are the celebrated Nibelungen frescoes by Schnorr. The banqueting-house was built 1832-42 in Renaissance style, and has a large balcony resting on ten Ionic columns. The old residence was built at different periods, and contains many beautiful bronze statues. The palace is connected by a winter garden with the theater, which has seats for 2,500 persons. On the other side of the palace is the royal garden, surrounded on two sides by arcades, which are connected with the banqueting-house. On the southern side of the Max Joseph Place stands the post-office, in Florentine style. The so-called generals' hall, an imitation of the Loggia dei Lanzi in Florence, was built in 1844. From this building begins the Ludwig Street, running northward, terminating at the Siegesthor (Gate of Victory). On it are the Odeon, built in 1828; the palaces of the Duke of Leuchtenberg and of Duke Max; the ministry of war; the library, built 1832-43 in Florentine style, and containing 950,000 volumes and 25,000 MSS.; the university, with 3,292 students in 1892, the seminary, and the Max Joseph School, which three buildings, built in 1840, form a large square. The Siegesthor, an imitation of the triumphal arch of Constantine at Rome, was finished in 1856. Starting from the royal palace to the N. W., and passing by the Theatiner church, built 1661-75 in Italian rococo style, one reaches the Wittelsbacher Place. It contains the equestrian statue of the Elector Maximilian I. by Thorwaldsen, and the Wittelsbacher palace (finished 1850), in mediæval style, with pointed arches. At the end of the Brienner Street is the Propylæum, built in imitation of the Propylæum of Athens, with reliefs by Schwanthaler. On this side of the gate is the Kunstauststellungsgebäude; to the right, the celebrated Glyptothek, built 1816-30 in Ionic style, with a portico resting on twelve columns, and a magnificent tympanum; the building contains twelve rooms filled with marbles, chiefly antique. Near by are an establishment for painting on glass and the famous Pinakothek. The old Pinakothek, built 1826-36, in Renaissance style, is 520 feet long, and contains 1,300 pictures, arranged in thirty-two rooms. The ground floor is occupied by a collection of engravings, containing about 300,000 pieces, a collection of drawings, numbering about 9,000, and a collection of Grecian and Etruscan vases. To the W. of this building is the Polytechnicum, a structure in rich Renaissance style, and to the E. the new Pinakothek, built 1846-53, which contains pictures by modern artists. Other noteworthy buildings are the bronze-foundry, with a collection of models and an exposition-room; the Schwanthaler Museum, containing nearly all the plaster models by this artist; the Academy of Science and Art, with an immense collection of fossils, a collection of minerals, of coins, of physical and optical instruments, etc. To the S. W. of the city, near the Karl Gate, stands the Hall of Fame, built in the form of a horseshoe, with forty-eight Doric columns, and finished in 1853 after a plan by Klenze. It contains the busts of eighty renowned Bavarians. In front of the buildings stands a colossal figure of Bavaria, 66 feet high, modeled by Schwanthaler. A beautiful view toward the Alps can be had from the interior of the head.

The principal churches are the Frauenkirche, Gothic in style, built in the fifteenth century, the metropolitan church of the Archbishop of München-Freysing; St. Michael's Hofkirche, built in the latter part of the sixteenth century, in Roman Renaissance style; the Auerkirche, built 1831-39 in Gothic style, with beautifully painted windows; the Basilica des heiligen Bonifacius, an excellent imitation of the old Italian basilica, finished in 1850, with sixty-six columns, beautiful frescoes, and thirty-four medallion portraits of popes. Here is the tomb of Ludwig I. (Ludwigskirche), built 1829-43, by Gärtner in the Italian round-arch style. Over the portal stand Christ and the apostles by Schwanthaler; the interior contains beautiful frescoes by Cornelius and his disciples. The Allerheiligenkirche or Neu Hofkapelle, E. of the royal palace, was built in 1837 in Byzantine style, and is a very elegant though small structure. The Protestantische Kirche was built 1827-32.

The city is generally well laid out, and has broad streets and many large public squares. It has grown rapidly; in 1801 it had but 40,000 inhabitants. The Academy of Fine Arts, comprising three divisions—architecture, sculpture, and painting—and under the leadership of able men, attracts steadily a great number of students. The same is the case with the Conservatory of Music. The city occupies also

a high rank in science. There are many scientific associations, good educational and numerous benevolent institutions. The manufacturing industry includes the bronze-foundries, the porcelain-manufactures at Nymphenburg, the glass-painting establishments, all founded by the Government; also the optical institute founded by Fraunhofer, and manufactures of mathematical instruments, machinery, fire-arms, cotton, and silver. The breweries are very extensive. Grain is the principal article of commerce.

The city appears for the first time in history in the twelfth century; in 1254 it was fortified, and from the Emperor Ludwig of Bavaria it received many privileges. In 1632 Gustavus Adolphus of Sweden entered it victoriously. The Elector Karl Theodor improved the fortifications at the end of the eighteenth century. In 1800 it was captured by the French. In 1814 King Maximilian I. began the rebuilding and beautifying, which were continued in a brilliant manner by Ludwig I. and Maximilian II. The population in 1885 was 261,981; in 1890, 349,024.

Municipal Corporations [*municipal* from Lat. *municipalis*, deriv. of *municipium*, a town having free local government and Roman citizenship]: corporations formed from the members of a city, town, or other community for purposes of local self-government. Public corporations, that is corporations formed for governmental or political purposes, may be divided into *quasi* municipal corporations and municipal corporations proper. The distinction between the two is important, inasmuch as the duties and powers of the latter are much broader than those of the former. Among the *quasi* municipal corporations are embraced such local governmental bodies as counties, towns, and school districts—bodies with extremely narrow powers, and formed generally for the purpose of administering in the localities affairs of general concern and importance. Among municipal corporations are embraced cities and villages which are formed primarily and almost exclusively for the purpose of administering the affairs affecting the particular districts in which such corporations are found. While almost all governmental districts possessing in any important degree the privileges of local self-government are at the same time municipal corporations, it is to be borne in mind that the incorporation of a place is, or at least was, not originally necessary in order that it possess rights of local self-government. Thus the English boroughs at a very early time received charters which assured to them certain governmental privileges, but they were not incorporated until about the middle of the fifteenth century. The first charter of incorporation in England is said to be that given to Kingston-upon-Hull, granted in 1429. From that time on charters of incorporation were granted with great freedom until most of the boroughs of any size became at the same time municipal corporations. The other divisions of the country, such as the counties and the parishes, did not become corporations until very much later. Indeed, the counties of England did not become incorporated until the passage of the Local Government Act of 1888. When municipal boroughs were first incorporated it was not the locality nor the inhabitants that formed the corporations thus created, but the most important individuals, generally members of the governmental body of the borough, i. e. the council, though sometimes the freemen were included. This idea has, with the more democratic character of municipal government, been abandoned, until now, in both the United Kingdom and the U. S., the corporation formed by the grant to a municipal borough or city of a charter of incorporation is not to be found in the officers or a narrow body of freemen, but in all the inhabitants residing within the municipal district.

While the original purpose of granting to municipal boroughs charters of incorporation was to enable them to act as subjects of private law, and thus to hold property and be capable of enforcing obligations contracted with them and of being forced by the courts to fulfill obligations which they had contracted, still most of the important municipal boroughs which were thus incorporated were at the same time governmental agencies as well. For example, the councils of almost all of the important municipal boroughs had under their direction and control the local police force. Further, in almost all cases a commission of the peace was issued to the individuals composing the council, who acted thus also as justices of the peace. The larger cities had also a special court of quarter sessions. In this way the more important municipal boroughs were

agents of the central government both for the purpose of the administration of justice and for the purpose of the administration of the police force. On account, however, of the degeneration of the boroughs and of their prostitution for purposes of central politics, which began during the period of the Stuarts in the interest of the king, and was continued after the revolution of 1688 in the interest of the great political parties from that time on controlled by the nobility, it was felt to be inexpedient to confer upon the municipal organization any of the other administrative duties which the Government had to assume as a result of the development of the kingdom. Thus when the suppression of the monasteries made necessary a system of administering poor relief, this branch of administration was conferred upon the parish organization which extended through the urban as well as through the rural districts. Later on also, when the administration of education became a governmental matter, and the municipal borough was made the urban school district, a school board was provided separate and apart from the municipal organization proper for the purpose of attending to the schools. In the same way when it became necessary to light and pave the streets, these matters were put into the hands either of the parishes or of special commissions or trusts formed by special acts of Parliament and not a part of the borough organization. The result is that the English borough was at the time of the formation of municipalities in the U. S., and is even at present, an organization mainly for the satisfaction of local needs, with very few functions of general government to discharge.

Naturally this was the conception of the sphere of activity of municipalities in the U. S. at the time municipalities began to develop; but as a result of their better organization in the U. S. during the colonial period they very soon came to be regarded not merely as organizations for the satisfaction of local needs, but also as important agents of the central government. While during the very early colonial period municipalities were considered to be so much private in character as not to be capable of possessing the power of taxation, with the development of their capacity as agents of central government the power of taxation—a distinctively public power—was granted them in order to enable them to discharge their public functions. Not only has this power been very generally granted to the cities, but the city itself, when of large size, is often made the agent of the State administration for the assessment and collection of central taxes; and in many other cases the city officers attend to certain matters of general interest, and the expense of a long series of matters which may not be attended to directly by city officials has devolved upon the city. In the U. S. in most of the large cities municipal officers, either elected by the people of the city or appointed by the municipal authorities, are intrusted with the care of the public health, the schools, and the support of the poor, attend to police and election matters, and have a series of duties to perform relative to the administration of judicial affairs. This gradual development of the city from an organization for the satisfaction of purely local needs into an agent of the central State government has resulted in an assertion by the latter of very much greater powers of control over the city than were exercised over the English borough. This control has been extended not only to those matters where the city acts as an agent of central government, but also to matters of purely local concern. Cities in the U. S. have as a result largely lost the power of regulating their own purely municipal affairs. As no city may exercise any power which the Legislature has not granted to it, and as the Legislature in the U. S. has generally been very niggardly in its grants of power to cities, every city which does not find a power that it desires to exercise contained in the charter or laws regulating its government is obliged to apply to the Legislature for a special grant of power. The result has been a continual interference by the legislatures of the States with the affairs of cities, an interference which has had so much of evil result that a majority of the States of the Union have prohibited the Legislature from interfering by such special act with the affairs of municipal corporations. It must be confessed, however, that the courts have felt obliged, on account of the difficulty of regulating at one time and by general law all the matters in which a city should exercise power, to allow the Legislature considerable freedom of interference in local concerns, notwithstanding the constitutional provisions mentioned.

At the same time that the position of the city has been

changing there has been a corresponding change in the organization of city government. The original governing body of the municipal borough in both England and the U. S. was the council, in which all powers were centered. As a result, no doubt, of the more important functions which have been conferred by law upon municipal corporations in the U. S., there has been felt a need of more clearly defining the responsibility for the administration of city government, and the council has been split up. The judicial functions have generally been assumed by State officers, namely, the judges of the courts, the justices of the peace, and police magistrates. The executive functions have been conferred upon the mayor, who has been separated from and made independent of the council, and by executive officers who have been provided by statute; and the functions of deliberation have been retained by what was left of the council. This separation of functions began in the latter part of the eighteenth century or the beginning of the nineteenth. The modern tendency has been to increase more and more the powers of the mayor, conferring upon him almost all powers of appointment and removal. This is particularly true of the large municipal corporations of the U. S.

This increasingly public character of municipal corporations has had an influence not only upon its public legal, but also upon its private legal relations. Inasmuch as the private legal relations into which a municipal corporation enters result for the most part either in the formation of contracts or in the commission of torts, we may consider its private legal capacity under the two headings of contracts and torts. So far as contracts are concerned, all that need be said is that, like all corporations, municipal corporations may enter into only those contracts which their charters or the laws by which they are governed permit them to enter, and they must form such contracts only in the way in which the law has permitted them to act, and any excess of powers or deviation from the methods provided by law will result in their contracts being void and of no effect. When we come to consider the law of torts relative to municipal corporations, too much emphasis can not be laid upon the dual position which these bodies occupy. In so far as they may be regarded as organizations for the satisfaction of purely local and municipal needs, they are assimilated to private corporations, and their negligence in the performance of their duties, or their non-observance of the rights of others in the exercise of these duties, will result in a legal liability of much the same character as results in a similar case from the action of private individuals or private corporations; for whatever may have been the original rule—and there is some dispute as to this—as to their liability for torts, no rule of law is better settled than that the municipal corporation is liable for all damages caused by the negligent performance of these private and purely local or municipal duties. When, however, we come to consider the municipality as a governmental agent, the position which the government occupies in this respect must be borne in mind. The law has always been reluctant to recognize any liability on the part of the government for torts committed by its officers. This has been due to motives of public policy, to the fear that the action of the government would be paralyzed were it to be responsible for all incidental damages which might result from an exercise of its purely governmental and sovereign powers. The same rule has been applied to municipal corporations in that they are exempt from all liability for negligence in the performance of their governmental duties. The tendency is, however, to recognize a liability for the mismanagement of their property, whether such property is employed in the performance of a public or a private duty; this tendency has not been so marked as to justify the statement of the rule that in so far as they manage property they are not exempt from liability for negligence; but it will undoubtedly be the means by which the liability of municipal corporations will be extended to the future.

[FRANK J. GOODNOW.]

Municipal Government: the government of cities and towns. The rise of modern industry, with its use of steam and electricity, its development of the factory system in place of old-time handicrafts and household industries, and its adoption of such agents of expanding commerce as the railway and the steamship, has not only given an enormous stimulus to the growth of population, but has also tended to mass population in towns and cities. While agricultural production has vastly increased, the increase is due to the opening up of new areas rather than to any increase in the

density of the farming population, and in the thoroughness and intensity of manual labor as applied to the soil. In fact, the invention and use of labor-saving machinery in the operations of agriculture have, especially in the U. S., materially lessened the number of people who can advantageously be employed in the tillage of a given area. The consequence has been, as shown by successive national and State census reports, a steady falling off in the population of strictly rural communities, this decline being exhibited since 1875 in Iowa and Minnesota, as well as in States E. of the Mississippi river. In Scotland, England, France, and Germany, the strictly rural population has been either declining or at an absolute standstill for several decades. In Scotland and France a sharp decline has been visible, while an apparent slight gain in England and Germany has in fact been due to the encroachment of industrial and urban conditions upon the village life of farming districts, rather than to any increase in the number of people living a distinctly rural life. The growth of U. S. cities has been at an enormous rate of increase; but the growth of English, Scotch, and German cities has been at a pace almost as great. It may simply be said that about three-fourths of the people of England and Scotland are now living under the conditions that belong to urban life, and that in the older parts of the U. S. the town dwellers outnumber the country dwellers. The urban impulse is comparatively new in Germany, but is at the same time very strong. The French people are less mobile, yet their great towns are growing with considerable rapidity, while the national population as a whole is barely maintaining its volume.

When the modern urban movement began to exhibit strong tendencies in Great Britain, the old traditional town life was very simple. The functions of the municipal corporations described in *MUNICIPAL CORPORATIONS* (q. v.) were not very numerous, and did not require the expenditure of large sums of money; but the rise of modern industrial towns made necessary a wholly new *régime* of municipal life. It was discovered that the comfort and happiness of a rapidly increasing proportion of the population demanded the exercise of a new series of public functions. It was not enough that the police departments and local courts of justice—performing the negative function of preserving order and punishing misdemeanors—should be strengthened, but it became necessary to meet with the assumption of positive municipal functions the supply of various common necessities. There poured into the manufacturing towns a great access of population from villages and country districts, and these factory-workers were huddled into crowded and ill-constructed tenements under conditions that were deleterious and demoralizing in every respect. Much space would be required to describe the recurring epidemics and the varied evils consequent upon the aggregation of town populations without what we now term municipal improvements. The first great step in England toward the adaptation of municipal life to the needs of growing communities was taken in the reform of the organization of the town or borough corporations. These had, for the most part, fallen into the hands of self-perpetuating groups of men who exercised under mediæval charters the proscriptive and traditional authority of the municipal government. By the reform acts which were passed in 1833 for Scotch cities, in 1835 for English, and in 1840 for Irish, these old corporations were reconstructed, and municipal government was placed in the hands of the householders. The poorest class was excluded, but subsequent laws have removed disqualifications until every family now has its vote. Authority is exercised by a common council, which is nothing more nor less than a large committee of the voting population. The organization of the English municipal corporation is very simple. The electors have only to choose councilors, one each year from each ward, the most usual number of wards in the larger towns being sixteen. The term is three years, and one-third therefore of the council retires annually. The council elects the mayor, usually from its own number. It also adds to its body a number of so-called aldermen equal to one-third of the elected councilors. The aldermen, in fact, are usually appointed from the councilors who have served longest, and their selection leaves vacancies to be filled by special ward elections. All the working departments of the municipal administration are manned by expert chiefs appointed by the council, holding their places upon a tenure that is practically permanent. The council through its standing committees supervises the various branches of the city government. The mayor is merely the

council's presiding officer and most important member. He is elected for a single year and has no appointing power or special authority, all control of municipal affairs being vested in the council. The town-clerk, who is the legal representative and the archive keeper, is the most indispensable functionary of an English municipality. Like the other officials, he is an appointee of the council. Some differences in nomenclature distinguish municipal government in Scotland, but in all essential matters it is the same as the English system. As civilization has advanced and science has led the way, these simple representative city governments of England and Scotland have enormously increased their activities in behalf of the common wants of the population. They have spent great sums upon the introduction of adequate municipal water-supplies, and have in many instances established municipal gas and electric works which not only furnish ample and cheap illumination of streets and public places, but also furnish light to private consumers at reasonable prices. They have constructed great drainage and sewer systems, with which the plumbing of all houses is obliged to connect. They have established public abattoirs and suppressed private slaughter-houses, have erected produce-markets, and brought all food-supplies under strict municipal sanitary inspection. They have entered upon great projects for the demolition of unsanitary tenement-houses, have adopted stringent regulations guarding against further imperfect building, and have devised methods of sanitary visitation for the prompt suppression of nuisances of every class, and for the immediate isolation, in great municipal epidemic hospitals, of cases of infectious diseases. Through these and kindred measures they have greatly lowered the death-rate, and have reduced to small proportions the ravages of those diseases that are spread by infection and that are amenable to sanitary control. Great reforms for the convenience of traffic and for the better admission of air and light have been made by the reconstruction of street systems and by the retention of open spaces. Commendable activity has also been shown in the acquisition of parks and public pleasure-grounds. The health and comfort of the people have been promoted in many of these places by the establishment of public baths, while in several of them there are public laundries and wash-houses patronized by the housewives in the tenement districts. Public libraries and reading-rooms under municipal auspices have become frequent, as also have public halls and assembly-rooms. In many of the English and Scotch cities the street-railways have been constructed and are owned by the municipality itself, although it is the common practice to lease them to a private company for operation. The great city of Glasgow has now assumed the direct operation of its street-railways, and several of the smaller English cities have entered upon the same policy. The metropolis of London, under the Local Government Act of 1888, became an administrative county governed by an elected council of citizens; and since that time it has entered upon a policy for the promotion of the welfare of its great population that is similar in scope to that described as common to the industrial and manufacturing cities, such as Birmingham, Manchester, Glasgow, Sheffield, Leeds, and scores of other places.

Municipal government in France under existing forms is the outgrowth of the French Revolution. The laws of France—as also those of Italy and Belgium, which are historically and practically modeled upon the French system—have grown out of the great reforms instituted as a result of the French Revolution. All France is divided into communes. The principle of communal government is the same for the smallest country township as for the largest cities. Except as the general Government through the Department of the Interior exercises some discretionary power and takes occasional steps of interference, the communes are little republics. Universal manhood suffrage prevails, and the voters of each commune elect from time to time a certain number of members of the communal or municipal council. The size of the council varies according to the population of the commune, a sliding scale having been established in the general code for the government of communes and municipalities. The municipal or communal council appoints the mayor from its own number, and the mayor in turn selects a certain number of councilors to be his coadjutors and to act as a standing executive committee. The mayor and this committee are known as the *corps législatif*. Each member of the standing committee is given the supervision of some department of the municipal administration, and acts in the capacity of the chairman of a committee having charge,

let us say, of water supply, or police, or some other branch of the local administration. The *comptroller* presides at frequent sessions, and the whole business of administering the affairs of the municipality comes under the direction of the mayor. The full council meets less frequently, but goes very exhaustively into reports from the mayor and executive corps, makes all the by-laws and regulations for the government of the municipality, and decides upon such subjects as the levy of local taxes, and votes in detail the amounts to be expended for the various purposes. This part of municipal government, with some differences of detail, may be said to belong to all the Latin countries of Europe. It works effectively, and has shown its capability of bearing an unlimited expansion of local functions and undertakings. Thus of late years in Italy enormous physical reconstructions and public works of supply and improvement have been undertaken, and faithfully and ably carried out by the municipal councils, with their *sindaco*, as the mayor is called, and their group of experienced members selected as the executive corps.

In Germany municipal government as a sort of community-housekeeping has developed in many respects a higher state of perfection than anywhere else. The structure of municipal government in Prussia grows out of the general system of administration that dates from the reforms of Stein and Hardenburg early in the nineteenth century. Circumstances that were dominant at that time made it possible for property interests to retain a degree of special representation in government that English and French political reforms would not admit. The franchise, both for national and for local and municipal purposes, was based upon a three-class system which made taxation the measure of representation. The hundred men whose tax highest on the tax-roll and paid one-third of the taxes were allowed to exercise as much authority at the polls as the great mass of workmen whose names stood at the other end of the tax list, and who, in the aggregate, also paid one-third of the direct taxes. A middle class, paying the second third of the total sum raised by direct taxation, also exercised a like share of political authority. This system was not respected in the establishment of the present German empire, and simple manhood suffrage is the basis of the electorate that is represented in the imperial Reichstag; but in the government of Prussia and of Prussian municipalities the three-class system still prevails. It also exists in some other parts of Germany, though not in all. The body in which the authority of municipal government is reposed is the *Gemeinderath*, or common council. It is elected by the body of electors, or *Wahlmänner*, of which the three classes of voters have each selected one-third. The common council in a German town is elected for six years, one-third of the membership retiring every two years. The executive work is performed by a burgomaster, or mayor, and the body of department chiefs, known as the magistrates. The mayor is selected by the common council, and so are the high department chiefs, or magistrates, and these functionaries, the mayor included, have what is practically a life tenure upon their positions. In some cases they are appointed expressly for life or good behavior, while in other cases they have twelve-year terms with the practical assurance of reappointment. They are selected for expert knowledge, and administrative experience and ability. They constitute, with the burgomaster, what is known as the *Magistratsrath*, and they hold frequent conferences together upon some such plan as that already described in the account of the executive corps of the municipalities of Latin countries. Some of the magistrates are highly salaried, while another element of the body is composed of distinguished citizens who serve without pay, and who regard the office as an honor and the opportunity to serve their fellow citizens an agreeable public duty. This body often includes men who have been brought from other cities on account of their special ability, and the burgomaster himself is frequently selected on the strength of the good service he has rendered in a like capacity to some smaller city. The law department, the treasury department, the public-health department, and the educational department, also those of water-supply, gas-supply, streets and paving, architecture and building, care of the poor, property assessment, and various others, are all presided over by some member of the executive magistracy selected on account of his special attainments and qualifications. The minor positions in the official service of a German city are filled under rules and regulations which give protection against arbitrary removal,

and it is easy for the cities to secure the services of expert and highly trained civil servants.

The German cities are run upon excellent business principles, and it is considered their function to undertake anything that will promote the wellbeing of the community, provided the undertaking will not involve a heavy burden of taxation without affording any compensatory relief. Thus magnificent water-supplies are the rule in German cities, but they are managed in such a way that while furnishing the citizens with good water at moderate charge the works are made to pay the expenses of management, all interest charges upon the cost of the plant, an ample fund for maintenance and for the accumulation of a sinking fund to meet bonded indebtedness as it falls due, and finally to pay over a clean profit into the city treasury to lighten the tax-rate. The gas-supply in Germany in like manner is, as a rule, provided by the municipal authorities as a profitable undertaking. Many of the German cities are establishing electric-light plants on similar business principles. Great markets and abattoirs are the rule in these German cities, and they are made self-supporting. The German towns have awakened greatly to the necessity of sanitary reforms in every direction, and they have applied scientific knowledge to the problems of the public health with a thoroughness nowhere else equaled. All great German towns maintain well-equipped chemical and bacteriological laboratories, which are constantly testing the character of the water-supply, and examining food that is offered for the consumption of the masses. Street-paving and public works of various kinds are prosecuted with a thoroughness that has given great reputation to German municipal administration. The street-cleansing service also excites the admiration of American visitors. It is the universal policy to maintain municipal savings-banks and pawnshops, so conducted as greatly to encourage thrift and to lessen the hardship of sudden misfortune. In nothing is German municipal administration more successful than in its system for the relief of the poor and the distribution of public charity. Under the executive magistrate who has oversight of that department there is a large central committee, upon which members of the council and non-official citizens are asked to serve. There is a subdivision of the city into main districts, and then into minute ones for the organization of relief. Small districts contain perhaps two or three hundred families each, sometimes including not more than two or three large tenement-buildings. For each of these districts a visitor is selected, whose responsible and upright character has commended him to the attention of the central authorities. Every citizen thus appointed is expected to serve. It is considered an honor and a serious public duty, and refusal to accept without good excuse would involve penalties under the law. The visitor becomes the good angel of his little district, knows all the families, and can not well be imposed upon. The families in turn know to whom they must first appeal in case of need. The visitor has at his call a physician, whose duty it is to render prompt medical relief. Each visitor must make frequent and regular report of every case of need that arises in his neighborhood, and every case of duplication or fraud is thus easily traced and exposed. The German municipalities are, either on their own account or as agents of the general Government, entering upon the policy of insuring workmen against illness, accident, and the peril of an impoverished old age. These communities have shown themselves by far the most enlightened in the world in their methods of dealing with poverty, and have succeeded as no other modern communities have done in reducing city life to a system in which each individual and each family has its place as in a great household. The direct application of municipal energy to the task of providing a kind of education for children which would at once fit them for life under existing conditions, and enable them to enter advantageously into the industrial life of their own particular community, has been carried further in the German cities than anywhere else, with the possible exception of Paris. Not only is ordinary elementary education universal and compulsory, but the cities provide much manual, trade, and commercial instruction, and, through the universally established system of gymnastic drill, make provision for physical development.

The typical modern city is not to be sought in Western Europe or America alone, but may be studied to excellent advantage in the two capitals of the Austrian-Hungarian empire, Vienna and Budapest. These splendid cities have established admirable systems of municipal government, under which they have been marvelously reconstructed,

transformed, and adorned, and under which also the health and comfort of the population has been cared for no less than the externalities of fine architecture, broad boulevards, and ornate pleasure-grounds. The most recent tendency of large cities in all countries is that of a decline of population in their central wards and districts, and a vast development of less densely housed population in the suburbs. This new disposition to a readjustment of urban populations over a greater area is due principally to the rapid increase of transit facilities, by which for a small price a great host of people may be carried from business at the core of a town to homes on the circumference. Thus the multiplication of workingmen's low-fare trains and other facilities in London is fast depopulating the inner city; and a little area of 1 sq. mile, in whose busy streets and shops 1,000,000 people are engaged during the working hours, now shelters less than 50,000 at night. Of London, Paris, Berlin, Vienna, New York, and perhaps also of Philadelphia and Chicago, it may be said in a general way that there is a central population of approximately 1,000,000 people which for a considerable period of years has remained practically stationary, and which is now tending to a slight decline. All further growth of population attributed to these cities belongs to the portions lying beyond the inner wards which contain the one-million nucleus. If a still smaller nucleus of 200,000 or 300,000 is sought, one discovers that the enormous central districts show substantial declines. Thus the question of the disappearance of the slums is, under natural and healthful circumstances of evolution, tending to settle itself. Some intelligent and vigorous effort to assist these natural and wholesome tendencies can, however, greatly quicken the results that are desired. In Great Britain municipal governments, under a series of so-called "workingmen's dwellings acts" and "housing-of-the-people acts," are condemning and destroying the most objectionable tenement rookeries, and providing here and there in the crowded districts for small parks, playgrounds, and open spaces. They are also perceiving that prevention is better than cure, and that stringent regulation of new buildings may in the course of one or two generations result in a vastly improved housing for the population of an entire great city.

In the U. S. the problem of adjusting town conditions to the convenience and welfare of large masses of population has come into prominence more recently than in Europe, because in the U. S. the life of the farming districts and of country towns has until lately been the characteristic and prevailing system. The development of large towns since the civil war has led to much scandal in municipal administration and has brought some reproach upon the institutions of the country. It may be said for the large cities and towns of the U. S. that they have shown enterprise in the management of certain departments, such as the water-supply, the fire-extinguishing service, the provision of common schools, the creation of parks, and, in many cases at least, the establishment of public libraries. The chief difficulty of municipal government has grown out of a lack of adaptation of the municipal framework to the accumulation of business which modern civilization makes incumbent upon the ruling authorities of a large town. A hopeful period of reform has been entered upon, and simplicity and unity begin to take the place of an antiquated system of disconnected boards, commissionerships, trusteeships, separately elected mayors, and aldermanic groups, or common councils stripped of adequate authority, and therefore unable to command the membership of the best-qualified citizens. In the U. S. the policy has been to confer street-railway franchises and gas and electric franchises upon private companies, and the negotiations between these companies and the municipal bodies having power to grant franchises has been a constant source of scandal and corruption. The frequent interference of State Legislatures in the affairs of the cities has also made impossible any stability of municipal methods or any proper development of local responsibility. The municipal-reform movement has been based more than anything else upon the principle of local home rule for municipalities, in order that the people who pay the costs, bear the ills, and enjoy the advantages of any given municipal administration may exercise authority under a charter which shall not limit them unduly, and which shall guarantee them against outside intervention in matters of detail. The taxes collected for the maintenance of municipal government and local institutions in all civilized countries have lately grown to formidable proportions; and in the U. S. as well as in some European countries they

constitute very much more than half of all the taxation levied for all purposes upon the taxpayer; but the citizen receives in return a series of services which are as essential to his health, comfort, and happiness as are the necessities of life which he procures through his private expenditures. Municipal indebtedness everywhere tends to assume large dimensions; but most of it has resulted from a tangible and commendable investment in public works which, either directly or indirectly, give ample pecuniary return. The fear, therefore, lest the rapid growth of modern municipal expenditure and the formidable development of municipal indebtedness may be leading on to a period of disaster, or even of bankruptcy, is not well founded. All municipal improvements essential to the health and general wellbeing of the community are to be considered in the light of a co-operative investment which can not well result otherwise than advantageously.

ALBERT SHAW.

Municipal Law of England and the U. S. The municipal or national law of England has assumed its present form after a practically uninterrupted development of fourteen centuries. Although it has been largely influenced by Roman law, civil and canon, it is essentially, in its character as in its origin, a Teutonic system. Carried by English colonists to all quarters of the globe, it divides with Roman law the rule of the modern civilized world.

Anglo-Saxon Law.—During the first five centuries of the Christian era Britain was governed by Roman imperial law; but this law, like the rest of Roman civilization, was swept away by the heathen hordes from the coast of the North Sea, who invaded and conquered the island. English law began as "a slip of German law planted in England" (Maitland). It consisted at first of numerous bodies of tribal custom, varying in details, similar in essentials. The so-called "laws" or "dooms" issued by Kentish, Wessex, and English kings and their *witan* from the seventh to the eleventh century, and even those published by the Danish conqueror Canute, are simply statements of Anglo-Saxon custom. Like the contemporaneous "folk-laws" of continental Germany, these dooms consist mainly of provisions for the punishment of breaches of the peace and tariffs of penalties for private wrongs. After the conversion of the English to Christianity the Church exercised a certain humanizing influence upon the law—an influence which was more considerable in the eighth and ninth centuries than in the tenth and eleventh. The Church also introduced its own law of marriage, and familiarized the English with the use of deeds and testaments; but even in these matters its innovations were adapted to the national ideas and customs.

Norman Law.—The system of law which Rolf and his Norse followers found in Northern France when they conquered and colonized that region, the system which they accepted and perpetuated in their duchy of Normandy, and which William the Conqueror and his men carried with them to England, was also a transplanted slip of German law, viz., the law of the Franks; but through the legislative reforms of the Frankish kings and emperors, and in the practice of the Frankish courts, the law of the Franks had reached a higher stage of development than the closely related law of Saxon England. The Norman conquest of England brought these two systems face to face. The English, as the Conqueror had promised them, lived by their own law; the Normans by Norman law; the relations between the two races were ordered by special provisions. These special provisions, of course, were framed in a Norman spirit; and it was equally a matter of course that the Anglo-Saxon law, where it was still applicable, suffered at the hands of the unsympathetic Norman officials who had to apply it; but the fact that the Anglo-Saxon law was gradually superseded by the Norman was not due solely or even mainly to the conditions of competition, but to the technical superiority of the Norman system. English resistance to this process produced in the eleventh and twelfth centuries numerous compilations of Anglo-Saxon laws, falsely ascribed to Saxon or Norman rulers (e.g. the so-called laws of Edward the Confessor, of William the Conqueror, of Henry I.), but the infiltration of Norman ideas in these very compilations shows the hopelessness of the struggle. In the fusion of the two systems which accompanied the fusion of the two races, in the development of a common law for all Englishmen, the Norman law was by far the more important constituent. The language of the laws and of the reports, from the time of the Plantagenets to that of the Tudors, was Norman-French.

The Common Law.—The fusion of Saxon and Norman law was not accomplished by the development of a new popular custom, a new English folk-law. It was effected partly by legislation (royal charters, provisions, assizes, statutes), mainly by judicial decisions. The Norman conquest had given England a more strongly centralized government than existed anywhere upon the Continent before the thirteenth century. At a period when the administration of secular justice upon the Continent had fallen into the hands of the feudal seigneurs and the free cities, the king's writs ran throughout England; controversies were tried by royal justices in the county and circuit courts; and appeals lay to the central courts of exchequer, king's bench, and common pleas. These conditions alone would have insured a rapid development of national English law, but the process was hastened by the centralization of legislative power in the crown and the Parliament. When the imperial Roman law, revived in Italy, spread over Europe in the twelfth and following centuries, the English common law was sufficiently developed to avert any such "reception" of the law-books of Justinian as took place upon the Continent. Such influence as they exerted was indirect, and was limited to special departments of the law. The Lombard jurist Vacarius read Roman law at Oxford in the twelfth century, and one of the first important treatises upon English law, that of Bracton (properly Bratton, *circa* 1259), was strongly colored by Roman ideas; but even Bracton drew upon the Roman jurisprudence for his definitions, his classification, and his terminology rather than upon the Roman law for his rules; and in the later mediæval writers (Britton, Fortescue, Littleton, etc.) Roman influences are far less perceptible. In the thirteenth and following centuries it was not the universities that trained the lawyers, but the Inns of Court. It is true that one very important part of the English common law, the law of contracts, seems to exhibit numerous Roman grafts; but it may well be queried whether this fact is due to a direct acceptance of Roman rules or to their indirect transmission through the customs of European merchants. See MERCANTILE LAW.

The most important foreign influence, as in the Anglo-Saxon period, was that of the Church. From the Conqueror the ecclesiastical courts obtained an independent jurisdiction, which they sedulously strove to widen. Their encroachments were checked by many statutes (provisions of Clarendon, statutes of *premunire*, etc.), and their subjection to the royal authority was repeatedly emphasized; but their jurisdiction over MARRIAGE (*q. v.*) and family law in general, and over the administration of estates, was never seriously questioned, and these branches of the English law are mainly the creation of the ecclesiastical courts.

It should be added that throughout the Middle Ages churchmen were frequently employed as judges in the secular courts (Bracton; for example, was an ecclesiastic as well as a justice of eyre and of assize), and that the chancellors, from Becket to Wolsey, were regularly ecclesiastics.

Equity.—Toward the close of the Middle Ages judicial law-making assumed a peculiarly bold and open form in the decisions of the court of chancery. The chancellors exercised the right of supplementing and even of overriding the common law by virtue of the equitable powers which all Teutonic peoples seem to have regarded as inherent in the crown—or which, if a wider generalization may be risked, all Aryan nations appear to have regarded as inherent in supreme political authority. (Cf. ROMAN LAW, *ius honorarium*.) In England these powers seem to have been little needed while the common law was in active development, and while new writs were constantly appearing to meet new exigencies; it was only when the common law had become relatively rigid that equity became an important agency in the development of the law. Some of the earliest traces of a special jurisdiction exercised by the court of chancery are found in the reign of Richard II.; under the Tudors the development of equity was very rapid; since the eighteenth century the courts of equity, both in England and the U. S., have practically confined themselves to administering the law established by previous decisions. The net result of the whole process has been to create "a kind of secondary common law" (Kent), which in our day has been substantially merged in the general body of the judge-made law. See EQUITY.

Blackstone.—The English law, common and statutory, as it existed toward the close of the eighteenth century, has been so set forth by Blackstone that his work has become a legal classic. The faults of his work are mainly due to the

circumstances under which it was done, namely: That at the time when it was written the historical study of law was in its infancy; the analysis of legal institutions was crude and imperfect; and a thoroughly logical arrangement of the law was a problem that interested very few persons on the continent of Europe and nobody in England. A foreign scholar who is far more competent than most of Blackstone's critics to appreciate that writer's shortcomings, Heinrich Brunner, of Berlin, has justly said that "no other system of modern law has been presented in so complete and well-rounded a form as the English law in the *Commentaries* of Blackstone."

United States.—The English colonists brought with them to America the English law, common and statutory. After the Declaration of Independence it was expressly resolved in some of the States that this law was still in force. It was as unnecessary to pass such resolutions as to decree the continued employment of the English language. Except in those portions of the U. S. where the colonists and their institutions were French or Spanish, the English law, as it existed at the period of independence, is still the basis of law.

The colonists also brought with them those methods of developing the law which had been recognized and employed in England, viz., statutes and judicial decisions. In consequence, however, of the adoption of written constitutions which are not enacted by the ordinary legislative bodies, and by reason of the division of powers, legislative and judicial, which is incidental to the federal form of government, the sources from which law proceeds are more numerous in the U. S. than in England. *Written law* is made (1) by amendment of the Federal Constitution; (2) by acts of Congress and treaties; (3) by amendment of the several State constitutions; (4) by acts of the several State legislatures. *Unwritten law* (see LAW) is made (1) by the Federal judiciary and (2) by the several State judiciaries. As regards subsidiary or delegated law-making power (ordinance, etc.), see LAW.

The extent to which the common law, i. e. the judge-made law, is still in force in Great Britain and its colonies and in the U. S.—the extent, therefore, to which the *development* of the law is still in the hands of the judiciary—constitutes a striking difference between these countries and the countries of the Roman law. In the states of continental Europe and of Central and South America the entire law is ordinarily reduced by codification to statutory form; or at least the attempt is made to bring the whole law into such form; and the law-making power of the judiciary is limited to the interpretation of the written law and the filling of "open places." In Great Britain and in the U. S. considerable portions of the law have been reduced to statutory form, and even to the form of codes; but the great body of private law, especially the law of personal property and of contracts, still rests upon judicial custom or "precedent," and is developed not by legislation, but by the decisions of the courts.

LITERATURE.—Upon the history of English law as a whole no satisfactory work exists. The best is still Reeves's *History of the English Law* (3d ed. 1814; later editions by Finlason to be avoided). For literature of special historical investigations, see Brunner, *Quellen des Englischen Rechts*, in Holtzendorff's *Rechtencyclopädie* (5th ed. Leipzig, 1890; English translation of Brunner's article from the 4th ed. by Hastie, Edinburgh, 1888), and Maitland, *Materials for English History*, in *POLITICAL SCIENCE QUARTERLY*, i., 496, 628. For modern English law, see Stephen, *New Commentaries* (7th ed. London, 1874). For American law, see Kent, *Commentaries* (12th ed. by O. W. Holmes, Jr., Boston, 1873). A brief but very suggestive work is that of O. W. Holmes, Jr., *The Common Law* (Boston, 1881). Of the English judge-made law vs. statute, see Carter, *Codification of our Common Law* (New York, 1884), and Dillon and Munroe Smith in *Political Science Quarterly*, ii., 91, 105; iii., 136.

MUNJEET, SM.

Municipio Nontro (Brazil): See RIO DE JANEIRO.

Munjeet, or **East Indian Madder** (*Munjeetia cordifolia*) extensively cultivated in India, its root being used as a dyestuff for producing colors similar to those of common madder. It was formerly supposed to contain the same coloring-matters as madder, alizarin, and purpurin. Dr. Stenhouse (*Proc. Roy. Soc.*, xii., 633; xiii., 86, 145) has shown that it contains purpurin, but no alizarin. The substance, however, is not a distinct body, *munjatine*, having properties very similar to those of alizarin.

Munk, HERMANN, M. D.: neurologist; b. in Posen, Prussia, Feb. 3, 1839; was educated at Posen, and Berlin and Göttingen Universities; became successively a physician (1860), docent in the University of Berlin (1862), assistant professor (1869), professor and director of the physiological laboratory in the Veterinary High School (1876). He is a member of the Royal Academy of Sciences in Berlin. He belongs to the school of physiologists known by the names of Müller, Dubois-Reymond, and Virchow. His principal works on physiology and physiological psychology are *Untersuchungen über das Wesen der Nerven-Erregung* (vol. i., Leipzig, 1868); *Die elektrischen u. Bewegungs-Erscheinungen am Blute der Diona muscipula* (Leipzig, 1876); *Ueber die Functionen der Grosshirnrinde: Gesammelte Mittheilungen* (Berlin, 1881; 2d ed. 1890); numerous memoirs in *Zeitschr. für wissensch. Zoologie* (vol. ix.), *Arch. f. Anat. u. Physiol.* 1860-94), *Sitzungsber. d. Berliner Akademie d. Wiss.* (1880-94), etc. J. M. BALDWIN.

Munk, SALOMON: Orientalist; b. at Glogau, Silesia, May 14, 1805, of Jewish parentage; studied at Berlin (1820), at Bonn, and at Paris (1828); was appointed assistant in the department of Oriental MSS. in the National Library of Paris (1835); traveled in Egypt and Syria with Montefiore and Cremieux (1840), where he assisted in founding schools for Israelites; and was made Professor of Hebrew, Chaldee, and Syriac at the Collège de France (1865), though in 1852 he had become quite blind. In 1860 he was elected a member of the Académie des Inscriptions et Belles-Lettres, and a little later a member of the Consistoire Central Israélite. D. Feb. 6, 1867. His greatest work was the edition of the Arabic text, with French translation, of Moses ben Maimon's Guide of the Perplexed, *Le Guide des Égarés* (3 vols., Paris, 1856-66). He also wrote *Reflexions sur le culte des anciens Hébreux* (Paris, 1833); *Notice sur Rabbi Saadia Gaon* (Paris, 1838); *Palestine* (1845); *Philosophie chez les Juifs* (1848); *Notice sur Aboul Walid Merwan* (1851; crowned by the Academy); *Mélanges de philosophie juive et arabe* (1857-59); *Commentaire de Rabbi Tanhoum de Jérusalem sur le livre de Habakkouk* (1843). He also wrote articles in the *Encyclopédie pittoresque*, *Dictionnaire des Sciences philosophiques*, and the *Dictionnaire de la conversation*. RICHARD GOTTHEIL.

Munkacsy, moon-kaat'sée, MIHALY: historical and genre painter; b. at Munkacs, Hungary, Oct. 10, 1846. His real name was Michael Lieb, and he was a carpenter's apprentice before he began the study of art. He studied at the Vienna Academy and under Franz Adam in Munich; went to Düsseldorf in 1867 and painted there *The Last Day of a Man Condemned to Death*, which at once brought him into notice. In 1872 he established himself in Paris and painted pictures of life in that capital. With his picture of *Milton Dictating Paradise Lost to his Daughters* (in the Lenox Library, New York) he entered on a new field, and this work and others exhibited by him at the Paris Exposition of 1878 attracted much attention. *Christ before Pilate* and *Christ on Calvary* are two large compositions which have been exhibited in all the large cities of the U. S. He visited the U. S. in 1886 and painted several portraits in New York. Studio in Paris. WILLIAM A. COFFIN.

Muñoz, JUAN BAUTISTA: historian; b. near Valencia, Spain, 1745. He graduated at the University of Valencia, devoted himself to historical studies, and in 1779 was commissioned historiographer of the Indies, with special orders from the king to write the history of America. Only the first volume of his *Historia del Nuevo Mundo* was published (Madrid, 1793); this brings the narrative down to 1500, and is a work of the highest value. D. at Madrid in 1799. His manuscripts were scattered, but most of them are now in the Academy of History at Madrid. H. H. S.

Munro', HUGH ANDREW JOHNSTONE, D. C. L.: classical scholar; b. at Elgin, Scotland, Oct. 14, 1819; was educated at Trinity College, Cambridge, where he became a fellow 1843; published an edition of *Lucretius* (3 vols., text, commentary, translation; 4th ed. 1885), one of the standard works of English scholarship; of *Horace* (1869); *Elucidations of Catullus* (1878); and numerous articles of great value in philological journals. He is also distinguished as an elegant writer of Greek and Latin verse. D. Mar. 30, 1885. Dr. Munro was the first university professor of Latin, from 1869 to 1872, when he resigned. Revised by A. GUDEMAN.

Munster: the largest of the four provinces of Ireland; bounded N. and E. by Connaught and Leinster, and S. and

W. by the Atlantic. Area, 9,481 sq. miles. Pop. (1891) 1,168,994. The province is divided into the counties of Cork, Clare, Kerry, Limerick, Tipperary, and Waterford.

Münster: capital of the province of Westphalia, Prussia; on the Aa; 101 miles by rail N. by E. of Cologne (see map of German Empire, ref. 3-D). It is an old but well-built and picturesque town, surrounded with beautiful promenades (its old fortifications), and containing many open places planted with trees and lined with elegant houses. The most remarkable among its buildings are the cathedral (built 1225-61), and the town-hall, in which the Peace of Westphalia was signed in 1648. From the twelfth to the eighteenth century Münster was the capital of an independent principality of the German empire. In 1719 it was merged into the archbishopric of Cologne, and in 1814 it was given to Prussia by the Congress of Vienna, together with most of its territory. It has many good educational institutions, printing establishments, dye-works, and manufactures of leather, woolen, cotton, and silk fabrics, paper, and sugar, and it carries on a considerable trade in its own manufactures and the products of the surrounding district. Pop. (1890) 49,340.

Münsterberg, HUGO, Ph. D., M. D.: psychologist; b. at Dantzig, Germany, June 1, 1863; studied at Dantzig, Geneva, Leipzig, and Heidelberg. From 1887 to 1891 was instructor and 1891-92 Assistant Professor of Psychology in the University of Freiburg in Baden, Germany; in 1892 became Professor of Experimental Psychology, Harvard University, Cambridge, Mass. His principal works are *Die Willenshandlung* (Freiburg, 1888); *Gedankenübertragung* (1889); *Der Ursprung der Sittlichkeit* (1889); *Beiträge zur experimentellen Psychologie* (1889-93); *Aufgaben und Methoden der Psychologie* (1891); and many psychological and philosophical articles in *Psychological Review*, *Reallexikon der medicin. Propädeutik*, *Zeitschrift für Psychologie*, etc. J. M. BALDWIN.

Muntaner', RAMON: chronicler; b. at Peralada, Catalonia, in 1265; d. in 1336; the most important authority on the early history of his country, as well as one of the most valuable of mediæval annalists. After having filled many positions of trust under his sovereign, and participated in the remarkable Catalan expedition to Rumelia and Greece, Muntaner retired to Xilvella, near Valencia, and at the age of sixty years began the composition of his chronicle. His narrative covers the period between the "miraculous" birth of King Jaume, Jacme, or Jayme, I., the founder of the Catalan nationality, in 1208, and the coronation of King Alphonso in 1328. Muntaner's chronicle was first printed at Barcelona in 1558 under the title *Chronica o Descripcio dels fets e hazanyes del inclyt Rey Don Jaume, primer Rey d'Arago, de Mallorques e de Montpesler; fets per lo magnífich en Ramon Muntaner*. A reprint of this edition appeared at Barcelona in 1562. Lantz gave an edition of the text in the publications of the Stuttgart *Literarischer Verein* in 1844, and Bofarull has published at Barcelona the text with a Castilian version (1860). There is a good French translation by Buchon in the *Chroniques étrangères relatives aux Expéditions françaises pendant le XIII^e Siècle* (Paris, 1841); a German by Lantz (2 vols. 8vo, Leipzig, 1842); and an Italian by F. Moisé—*Due cronache catalane*, etc. (2 vols., Florence, 1843-44). See also G. Finlay, *Mediæval Greece and Trebizond* (London, 1851). Revised by A. R. MARSH.

Mün'ter, FRIEDRIK CHRISTIAN CARL HENRIK: theologian and author; b. at Gotha, in the duchy of Saxe-Coburg, Oct. 14, 1761; studied theology and archæology at Copenhagen and Göttingen; traveled for three years in Italy on a stipend from the Danish Government; was appointed Professor in Theology at the University of Copenhagen in 1790, and Bishop of Sealand in 1808. D. at Copenhagen, Apr. 9, 1830. He published the Coptic translation of the book of Daniel (1786), the statute-book of the Templars (1794), a manual on early Christian doctrinal history (1801-04), valuable works on the introduction of Christianity into Denmark (1823-32), and of the Reformation (1802), a very learned disquisition on the religion of the Carthaginians (1823), and a work describing the symbols and artistic representations employed by Christians in the first century (1825).—His father, BALTHASAR MÜNTER (b. at Lubeck, Mar. 24, 1735; d. in Copenhagen, Oct. 5, 1793), was minister of the German congregation at Copenhagen, and wrote in German *A Faithful Narrative of the Conversion and Death of Count Struensee* (trans. into English by Rev. G. F. A. Wendeborn, London, 1773; 3d ed. 1826).

Revised by S. M. JACKSON.

Muntjak: the Javanese name adopted as the common name of a few species of stags deer found in Southern and Eastern Asia and some of the neighboring islands. They are characterized by the great height of the pedicels, processes of the frontal bones, supporting the antlers. The pedicels are continued forward on the skull as prominent, converging ridges; the antlers, which are short, turn inward at the tip, and have but a single brow-prong. The little side hoofs so well developed in other deer are small, and represented by the lower portion only. These little deer stand only about 2 feet high at the shoulder. The most common species, *Cervulus muntjak*, often called banting-deer, occurs in British India, Burma, Ceylon, Java, Sumatra, etc. *Cervulus merasi* is found in China. F. A. L.

Muntz: See BRASS.

Munychia, μυνχία (a. in Gr. Μουνχία): the name of one of the harbors of Athens, and also of a hill lying between the harbors Zea and Munychia. On the hill there was a temple of Artemis Munychia, in whose honor a festival (also called *Munychia*), in commemoration of the battle of Salamis, was held. The hill was the scene of the battle between the patriots under Thrasylbulus and the Thirty Tyrants, 404 B.C. In 322 B.C. the hill served as a fortress for the Macedonian garrison of occupation. J. R. S. S.

Münzer, THOMAS: Reformer; b. at Stolberg, in the Harz Mountains, about 1490; studied at Leipzig, and became preacher at Zwickau, in Saxony, in 1520, and in 1523 at Allstedt, in Thuringia. At first he worked in unison with the Reformers, though his preaching was always strangely mixed up with mystical and fantastical ideas, but afterward he turned, according to his own "inner light," against the "halfness" of Luther and Melancthon, and demanded a radical reform of Church and state, which led to uproar and confusion. He entertained peculiar ideas of infant baptism, similar to those of the Anabaptists, with whom, however, he had no direct connection. His most characteristic views were a belief in continuous divine revelation through dreams and visions, and in the community of property, and he promulgated them in speech and writings with a somewhat coarse but often impressive eloquence. Expelled from Allstedt by the Government, he went to Nuremberg, and next to Schaffhausen, but returned soon to Thuringia, and settled at Mühlhausen. Here he succeeded in overthrowing the city council and appointing another which was entirely under his control; and when in 1525 the Peasants' war broke out in Southern Germany, he instigated the whole population in and around Mühlhausen and Langensalza to rise in revolt. Murder and plunder ensued, but on May 15, 1525, the peasants were totally routed at Frankenhäusen after a long battle. Münzer was taken prisoner, put to the torture, and beheaded at Mühlhausen a few days afterward. His *Life* was written by Melancthon (Hagenau, 1525), G. T. Strobel (Nuremberg, 1795), J. C. Seidemann (Dresden and Leipzig, 1842), and Heinrich Leo (Berlin, 1856). Revised by S. M. JACKSON.

Mur: a river of Austria. It rises in the Murek Mountains in the district of Salzburg, enters into Styria, where it becomes navigable at Judenburg, and passes by Gratz, flows through Hungary into Croatia, and joins the Drave at Legrad, after a course of 230 miles. It receives about 100 affluents, among which are the Kainach, Lasznitz, Sulm, Pöls, and Mürz, but none is navigable.

Murad: the name of five Ottoman sultans. MURAD I. GHIAZI the Victorious (1360-89), b. in 1326; son of Sultan Orkhan Ghiazi; captured Adrianople in 1360, and in 1365 made it the Ottoman capital; subdued a large part of Asia Minor; captured Thessalonica in 1386, and crushed Serbia at the battle of Kossovo (1389), where he was slain. Tireless and able in war and council, pious, frugal, and just, he is one of the most illustrious Ottoman sovereigns.—MURAD II. (1421-51), b. in 1403; son of Mohammed I.; conquered Phrygia and Karamania, subjected the Peloponnesus to tribute, and consolidated the empire; but he was unsuccessful at the siege of Constantinople, 1422, and at Belgrade (1439), and could not conquer the Albanian Scanderbeg or the Hungarian Huniadi. He loved his people, encouraged learned men, and built many mosques and colleges. Though twice abdicating in favor of his son Mohammed, he was each time soon afterward forced by his subjects to reascend the throne.—MURAD III. (1574-95), b. in 1546, was a son of Selim II.; had his life devoted to expanding the empire on his accession. He conquered Georgia (1578), and carried on a

successful war against Persia (1577-90). Though brave, he was avaricious, uxorious, sanguinary, and feeble-minded, and the empire declined under his reign. He had 129 children. MURAD IV. (1623-40) b. 1612.

Achmet I.; captured Bagdad in 1638, reduced the Druses, cowed the janissaries, and introduced a few reforms. He possessed ability, but was violent, revengeful, and unjust, and injured rather than benefited the empire.—MURAD V. (May 29-Aug. 31, 1876), b. in 1840, was a son of Sultan Abdul Medjid. On the dethronement of his uncle Abdul Aziz, he succeeded, according to Ottoman custom, as the eldest member of the dynasty. Well educated, affable, and kindly, his accession gave rise to high hopes, but excitement, caused by the violent death of Abdul Aziz and by the assassination of some of his own ministers, brought on insanity, and he was deposed. His brother Abdul Hamid II., present sultan (1897), reluctantly succeeded.

E. A. GROSVENOR.

Mura'na [= Lat. = Gr. *μύραινα*, a sea-eel]: the typical genus of the moray family of fishes (*Muranidae*). It includes the *Mura'na helena*, the famous mura'na of the ancients, a European salt-water eel. Its flesh is white and good, and it was artificially bred by the ancient Romans, who proved it extremely. Other species of *Mura'na* are found in tropical America.

Mura'nidae (Mod. Lat., from *Mura'na*, the typical genus): a family of fishes of the order *Apodes*, typified by the celebrated MURÆNA (*g. v.*) of the ancients. The body is elongated, as in the common eel; the scales absent; the head moderate; the opercular bones generally rudimentary and in part wanting; the mouth with the cleft moderately developed, or very large and extending far backward laterally; the intermaxillaries are rudimentary; the teeth well developed; the branchial apertures developed externally as lateral holes; the dorsal and anal fins variable, sometimes being well developed and sometimes nearly absent; the pectoral fins also either present or absent. The skull exhibits a number of well-marked characters, as shown by Cope; the parietals are largely in contact; the ethmoid very wide; the symplectic, maxillary, pterygoid, basal, branchiylal, and superior and inferior pharyngeal bones all wanting, except the fourth superior pharyngeal; this is jaw-like, and supported by a strong superior branchiylal; other superior branchiylals wanting or cartilaginous. The color is formed by the articulation of the lighter hues inclosing darker interspaces, sometimes by blue cross-bands, sometimes by white ocelli, and sometimes the coloration is uniform. The species are very numerous, chiefly in the tropical seas. Most of these fishes are voracious and some even ferocious. They are known to English-speaking fishermen as morays, a word derived from *Mura'na*. Revised by D. S. JORDAN.

Mural Circle [*mural* is from Lat. *murus*, a wall, or *murus*, wall]: an astronomical instrument consisting of a large graduated circle, to which is attached a telescope moving only in the plane of the meridian, and supported on the perpendicular face of a wall. It was used for the determination of the declinations of the heavenly bodies, but is now superseded by the meridian circle, which has the advantage of allowing both right ascension and declination to be determined at the same time.

Murat, Fr. pron. mū'raa', JOACHIM: soldier; b. at La Bastide-Fortunière, in the department of Lot, France, Mar. 25, 1771; the son of an innkeeper; was educated at Cahors and Toulouse, where he prepared himself for the Church. Dismissed from the seminary, he entered a regiment of chasseurs, and, cashiered in the regiment, lived for some time as waiter in a *café* in Paris. On the establishment of the constitutional guard of Louis XVI. he became a member of that body of troops, and was afterward transferred to a regiment of cavalry. He was aide-de-camp to Napoleon in 1795; accompanied him to Egypt in 1798; was made general of division in 1799; married in 1800 Caroline, a sister of the First Consul, and was made marshal of France, imperial prince, and grand admiral in 1804. In most of Napoleon's great battles, Austerlitz, Jena, Eylau, Friedland, he took a distinguished part, and the emperor loaded him with honors. In 1805 he was made Grand Duke of Berg, and in 1808 King of Naples under the name of Joachim I. Napoleon. Murat wished to govern his kingdom independently of France, but every attempt in this direction Napoleon frustrated with indignation. After the battle of Leipzig, Murat hastened to Italy and opened negotiations with Great Britain and Austria. He was defeated at the battle of the

on Jan. 11, 1814, the possession of his throne on the condition of his joining the allies against Napoleon. He marched against Prince Eugene, Viceroy of Italy, but when he heard that the Bourbons insisted violently at the Congress of Vienna on his expulsion, he stopped, and when Napoleon returned from Elba he at once declared war against Austria (Mar. 31, 1815). Defeated Apr. 12 at Ferrara, and May 2 at Tolentino, he fled to France, where, however, Napoleon refused to receive him. He lived in the vicinity of Toulon, but after the battle of Waterloo he was compelled to leave France. With a few adherents he made a fantastic attempt to invade Naples, but was caught near Pizzo, tried before a court martial, and shot Oct. 13, 1815.

Murato'ri, LUDOVICO ANTONIO: historian; b. at Vignola, in the duchy of Modena, Oct. 21, 1672; studied theology and history at the University of Modena; took holy orders; became keeper of the Ambrosian Library at Milan in 1694, and of the d'Este Library and the ducal archives at Modena in 1700, and died Jan. 23, 1750. His contributions to the history of Italy are very valuable: *Rerum Italicarum Scriptores* (25 vols., Milan, 1723-51); *Antiquitates Italicae Medii Aevi* (6 vols., 1738-42); *Annali d'Italia* (12 vols., 1744-49).

Muravieff: name of a family eminent in Russian literary, military, and political history, prominent during the reign of Ivan III. (1462-1505), who granted them large tracts of land, and especially noteworthy in the eighteenth and nineteenth centuries. (1) MURAVIEFF, MICHAEL: poet and diplomat; b. 1757; tutor of the grandchildren of Catherine II., who made him a senator, state secretary, and curator of the University of Moscow. D. 1807. His scattered literary works were collected and published at St. Petersburg in 1820, the chief being *The Inhabitants of the Suburbs*, *Dialogues of the Dead*, and *Essay on Literature and Morals*.

—(2) MURAVIEFF, NICOLAS: mathematician; published the first algebra in Russian (1752); made lieutenant-general and governor of Livonia by Catherine II.; d. 1770.—(3) MURAVIEFF, NICOLAS NICOLAÏEVITCH: general; son of preceding; b. 1768; played a brilliant part in the Russo-French wars of 1812-15; then devoted himself to a school, afterward imperial, which he had founded for Russian staff officers and to development of national agriculture. D. 1840. He left five sons, all of whom became distinguished.—(4) MURAVIEFF, ALEXANDER: general; oldest son of preceding; b. 1792; d. 1864; took part in conspiracy of 1825, on account of which he was exiled to Siberia, but was pardoned for his father's sake and recalled; served with distinction in the Crimean war; was appointed governor of Nijni Novgorod in 1856.—(5) MURAVIEFF KARSKI, NICOLAS: general; son of (3); b. 1793; fought in Russian campaigns of 1812-15; chief of staff during war with Persia (1827); general in Russo-Turkish war (1828-29); commanded the right wing at the capture of Warsaw (1831); commanded the army of assistance which disembarked in the Bosphorus (1833); was disgraced in 1838, but during the Crimean war commanded the army of the Caucasus and captured Kars (1855), for which exploit he received the title *Karski* and was made a prince. Though he fought in over fifty pitched battles he was never wounded. D. 1856.—(6) MURAVIEFF, MICHAEL: general and mathematician; son of (3); b. 1796; fought in campaigns of 1812-15; governor of Grodno (1830), where he crushed insubordination with severity; vigorously opposed emancipation of the serfs; put down the students' rebellion (1861) and the Polish insurrection (1863); was president of the Russian Geographical Society, and did much for Russian agriculture. D. 1866.—(7) MURAVIEFF AMURSKI, NICOLAS NICOLAÏEVITCH: general; son of (3); b. 1810; served in the Caucasus; governor-general of Eastern Siberia (1847), and conquered the territory on the Amur for Russia (1858), whence he gained the title of *Amurski*; negotiated a treaty with Japan very favorable to Russian interests. D. 1881.—(8) MURAVIEFF, ANDREW: traveler and author (1798-1874); son of (3); a versatile and very popular writer; composed many works in German and Russian on history, religion, and his travels. The chief are *Pilgrimage to the Russian Holy Places* (1832); *Dante*, a drama (1841); *History of the First Four Centuries of Christianity* (1842); *History of Jerusalem* (1844); *History of the Russian Church* (1845); *Souvenirs of Rome* (1846); *Description of Georgia and Armenia* (1848); *Souvenirs of the East* (1851); *Impressions of the Ukraine and Schastopol* (1859).—(9) MURAVIEFF-APOSTOL, IVAN; author; b. 1769; ambassador to Saxony and Spain; versed in ancient and modern languages; translated many

works into Russian. D. 1851. His best-known original production is archaeological, *A Journey in the Crimea*. His three sons took part in the insurrection of 1825; the eldest, SERGIUS IVANOVITCH MURAVIEFF-APOSTOL, the chief of the conspiracy, was hanged; the second died of his wounds; and the third was exiled for twenty years to Siberia.

E. A. GROSVENOR.

Murchison, Sir RODERICK IMPEY, K. C. B., F. R. S., D. C. L., LL. D.: geologist; b. at Tarradale, Ross, Scotland, Feb. 19, 1792; studied at the military college, Marlow, and the University of Edinburgh; was an officer in the army 1807-15, serving in the Peninsula and Sicily; was the associate of Davy; became in 1825 a fellow of the Geological Society, and in 1826 F. R. S.; aided Sedgwick and Lyell in British and continental geological studies; was one of the founders of the Royal Geographical Society, and often its president; traveled extensively in Russia, Scandinavia, etc.; was knighted 1846, made K. C. B. 1863, baronet 1866; became in 1855 director-general of the geological survey of the United Kingdom. D. in London, Oct. 22, 1871. Among his leading works are the *Silurian System* (1839), enlarged to *Siluria* (1854), *Geology of Russia and the Ural* (1845), and *Geological Atlas of Europe* (1856). He was the recipient of numerous honors and distinctions, British and foreign. See *Memoir of Sir Roderick Murchison*, by Archibald Geikie (2 vols., London, 1874).

Mur'cia: province of Spain, part of the old province of the same name, which in 1833 was divided into the present provinces of Murcia and Albacete. Area, 4,478 sq. miles. The surface is mountainous, forming elevated plateaus and large, deep valleys. Where water is abundant the soil is exceedingly fertile, producing wine, oil, silk, hemp, and all kinds of fruits, but in places where water is deficient the country is nearly a desert. Mineral springs abound; copper, lead, iron, and salt are found. Pop. (1887) 491,436. Capital, Murcia.

Murcia: capital of the province of Murcia, Spain; on the left bank of the Segura; 50 miles N. by W. of Cartagena (see map of Spain, ref. 18-H). It is irregularly built, but its streets are clean and its houses substantial, often elegant. Its cathedral has a high tower, from the top of which there is a magnificent view of the surrounding valley, the *huérta*, the river which waters it, and the lofty mountains which inclose it. Murcia has good educational institutions, manufactures of silk, linen, mats, cordage, saltpeter, powder, glass, and musical instruments, and an extensive trade in the products of its fertile *huérta*. Pop. (1887) 98,538.

Murder [M. Eng. *morder*, *morthor* < O. Eng. *morðor*, deriv. of *morð*, murder; Germ. *mord*, Goth. *maithr*; cf. Sansk. *mṛta*, death; Gr. *θωρός* (for *μωρός*), mortal; Lat. *mors*, *mortis*, death]; the unlawful killing of a person with malice aforethought; or, as defined by Lord Coke, the unlawful killing by a person of sound mind and discretion of any reasonable creature in being and under the king's peace, with malice aforethought, either express or implied. This crime is punishable, almost without exception, in all countries with the death penalty; and when committed on one's self involved at the common law the forfeiture of the decedent's goods and chattels and ignominy to the dead body. (See CAPITAL PUNISHMENT and SUICIDE.) By examining the separate elements of the latter definition, it will appear that to constitute the crime of murder the act of *killing* must have been by a person of sound memory and discretion—that is, by a person who is neither insane nor of such an age as to be incapable, either absolutely or by legal presumption, of the intent which is necessary to the commission of the crime. (See INSANITY and INFANT.) The killing must also be unlawful—that is, neither excusable nor justifiable. See HOMICIDE.

The *person killed* must be a reasonable creature in being—that is, a living person fully born. At the common law, therefore, the killing of an unborn child was not murder, although if the child were fully born alive and then died from the effects of acts committed upon it before birth, this constituted murder. (See INFANTICIDE and ABORTION.) It was also a rule of the common law, which is still valid, that the death of the person must occur within a year and a day of the time of the wrongful act or injury which is the alleged cause of death, the day upon which the act is committed being included in the reckoning.

The expression "under the king's peace," or, as it is commonly expressed in the U. S., "under the peace of the State," excludes from being regarded as murder the killing of an

p. 118); also *Jahresbericht* (1857, 649; 1858, 671; 1859, 752), and Wagner's *Jahresb.* for the same years.

Revised by IRA REMSEN.

Murfree, MARY NOAILLES: novelist; b. near Murfreesboro, Tenn., about 1850. Her short stories and novels, written under the pseudonym *Charles Egbert Craddock*, are impressive and highly dramatic studies of life among the Tennessee Mountains. They include *In the Tennessee Mountains* (1884); *The Prophet of the Great Smoky Mountains* (1885); *The Despot of Broomsedge Cove* (1888); *In the Stranger People's Country* (1891); *His Vanished Star* (1894).

H. A. B.

Murfreesboro: city (founded about 1800, State capital in 1817-27); capital of Rutherford co., Tenn. (for location of county, see map of Tennessee, ref. 6-F); near Stone river, on the Nash., Chat. and St. L. Railway; 32 miles S. E. of Nashville, 119 miles N. W. of Chattanooga. It is in an agricultural, cotton, and fruit-growing region, and has an historical value from the fact that engagements occurred here between the Union forces under Gen. Rosecrans and the Confederates under Gen. Bragg, on Dec. 31, 1862, and Jan. 2, 1863, the actions forming what is known as the battle of Murfreesboro or Stone river. The city is the seat of Soule Female College (Baptist, founded 1841), and has 6 churches, a national soldiers' cemetery, 2 national banks with combined capital of \$175,000, and 3 weekly newspapers. Pop. (1880) 3,800; (1890) 3,739; (1894) estimated, 5,000.

EDITOR of "FREE PRESS."

Murfreesboro, Battle of: one of the most fiercely contested battles of the civil war in the U. S.; fought Dec. 31, 1862, and Jan. 2, 1863, between the Union forces under Gen. Rosecrans and the Confederates under Gen. Bragg. It is also known as the battle of Stone River.

Gen. Rosecrans moving out from Nashville Dec. 26, 1862, forced back Bragg's outposts, and on the 29th found his army in position about 2 miles in front of Murfreesboro, Tenn., facing nearly N. W., its right under Breckinridge resting on Stone river, its center under Polk and its left under Hardee. Rosecrans drew up his army in front of the Confederates, McCook on the right, Thomas in the center, and Crittenden on the left, resting on Stone river. The left of each army extended beyond the right of the other. The plans of battle adopted by Rosecrans and Bragg were nearly identical.

In the morning of Dec. 31 each advanced his left wing with a view to turning and driving in the enemy's right. Hardee being but a short distance from McCook, his attack made at daylight struck first, and being pushed with great vigor the Union right was slowly rolled back, until at the close of the first day Rosecrans's army was concentrated, its right and center along the Nashville Pike on a short line nearly at right angles to its original position, and its left curved back and resting on Stone river. No serious fighting occurred on Jan. 1. The lines were rectified and Rosecrans extended his left, placing one division under Col. Beatty on the east bank of the river in a position to enfilade a part of Bragg's line, making it necessary for Bragg to dislodge this division or abandon his line.

On Jan. 2 Breckinridge, by Bragg's order, assaulted Beatty's division, and by the force of his attack at first forced it back. The Union left in falling back, however, exposed the Confederates to a crushing artillery fire, by which they were stopped, and a vigorous countercharge drove them back to their original position.

No further attacks were made, and on the night of Jan. 3 Bragg withdrew to the Elk river. The Union force engaged was 43,400 men; its losses, 1,730 killed, 7,802 wounded, and 3,717 missing; total, 13,249, or 31 per cent. The Confederate force was 37,800; its losses, 1,294 killed, 7,945 wounded, and 1,027 missing; total, 10,266, or 28 per cent.

JAMES MERCUR.

Murger, mür'zhä', HENRI: novelist; b. in Paris, Mar. 24, 1822: the son of a concierge and tailor. At the age of fifteen he was put into a notary's office, but found it uncongenial. The following year he became secretary to Count Leo Tolstói. This position gave him independence and leisure to devote himself to writing. Little is known about his career during the next ten years. Probably he was leading the irregular and dissipated life of that artistic and literary Bohemia which he described so vividly in his best-known work, *Scènes de la vie de Bohème* (1848), of which he himself is thought to be the hero. In it the life of the Latin Quarter, with its mixture of gayety and wretchedness, youth-

ful spirits and corruption, is reproduced with a realism that is relieved by touches of poetic feeling. Murger made himself the special painter of this life, and it furnished him most of the materials for his other novels, none of which equals the *Vie de Bohème*. D. in an asylum for the insane near Paris, Jan. 28, 1861. Among his other works are *Claude et Marianne* (1851); *Scènes de la vie de jeunesse* (1851); *Le dernier rendez-vous* (1852); *Le pays latin* (1852); *Adeline Protat* (1853); *Les buveurs d'eau* (1854). His poems were collected in one volume, *Les Nuits d'Hiver*.

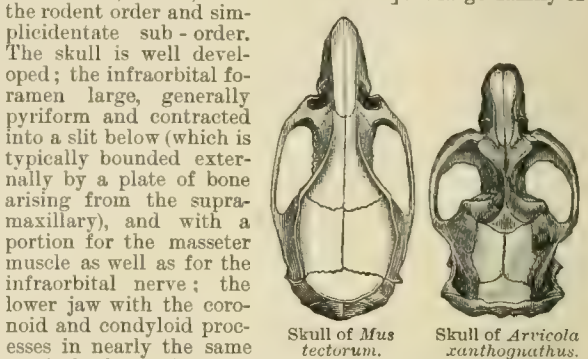
A. G. CANFIELD.

Muriatic Acid: See HYDROCHLORIC ACID.

Muric'idæ, or **Muric'inæ** [Mod. Lat., named from *Murex*, the typical genus]: a family of gasteropod molluscs, order *Rhachiglossa*, occurring mostly in the warmer seas. The shell has an anterior canal, and is ornamented by two or more series of thickenings (varices). The genera and species are numerous. One species is said to have been the source of the celebrated Tyrian purple. All the species are carnivorous.

J. S. K.

Mu'ridæ [Mod. Lat., named from *Mus*, the typical genus = Lat. *mus*, mu'ris, mouse. See MOUSE]: a large family of



the rodent order and simplicidentate sub-order. The skull is well developed; the infraorbital foramen large, generally pyriform and contracted into a slit below (which is typically bounded externally by a plate of bone arising from the supra-maxillary), and with a portion for the masseter muscle as well as for the infraorbital nerve; the lower jaw with the coronoid and condyloid processes in nearly the same vertical plane with each other and with the descending ramus, the last more or less twisted; molar teeth generally $\frac{3}{4}$ (rarely $\frac{3}{2}$ or $\frac{3}{1}$) \times 2; the hind legs are but moderately developed, and the animals normally progress by a running gait approaching to leaping; the tibia and fibula are united below; the metatarsal bones separate from each other; a cæcum is present. This family is by far the most extensive of the order, and contains over 300 species, representing about fifty genera, which have been distributed among six sub-families—viz., *Murinae*, to which the *Spalacinae* and *Georhynchinae* are adjuncts, and *Arvicolinae*, with which the *Siphneinae* and *Ellobiinae* are nearly connected. See LEMMING, MOUSE, MUSKRAT, and RAT.

Revised by F. A. LUCAS.

Murillo, moo-reel'yō, BARTOLOMÉ ESTEBAN: painter; b. at Seville, Spain, in 1613. The first instruction he received was from his cousin, Giovanni del Castillo. In order to earn his living he painted church banners and pictures for exportation to South America, and acquired great rapidity and facility of execution. After studying under Van Dyck and Pedro de Moya he visited Madrid, where his talent was recognized by Velasquez, who got him work at the Escorial, thus procuring him the means of remaining in that city, where he made numerous copies from Titian, Rubens, and Van Dyck. On his return to Seville in 1645 his work created a great sensation. He painted some large pictures for the convent of St. Francis, in which he showed himself to be a remarkable colorist; after these he painted *The Death of Santa Clara*, and *San Giovanni Giving Alms*. His fortune was made at last, and he had innumerable commissions. His most perfect works were produced at the age of thirty-five, and acquired for him the reputation of being the foremost of Spanish colorists. Among these are *St. Leander* and *St. Isidore*, and *St. Anthony of Padua*; also the pictures to adorn the Church of Santa Maria la Blanca, which are now in Paris. In 1667 and 1668 he directed the works in the cathedral, and painted an *Immaculate Conception* in one of its cupolas. The epoch of Murillo's greatest success was from 1670 to 1680, when, besides other works, he produced for the Capuchin church in Seville twenty-three pictures, which were sent to South America later. In 1687 he went to Cadiz to paint in the Capuchin church an altarpiece, *The Marriage of St. Catherine*, and while occupied on this picture he fell from the scaffolding. He returned to Seville,

but died from the effects of the injury Apr. 3, 1682. See Minor, *Murelio* (London, 1882), and Curtis, *Volapük*, and *Murelio* (1886). W. J. STELLMAN.

Murner, Thomas, clergyman and satirist; b. according to tradition, at Strassburg, Dec. 21, 1475; was educated in the school of the Franciscans, and ordained in 1494; studied theology at Paris and law at Freiburg in 1499. In 1506 he was made poet laureate by the Emperor Maximilian; taught logic at Cracow; became doctor of divinity, and led a roaming life, preaching in many cities and drawing large crowds by his witty sermons. Being an opponent of Luther, he was invited to come to England by Henry VIII., but he soon returned to Strassburg, where, in the meantime, the Reformation had been introduced. He fled to Switzerland and preached for a time at Lucerne, but was forced to flee again, and went to Heidelberg. Finally he received a small parish at Oberkirch in the Alsace, where he died about 1536. Murner was the greatest satirist of the sixteenth century, far more original and witty than Sebastian Brant, whom he followed in his earlier productions. His principal works are *Der Scherz* (Zürich, 1512); *Die Narrenschänke* (1512); and *Die Geuchmat* (1519), in which he mercilessly and with great power of language ridicules the follies of his contemporaries. Though he did not spare the clergy with his attacks, he was nevertheless opposed to the Reformation as an unjustified innovation of the individual Luther. He answered the numerous libels which, on this account, were heaped upon him by the Lutherans in the best and most striking of his satires, *Von dem jessen vatterlichen Verren* (1522). The hatred of his religious opponents has followed Murner up to modern times, blackening and defaming his character, and not until recently has history begun to do justice to this extraordinary man. See Lappenberg, *Murners Uebersicht* (1854); K. Godela, *Murners Arbeiten* (1879); G. Balle, in Kerschmann's *Deutsche Nationalliteratur* (vol. xvii.); Kawerau, *Thomas Murner und die Kirche des Mittelalters* (1890); M. Späcker in Paul and Braune's *Beiträgen* (xviii., 1-72). JULIUS GOEBEL.

Murphy, James Gracey, LL. D., D. D.: clergyman and author; b. in the parish of Comber, County Down, Ireland, Jan. 12, 1808; was educated in the Royal Academical Institution at Belfast and Trinity College, Dublin, where he spent three years as sizar and three as scholar; was minister at Ballyshannon 1836-41; classical head master in the Belfast Academical Institution 1841-47; Professor of Hebrew in the Assembly's Theological College at Belfast from 1847 till he retired at his own request in 1888. He has published *A Latin Grammar* (London, 1847); *A History of the Bible* (1857); *Verbal Impossibilities in Coleridge's Poetry* (London, 1863); *The History of the Bible* (1873); *Commentaries on Genesis* (Edinburgh, 1864; Andover, 1866); *Exodus* (Edinburgh, 1866; Andover, 1868); *Leviticus* (Andover, 1872); *Psalms* (Edinburgh, 1875); *Revelation* (London, 1882); *Chronicles* (Edinburgh); *Daniel* (London, 1884); and *Sacrifice in Scripture* (London, 1889). C. K. HOVE.

Murphy, John Francis, painter and engraver; b. at Oswego, N. Y., in 1853; was elected member of the Society of American Artists in 1883; National Academician 1887; member of the American Water-color Society; was awarded the Webb prize at the Society of American Artists in 1887; second Hallgarten prize, National Academy, 1885. His pictures are in the collection of the Metropolitan Museum of Art, New York. W. A. C.

Murphysboro, a city, capital of Jackson county, Ill., on the Big Muddy river, and the Chi. and Tex., and the Mobile and O., and the St. L., Alton and Terre H. railways; 6 miles W. of Carbondale, 90 miles S. E. of St. Louis. It is in an agricultural and coal-mining region; contains 8 churches, 2 public-school buildings with 23 departments, including a high school, 2 national banks with combined capital of \$100,000, and 2 daily and 2 weekly newspapers; and has manufactories of flour, lumber, fire-brick, ice, mineral waters, and cotton. Pop. (1880) 2,196; (1890) 3,880; (1900) 7,000.

Murray, Alexander, D. D., Scottish scholar; b. at Kitterick, Kirkcudbrightshire, Scotland, Oct. 22, 1775, the son of a minister of the gospel; was distinguished by extraordinary proficiency in the acquisition of languages, and was

and after serving in several parishes was elected in 1812 Professor of Oriental Literature at the University of Edinburgh. His knowledge of Semitic languages procured from the widow of James Bruce a commission to classify the extensive collection of manuscripts formed by that traveler, and also to bring out a second thoroughly revised and annotated edition of Bruce's *Travels in Abyssinia*, which appeared in 1807 (7 vols.), accompanied by a *Life of the author*. In 1812 he published *Outlines of Oriental Philology, comprehending the Grammatical Principles of the Hebrew, Syriac, Chaldee, Arabic, and Abyssinian Languages*, a manual intended for the use of his students. D. at Edinburgh, Apr. 15, 1813. He left in MS. a *History of the European Languages, or Resources of the Language of the Teutonic, Greek, Celtic, Slavonic, and Indian Nations*, published at Edinburgh in 1823 (2 vols.).

Murray, David, Ph. D., LL. D.: educationist; b. at Delhi, N. Y., Oct. 15, 1829; graduated at Union College in 1852; was successively a professor and principal of the Albany Academy from 1853 to 1863, and from 1863 to 1873 Professor of Mathematics and Physics in Rutgers College. In 1873 he entered the service of the Japanese Government as foreign adviser to the department of education. He is the author of a *Manual of Logic* (New York, 1872), a contributor to Mori's *Education in Japan* (New York, 1872), and the editor of an *Outline History of Japanese Education* (New York, 1876), prepared for the Philadelphia exhibition, to which he contributed the introductory chapter, and *The Story of Japan* (New York, 1894). He returned from Japan in 1878, and became secretary of the board of regents of the University of the State of New York. He resigned that office in 1888.

Murray, Hugh: geographer; b. at North Berwick, Scotland, in 1779; became at an early age a clerk in the excise office at Edinburgh, and devoted his leisure to literature, especially to geography. He edited *The Scots Magazine*, contributed to *The Edinburgh Gazetteer* and the *Transactions of the learned societies*, and wrote for the Edinburgh Cabinet Library seven volumes of *History of Discoveries and Travels*—namely, *Africa* (2 vols., 1817), *Asia*, 3 vols., 1820, and *North America* (2 vols., 1829); and ten volumes of descriptive geography—namely, *British India* (3 vols.), *China* (3 vols.), *United States of America* (3 vols.), and *Marco Polo's Travels* (1 vol., 1839). His principal work was the *Encyclopædia of Geography* (1834). D. in London, Mar. 4, 1846.

Murray, James A. H., LL. D.: lexicographer; b. at Denholm, Roxburghshire, Scotland, in 1837; taught school for some time in Hawick; was foreign correspondent in the Oriental Bank, London; graduated at London University, and while senior assistant master of Mill Hill School became in 1879 president of the Philological Society and editor of the *New English Dictionary* (see DICTIONARY); the presidency he again held in 1880. He is thoroughly familiar with most European and many Oriental languages, and became widely known as a philologist through his *Dialect of the Southern Counties of Scotland* (in *Trans. Lond. Philol. Soc.*, 1870-72, London, 1873). For the Early English Text Society he edited the minor poems of Sir David Lyndesay (1871); *The Complaint of Scotland* (1872); and *The Romance and Prophecies of Thomas of Erceuldoune* (1875). In 1884 he was honored with an annual civil-list pension of £270.

Murray, James Clarke: philosophical writer; b. in Paisley, Scotland, Mar. 19, 1836; was educated at Glasgow and Edinburgh Universities, and spent some time at Göttingen and Heidelberg. In 1862 he was appointed Professor of Mental and Moral Philosophy in Queen's University, Kingston, Canada, and since 1872 he has held the same chair in McGill University. He has published *An Outline of Mental Philosophy* (1862); *Ballads and Songs of Scotland* (London, 1874); *Memoir of David Murray* (Paisley, 1881); *Handbook of Psychology* (London, 1882); and *Principles of Psychology* (1891).

Murray, Moray, Scotch scholar; b. about 1533; was a natural son of James V. by Lady Margaret Erskine, who afterward married Sir Robert Douglas of Lochleven; was educated at the University of Edinburgh; and drew in 1538, and subsequently acquired the priory of

tion to hold three benefices, and took in 1544 an oath of fealty to Pope Paul III. In 1547 he accompanied his half-sister Mary (afterward Queen of Scots) to France, and in the following year repelled a descent of Lord Clinton upon the island of St. Monan, on the coast of Fifehire. In 1556 he joined the Scottish Reformers, and soon assumed the political leadership of the Protestant party. He was one of the Scottish commissioners to witness Mary's marriage to the Dauphin of France (1558); was appointed member of the council for civil affairs Dec., 1559, and one of the lords of the articles June, 1560; was sent as envoy to France Apr., 1561, to invite Mary to return to Scotland as queen, and on her arrival in August became her prime minister and chief adviser, protecting the Protestants in the enjoyment of their religious privileges, while he insisted upon the queen's right to worship according to her Catholic antecedents. In Feb., 1562, he was created Earl of Mar, and soon afterward married Lady Agnes Keith, daughter of the earl marischal, but in the same year resigned the title of Mar in favor of his uncle, Lord Erskine, who claimed it by right, and received in its stead the earldom of Murray; defeated the rebel Earl of Huntly at Corrichie, and governed Scotland with prudence, though incurring the displeasure of Knox and the extreme Protestants by his studied neutrality in the religious conflict then beginning. In 1565 he took up arms to prevent Mary's marriage with Darnley, but was defeated and escaped into England. He was recalled in 1566, and arrived at Edinburgh the day after the assassination of Rizzio, to which he was supposed to have been accessory, as also to the murder of Darnley in the following year, though his complicity in the latter crime is much less certain. He left Edinburgh the day before that event, and proceeded to France, also visiting Queen Elizabeth in England; returned to Scotland and induced Mary to abdicate July 22. He was proclaimed regent Aug. 22; defeated his sister's forces at Langside May 13, 1568, and firmly established his authority; at the trial of Mary at York for the murder of Darnley, gave his testimony against her, and produced as evidence the famous "casket letters," the authenticity of which has ever since been warmly debated. Murray ruled with skill and success until he was assassinated in the streets of Linlithgow by James Hamilton of Bothwellhaugh, Jan. 21, 1570.

Murray, JOHN: publisher; b. in London, Nov. 27, 1778; son of a Scotchman named John McMurray (b. in Edinburgh, 1745; d. in London, Nov. 16, 1793), who founded a prosperous bookselling shop in London. Succeeding at the age of fifteen to his father's business, young Murray ultimately became the friend and liberal patron of a famous circle of literary men, most of whose works he published. Among them were Byron, Moore, Campbell, Crabbe, Irving, and Gifford, the latter of whom edited for many years Murray's *Quarterly Review*, founded in 1809 as a Tory organ in opposition to *The Edinburgh Review*. In 1812 Murray removed his business from Fleet Street to Albemarle Street, where it still remains. D. in London, June 27, 1843.—His son, bearing the same name, b. in 1808, and educated at the University of Edinburgh, edited a series entitled the *Home and Colonial Library*, personally superintended the preparation of the well-known *Murray's Handbooks of Travel*, and brought out, among others, the works of Hallam, Grote, Milman, Layard, Wilkinson, Rawlinson, William Smith, Lyell, Murchison, Livingstone, and Darwin. In 1869 he established *The Academy*, a scholarly literary and critical weekly paper.

Revised by H. A. BEERS.

Murray, JOHN: naturalist; b. in Coburg, Ontario, 1849, of Scotch ancestry. His early education was received at Coburg, and at sixteen he was sent to the University of Edinburgh, where he took honors in natural and physical sciences, doing much of his work in the physical laboratory under Prof. Tait. In 1867 he began the marine investigations with which his name is so intimately connected. In that year he went on an expedition to Spitzbergen and Greenland, and in 1872 was appointed one of the naturalists of the CHALLENGER EXPEDITION (*q. v.*). On the return of the expedition he was appointed by the British Government as first assistant under Sir Wyville Thomson on the staff to prepare the final report on the scientific results of the expedition. On the death of Thomson he became director of the staff, and under his editorship fifty fully illustrated volumes have been issued. Of these he prepared the volume of the summary of results, and was joint author of the volumes on deep-sea deposits and the narrative of the

cruise. In 1880-82 he had charge of the scientific work on the deep-sea expeditions of the Knight Errant and Triton in the North Atlantic. He is the author of numerous scientific papers, largely upon physical geography and oceanography, and is a member of numerous learned societies. He received the degrees of LL. D. from Edinburgh and Ph. D. from Jena. He resides at present at Edinburgh.

J. S. KINGSLEY.

Murray, LINDLEY: grammarian; b. at Swatara, near Lancaster, Pa., Apr. 22, 1745; removed in 1753 to New York with his father, a Quaker merchant; was admitted to the bar in 1776; became a successful merchant of New York, and in 1784 retired from business; settled at Holdgate, near York, England, and devoted himself to literary pursuits; best known by his *English Grammar* (1795), which was for many years regarded as the best authority on the subject, and had a prodigious currency, particularly in Great Britain; published also an *English Reader*, a spelling-book, and other educational works, an *Autobiography*, and some religious works, which were popular. D. at Holdgate, Feb. 16, 1826.

Revised by H. A. BEERS.

Murray, WILLIAM: See MANSFIELD, EARL OF.

Murray, WILLIAM VANS: lawyer and statesman; b. in Maryland in 1762; received a classical education; went to London after the peace of 1783, and studied law in the Temple for three years; was elected a member of the Maryland Legislature on his return, and sat in Congress 1791-97; took a very prominent part in the early legislation of the U. S., and had few superiors in erudition, eloquence, wit, judgment, or skill in debate. He was appointed by Washington minister to the Netherlands in 1797, and became envoy to France in 1799, where the convention signed at Paris Sept. 30, 1800, which put an end to the serious difficulties between the U. S. and France, was mainly his work. He returned to his post at The Hague, where he remained until Dec., 1801. D. at Cambridge, Md., Dec. 11, 1803. He was the author of a treatise on *The Constitutions and Laws of the United States*.

Murray Bay [named from Gen. Murray, governor of Quebec in 1759], or **Malbaie**: a watering-place on the north shore of the St. Lawrence, in Charlevoix County, Province of Quebec; about 90 miles E. of city of Quebec (see map of Quebec Province, ref. 3-F). The bay on which the village is built is the estuary of the Murray river, which drains the region of a thousand lakelets. The scenery around the village is very picturesque, with frowning hills behind and beetling cliffs in front. Though the water of the bay continues cold during the greater part of the summer, the sea-bathing is one of the attractions of the place. The population of the parish is 3,500. There are two churches, and the river affords very good motive-power for a number of saw-mills. The place is reached from Quebec by steamer. J. M. HARPER.

Murray River: the principal river of Australia; rises on the western slope of the Australian Alps, and falls into Encounter Bay in lat. 35° 26' S., after a tortuous course of 1,200 miles. Its mouth is too shallow to be entered by large vessels, but the lower portion is navigable. The chief tributaries are the Murrumbidgee and the Darling, both on the N. The latter is longer than the entire Murray, but it is a desert river with little water, except after severe local storms. The entire basin of the Murray (including the Darling) is about 240,000 sq. miles.

Murree: a town and sanitarium of the Punjab; 30 miles N. E. of Rawal Pindi; on the upper slopes of Murree Mountain; from 6,200 to 6,500 feet above sea-level (see map of N. India, ref. 3-C). It is in summer the seat of the government, and is connected with Rawal Pindi by a good wagon road. The temperature ranges from 17° F. to 99° F., but the place is cool even during the summer, averaging about 65° F. It has several large hotels, a school for the education of the children of European soldiers, and a brass-foundry, and is the center of a large business. Pop. 2,500; in summer, 12,000 to 14,000.

M. W. H.

Murshedabad: town of British India, in Bengal; on the Bhagirathi river (see map of N. India, ref. 7-I). It was formerly the capital of Bengal, and is a large and straggling town, extending along the river for a distance of nearly 8 miles. With exception of the palace and some mosques, it is meanly built, its houses being mostly mud huts. It is situated on the main road between Calcutta and the North-west Provinces, and has an important trade. Pop. (1881) 39,231.

Revised by C. C. ADAMS.

Musæus (in Gr. *Mosaios*): 1. A singer, seer, and poet who flourished in the times before Homer. He was a pupil or son of ORPHILUS of Thessaly, and introduced various religious sacred poetry into Athens. His poems were collected by ORPHICISTS, who forged many of them. 2. A Greek historian who imitated Xenophon's *Memorabilia* and wrote an epic poem on the story of Heracles and Leda, edited by Passow (L. 1712, 1810) and by Dübner (Bonn, 1874). See also Schwanitz, *In Musæi Nomen* (Leipzig, 1876). 3. A Greek poet of the 5th century B.C. who wrote a collection of Epigrams, cited in Alexandrian times, and wrote a *Pharsalia* and poems in *Epigrammata* and *Attalia*. See Dübner, *Pharsalia des Musæi* (Paderb., 1840).

J. R. S. STURTELL.

Musæus, JOHANN KARI AUGUST; author; b. at Jena, Mar. 29, 1735; studied divinity; became in 1763 governor of the court pages at Weimar, and in 1770 became a professor in the gymnasium. D. at Weimar, Oct. 28, 1787. He is remembered as the author of *Volksmärchen der Deutschen* (1782), a collection of pleasing tales, for a long time very popular. He wrote also: *Die Lieder des Zerstörten* (1760); *Phänomenologische Reisen* (1778-89), against Lessing; *Freunde Heines Lebens* (1785); and *Streitsprüche* (1787-97), which show the influence of Wieland. See *Leb.* by Müller (1867). Revised by JULIUS GÖBEL.

Musca: See **FLY**.

Muscadine [from Fr. *muscadin*, musk-bouquet; from Lat. *Lat. muscus*, musk, whence Eng. *musk*]: name applied to a species of grape (*Vitis rotundifolia*), indigenous to the southern parts of the U. S. It is also popularly called bullace or bullitt grape, and fox-grape. The white supporting grape, which is one of its varieties, is much esteemed.

Muscæ Volitant'es [Lat., *liter.*, flitting flies]: a name given to the black, or more rarely very bright, floating objects which sometimes seem to appear before the eyes. If fixed and permanent black spots appear, moving with one or both of the eyes, there is reason to suspect organic disease of the eye, and an expert oculist should be consulted. If the spots fall or swarm upward, it is believed that they are caused by small and unimportant opacities floating in the humors of the eyes.

Muscat, or **Mascat**: an innamate in Arabia with indefinite boundaries; one of the eight divisions of Oman, lying S. W. of the Gulf of Oman and included between 22° and 27° N. lat. and 53° and 58° E. lon. This has been its general outline since 1856. It comprises also a narrow strip of land along the shores of Laristan and Moghistan. The coast-line, sometimes low, presents generally a succession of high precipitous rocks. Between and behind these hills, as well as far inland, are frequent patches of land which artificial irrigation renders marvelously fertile. Cotton, rice, maize, coffee, and tropical fruits of every sort are produced in abundance. There are no rivers but many springs. The climate is exceedingly unfavorable for Europeans, a dry, burning heat continuing for long periods night and day. The imam is the merchant-in-chief, practically controlling all the business relations of his subjects, which he regulates in accordance with his own interests. No reliable estimate of the population or extent of the innamate has ever been made. E. A. GROSVENOR.

Muscat, or **Maskat**: capital of Oman, an independent state of Southeastern Arabia; in a fertile plain in lat. 23° 38' N. lon. 58° 10' E., surrounded by gardens and plantations of date-palms, on the border of an inlet of the ocean which forms a spacious and safe harbor (see map of Persia and Arabia, ref. 7-J). The city is fortified, but rather poorly built. Its inhabitants consist of Arabs, Hindus, Negroes, and Jews, and carry on a very important trade in coffee, pearls, salt fish, dyestuffs, and other Persian and Arabian goods. The population is variously given at from 20,000 to 60,000. Revised by M. W. HALL, Esq.

Muscatine: city (settled under the name of Bloomington in 1836, incorporated as a city in 1853); capital of Muscatine co., Ia. (for location of county, see map of Iowa, ref. 6-K); on the great bend of the Mississippi river, and the Cin., Rock Is. and Pac., and the Burl., Cedar Rap. and N. railways; 30 miles W. of Davenport, 203 miles W. of Chicago. It contains 17 churches, 9 public-school buildings, 2 commercial colleges, several parochial schools, Commercial Club building, Young Men's Association building, a national bank with capital of \$500,000, a savings bank with capital of \$60,000, 2 private banks, and 2 daily and 5 weekly

newspapers. The manufactories include large sawmills, sash, door, and blind factories, iron-rolling mill, oat-meal mill, large box-factory, plumbing-supply factory, woven-wire picket-fence factory, brick and tile works, iron-foundries, marble-works, cigar-factories, pearl-button works, machine-shops, potteries, carriage, wagon, and harness factories, and large pickling-works. The natural slope of the ground affords excellent drainage, the streets are lighted by gas and electricity, the river is here crossed by a wagon bridge, and the city has electric railways. Pop. (1880) 8,295; (1890) 11,454; (1895) 12,237.

MANAGER OF THE JOURNAL.

Musch'elkalk [*German*, *muschel*, shell, *kalk*, lime]: in Germany, a great limestone, belonging in the middle of the Triassic period, and resting, typically, upon the Bunter sandstone, and covered by the Keuper or red marl beds. It is named for its abundant fossils, and supplies lime, marl, rock-salt, gypsum, and building-stone.

Musci: plural of *Mosses*, a class of plants. See **MOSS** and **WORDS**.

Muscle [O. Eng. *muscle*, from Lat. *musculus*, muscule, mussel, *liter.*, dimin. of *mus*, mouse, which some muscles resemble in form]: the tissue through the direct agency of which the various movements of animals are effected. Very early in embryonic life a part of the great mesodermic layer differentiates into elongated elements distinguished by the possession of contractility in limited and definite directions; these elements form the muscular tissue, whose minute structure is described in detail in *HISTOLOGY* (q. v.). In man and the higher animals muscular tissue is separated into two varieties, *voluntary* and *involuntary*, according to its control by the will or independence of action: the voluntary muscle constitutes the great masses of sarcoous substance or "flesh" of animals by which the various movements are carried out at will; the involuntary muscle, on the contrary, forms the walls of the hollow organs, as the stomach, intestines, blood-vessels, etc., whose contractions are beyond the control of volition. The number of individual contracting bands or "muscles" increases with the subdivision of labor and the specialization of action in the higher types, in man over two hundred distinct muscles being recognized. The close association of these organs with the skeleton separates them into the corresponding groups of the muscles of the *trunk* and those of the *extremities*, many of the latter group passing from the more fixed points of the axial skeleton to the upper parts of the freely moving limbs. The more rigid point of attachment of a muscle is spoken of as its *origin* in contrast to its *insertion* or attachment to the part moved; in many cases, however, the position of greatest fixation varies from time to time with the particular action to be secured. Muscular tissue is attached to other parts by means of dense white fibrous tissue, usually in the form of *tendons* or of aponeurotic expansions; in early life the tendons are relatively small and exceedingly pliant, as evinced by the greater suppleness and agility of youth as contrasted with the increasing rigidity of age due to the invasion of the muscular tissue by the encroaching tendinous structures. See *HISTOLOGY*.

G. A. PIERSON.

Muscle-reading, or so-called **Mind-reading**: the apparent detection of the thoughts of another from simple muscular contact with him. This phenomenon, under the phrase mind-reading, has given rise to much mystification of audiences and many extravagant claims to powers of clairvoyance, etc. It has now been shown by a number of well-planned experiments that it is impossible to think intently of directions, figures, etc., without making very slight muscular movements, or twitches, or tensions in the direction or around the figures thought of. The muscular system reflects in a very remarkable way the course of thought through all its concrete imagery. It is therefore possible that certain persons, of delicacy of touch and with training, should be able by simple contact to interpret these slight movements of the hand-muscles of another, and so to seem to divine his thoughts directly. The most interesting experiments, apart from those on hypnotic subjects, were reported by Prof. Joseph Jackson (See *Scientific American*, 1892.) The performances of many well-known operators can probably be explained in this way—i. e. Cumberland, Bishop, Randall Brown, etc. On the claims to mind-reading as well as to clairvoyance, see *Scientific American*, 1892, p. 100.

Muscle-sense: the sense which reports feelings of the activity of the muscles of the body as concerned in movement. It is in its development the earliest of the senses. As to the existence of such a class of sensations as seen in lifting, pushing, straining, and in the weariness that follows muscular exertion, there is no doubt. Beaunis finds that a singer retains control over the vocal chords after their sensitiveness to touch has been destroyed by cocaine. Clinical cases show the same for the limbs. This indicates that the skin is not the exclusive organ of muscular sensations. Further than this the muscular sensations have characteristics peculiar to themselves.

First, there seems to be a consciousness of the state of the motor apparatus as a whole, as capable or incapable of the movement in question. It is felt in the system as a disposition or indisposition for action. Considered as a state of readiness or the contrary, it may be called feeling of *motor potential*. It seems to be plain in the different consciousness we have of the power of the right and left arms respectively.

Fatigue is another general sensation classed here. It takes on a peculiar character according as the fatiguing movement is voluntary or mechanical; at least voluntary movement is more fatiguing than mechanical movements. No doubt in the case of voluntary movement more nervous energy is employed; and it seems equally clear that in the case of voluntary movement the higher nervous centers are more taxed. Mosso and Waller have shown that there is both nervous and muscular fatigue. Simple intellectual work exhausts the muscles as well as the brain.

Combined with touch, the muscular sense affords us knowledge of extension and force, and contributes important elements to our consciousness of self and the world. Sensations of contact, repeated on successive portions of the skin or by the same portion on different parts of the object, present data for the projection of a flat surface. It is by pressure added to these sensations that we come to apprehend depth. It is sufficient to remark this here. Spencer, speaking of the sensation of resistance as involving that of effort, says: "This sensation is at the bottom of our conception of the material universe, for extension is (as apprehended) only a combination of resistances; movement is the generalization of a certain order of resistances; and resistance is also the substance of force." For the general bearings of the muscular consciousness and its place in psychological theory, see **PSYCHOLOGY** and **WILL**.

Kinaesthetic sensations are sensations arising directly from the movements or positions of the members of the body as reported by the afferent or sensor nerves. See **SENSATIONS**.

Besides the particular and more or less clearly localized feelings (such as those due to passage through the air, stretching of the skin, etc.), there seems to be a sense of whereness or *massive locality* of the limb, as a whole, in reference to the body.

Kinaesthetic Sensations as Immediate or Remote.—The sensations of movement heretofore described have their stimuli in the organ itself which makes the movement. Such feelings are *immediate*. On the contrary, such movements may themselves serve to stimulate one or other of the special senses, giving a new class of sensations which report the movement. Such movement reporting sensations from other senses are *remote kinaesthetic*. For example, when I move my arm with my eyes shut and in the presence of noises which prevent my hearing the rustle of my clothing, etc., my sensations of movement are immediate. I now open my eyes and see the arm move and listen attentively and hear it; the optical and auditory sensations now added to my consciousness are remote kinaesthetic feelings. It is important to note that our feelings of movement are perhaps never free from these contributions from remote sources. They almost always enter in a complete statement of the case. See James, *Principles of Psychology* (New York, 1890, pp. 488 ff., vol. ii.).

The nervous arrangement which underlies this confluence of immediate and remote sensations is an illustration of the dynamic unity of the brain as a whole. The activity of one center stimulates the other directly, and both discharge into the motor course with which one is immediately and the other remotely connected, as is clearly illustrated by cases in which patients are unable to move their limbs as long as their eyes are closed, but can do so when they see their limbs. This means that the direct channel into the limb-center is blocked, but the indirect channel through the vis-

ual center is still open. (See **INNERVATION**.) On the other hand, instead of re-enforcing a discharge, a remote sensation or memory may inhibit it altogether, as where our sense of the great distance of a desired object obtained through the eyes leads us to give up altogether the effort to reach it.

Furthermore, what is true of sensations in general as regards their possible reproduction or memory is true of these states of the sensibility. From the nervous point of view, any form of stimulus which excites the kinaesthetic center or centers may bring up images of movement, and may, through these images, serve to start a brain process which issues in a series of real movements. What we may call the motor or stimulus value of these sensations is accordingly preserved in a weaker degree in the motor or stimulus value of their memories, both immediate and remote. For literary references, see **PSYCHOLOGY**. J. MARK BALDWIN.

Muscogeos: See **MUSKHOGEAN INDIANS**.

Mus'covite [named from *Muscovy*, the ancient name of Russia]: the most common species of mica, otherwise known as common or potash mica. Muscovite occurs crystallized in hexagonal prisms, belonging to the orthorhombic system; also in scales and plates, which are sometimes aggregated into stellate and plumose groups. It is remarkable for its eminent cleavage parallel to the base of the prism, the thin folia being separated easily by the thumb-nail. Its hardness on the cleavage planes is from 2 to 2.5, and its specific gravity from 2.75 to 3.1; its luster varies from pearly to metallic, and its color from white to gray, pale green, greenish yellow, and brown. It is remarkably elastic. In composition muscovite is a silicate of alumina, potash, and iron (silica, 43 to 50 per cent.; alumina, 31 to 39 per cent.; potash, 5 to 12 per cent.; ferric oxide, 1 to 8 per cent.). The name muscovite (or, as it was formerly called, Muscovy glass) is in allusion to its use in Russia as a substitute for glass in windows. In the U. S. it is largely used, under the misnomer of "isinglass," for the same purpose in stoves. It is one of the more abundant minerals, occurring in plutonic and metamorphic rocks, and also in broken flakes in many unaltered sandstones and clays, which are hence described as "micaceous." See **MICAS**.

Muscovy Duck: a South American duck (*Cairina moschata*) about 2 feet in length, and, in its wild state, of a black color with blue and green reflections. The species has been extensively domesticated, and its name is a perversion of musk-duck, applied to the bird on account of its peculiar odor. F. A. L.

Muses [plur. of *Muse*, viâ Fr. from Lat. *Mu'sa* = Gr. *Moûsa*, Muse, usually in plur. *Moûsai*, Muses]: in Greek mythology, the daughters of Zeus and Mnemosyne (Memory). They were fountain nymphs, who were worshiped in the groves and grottoes, and at the fountains of Olympus and Helicon, whose waters were thought to inspire song. From fountain nymphs they were exalted to the rank of goddesses of song, to whom poets prayed for inspiration. Later on they are the patrons of the different kinds of poetry and of the arts and sciences. So Calliope, she of the beautiful voice, is the muse of epic poetry; Clio, she who makes famous, the muse of history; Euterpe, she who makes glad, the muse of lyric poetry; Melpomene, she who sings, the muse of tragedy; Terpsichore, she who rejoices in the dance, the muse of the dance; Erato, the lovely one, the muse of erotic poetry; Polyhymnia, or Polymnia, the rich in hymns, the muse of sacred song; Urania, the heavenly one, the muse of astronomy; Thalia, the blooming one, the muse of comedy and idyllic poetry. In art Calliope is represented with a tablet and stylus in her hand, Clio with a scroll, Euterpe with a double flute, Melpomene with a tragic mask in her hand and a chaplet of ivy on her head, Terpsichore with a lyre and plectrum, Erato with a stringed instrument, Urania with a globe, and Thalia with a comic mask and shepherd's crook in her hands and a chaplet of ivy on her head. Polyhymnia has no distinguishing attributes, though she is easily recognized by her ample dress, and grave and thoughtful demeanor. Even after the Muses had become goddesses of song, it was not forgotten that they were originally fountain nymphs, and so their sanctuaries were situated at fountains. Fountains in which the Muses took especial delight were the Castalia, at the foot of Mt. Parnassus at Delphi, and the Aganippe and Hippocrene on Mt. Helicon. Epithets taken from the various seats of their cult were applied to them—e. g. Pierian, Castalian, and many others. Apollo was the leader of the Muses (*Musagetes*). By reason of their connection with dramatic poetry

they were especially near to Demysus, whose names and companions they were. J. R. S. STEWART

Museum [*—* Lat. = Gr. *Mouseion*, temple dedicated to the Muses, hence a place for study, literature, art, etc.; *literary, mental, or scientific*, pertaining to the Muses, goddess of Music, Muses]; an institution for the preservation of works of art, antiquities, and objects of natural history, and for their utilization in research, and in the culture and enlightenment of the people. Originally, museums were places sacred to the Muses, such as the groves of Parnassus and Helicon; later, temples in various parts of Greece were known by this name; and still later the meaning of the word changed, and it was applied to a place of study or a school. At Athens in the second century spoke of Athens as "the museum of Greece." The Museum of Alexandria, founded by the Ptolemies, B. C. 296, was a portion of the palace at Alexandria, which was set apart for the study of the sciences, and contained the great Alexandrian library; this was really a great university, the abiding-place of men of science and letters, who were divided into many companies or colleges, for the support of each of which a large revenue was allotted. After the burning of the Alexandrian Museum, the term museum, as applied to a great public institution, dropped out of use until the seventeenth century. The disappearance of the word is an indication of the fact that the idea for which it stood had also fallen into disfavor. It was not until the modern arts and sciences had been born, and a distinct literary and scientific class had been developed, that it was possible for the modern museum to come into existence, although there had always been collections of works of art and objects of natural history in many parts of the world.

The idea of a great national museum of science and art of the modern type was first outlined by Bacon in his *New Atlantis*, and the British Museum, founded in London in 1753, containing collections of books and manuscripts, as well as works of art and nature, was in some degree a realization of that plan. This institution is, at least to English-speaking people, the most important in the world bearing the name of museum, partly because of its magnificent library, and also from its unrivaled archaeological collections—Egyptian, Assyrian, Oriental, Greek, Roman—prehistoric and mediæval; its coins, its manuscripts, and its prints. The equally important natural history departments were removed in 1883 from Bloomsbury, where the parent institution still stands, to new quarters near the Art Museum in South Kensington, and placed under the control of a director, who is practically independent of the executive officer of the British Museum, its principal librarian. In modern usage the museum is always separated from the library.

Museums may be classified in two ways—(1) by the character of their contents, or (2) by the object for which they were founded. Under the first head they may be grouped as follows: (1) Museums of art; (2) historical museums; (3) anthropological museums; (4) natural history museums; (5) technological museums; (6) commercial museums. Under the second category they may be classed as (1) national museums, these being often in groups rather than combined in one; (2) local, provincial, or city museums; (3) college museums; (4) professional or class museums. The museum of art is the depository for the most precious material products of man's creative genius—paintings, sculptures, architecture (so far as it can be shown by models, drawings, and structural fragments), and specimens of the illustrative arts, such as engravings, and illustrations of the application of decorative uses. Perhaps the oldest museum of art, and one which is still among the most important, is that founded by Cosmo de' Medici in Florence at the beginning of the sixteenth century. It is preserved in the Uffizi Gallery, and is connected by a bridge across the Arno with a similar collection, of more recent origin but under the same administration, known as the Pitti Gallery, which is especially rich in paintings of the Italian schools.

Every city in Italy has its art museum. The Vatican Gallery in Rome is one of the most celebrated, including most important collections in painting and antique sculpture, besides numerous other departments; while the Capitoline Museum and the Lateran Museum contain treasures of the greatest importance. The Museo Borbonico at Naples is rich in similar collections, and includes also most important archaeological material from Herculaneum and Pompeii, from excavations of Etruscan cities and from Egypt. The Gallery of Bologna; the Academy of Fine Arts at Venice,

with its works by Titian, Tintoretto, and Veronese; the Brera and the Ambrosian Galleries in Milan; the museums of Turin, Modena, Padua, Ferrara, Brescia, and Perugia are remarkable, as well as that at Parma, particularly rich in the works of Correggio; and the Academy of Fine Arts at Siena, devoted to the work of the early Tuscan artists.

The art museums of France are next in importance to those of Italy. The Louvre, founded in 1793, is one of the richest in the world as regards not only painting and sculpture, but all other subjects which fall within the limits of a museum of art, and is supplemented by the Luxembourg Museum, containing the masterpieces of living artists, the Museum of the School of Fine Arts, and the Musée des Thermes, or Cluny Museum, devoted to the decorative arts of the Middle Ages. Every considerable city in France has its own collections, those of Lyons, Dijon, Bordeaux, and Toulouse being among the most important.

In Germany, those of Berlin—the Old Museum and the New Museum—those at Munich—the Pinakothek and the Glyptothek—and that of the Zwinger in Dresden, the resting-place of the Sistine Madonna, are the richest, while those of Cologne, Frankfurt-on-the-Main, Darmstadt, Ratisbon, Weimar, and Breslau also deserve special mention. In Austria-Hungary, the Belvedere Museum at Vienna is one of the highest rank; in Russia, the Hermitage Museum at St. Petersburg; in Spain, the Prado at Madrid; in Belgium, those of Antwerp and Brussels; and in Holland, those of Rotterdam and The Hague.

The National Gallery in London has an excellent collection of paintings of all schools. The South Kensington Museum, near London, is connected with the department of science and art, and is especially rich in material for instruction in all the arts of design; and there are collections in most of the cities of the United Kingdom.

In the U. S., the Museum of Fine Arts in Boston, the Metropolitan Museum of Art in New York, the Museum of Fine Arts in Cincinnati, the Corcoran Art Gallery in Washington, the Museum of Fine Arts in St. Louis, the Academy of Fine Arts in Philadelphia, the Art Institute of Chicago, and the Walters collection in Baltimore are the most important. The museums in the U. S., however, are far from rich in materials illustrating the earlier periods in the history of painting and sculpture.

The museums and galleries just enumerated should be regarded only as types. So many hundreds of important museums, public and private, exist, that it is impossible even to mention them by name. Besides these general collections, there are special museums devoted to the work of single masters, such as the Thorwaldsen Museum in Copenhagen, and the one at Brussels containing only the works of the eccentric painter Wiertz, the Donatello Museum in the Bargello at Florence, and the Michelangelo collections in its Academy of Fine Arts and in the Casa Buonarrotti.

Museums of history are intended to preserve objects associated with the events in the history of nations or races, or illustrating their condition at different periods in their national life. Every museum of art and every archaeological museum is also a museum of history, by reason of its wealth of portraits of historical personages, pictures of historical events, and the delineations of customs, costumes, architecture, and race characteristics. Historical museums are manifold in character, and of necessity local in interest. Some relate to the histories of provinces and cities. One of the oldest and best of these is the Märkisch Provinzial Museum in Berlin. Conspicuous among these also are the Museum of the City of Paris in the Hôtel Carnavalet, and the museums of the cities of Brussels and Antwerp. Some historical museums relate to a dynasty, as the Museum of the Hohenzollerns in Berlin. The cathedrals of Southern Europe and St. Paul's in London are in some degree national or civic museums. There are special museums, either devoted to single men—like the Galileo and the Dante and Buonarrotti Museums in Florence, or the Goethe Museum in Weimar and the Beethoven Museum at Bonn; to the great men of the nation, as the National Portrait Gallery of Great Britain, the German Valhalla at Ratisbon, and so forth; or to great men of a special profession, such as the Gallery of Artists in the Pitti Museum of Florence, consisting of portraits of all the great artists of the world, painted by themselves. In this class would come also collections of autographs

historical museums should also be mentioned those representing the earliest history of a race or country, such as the

magnificent Musée Gallo-Romain at St.-Germain, near Paris, devoted to the history of France up to the end of the Roman occupation; the Romano-German Museum at Mentz, and the Etruscan Museums at Florence, Bologna, and elsewhere in Italy; the Ghizeh Museum near Cairo, Egypt (formerly the Boulak Museum); the museums at Constantinople, the Acropolis Museum at Athens, and many others. Such institutions as the Bavarian National Museum at Nuremberg and the National Museum in Munich have to do with the later periods of national history, and there are throughout Europe numerous collections of armor, furniture, costumes, and architectural and other objects, illustrating the life and arts of the Middle Ages and the later periods, which are even more significant from the standpoint of the historian than from that of the artist. Important among these is the Royal Irish Academy at Dublin.

Museums of anthropology and ethnology include such objects as illustrate the natural history of man, his classification into races and tribes, his geographical distribution, past and present; the origin, history, and methods of his arts, industries, customs, and languages, particularly among primitive and semi-civilized peoples. Museums of anthropology and history meet on common ground in the field of archaeology. In practice, historic archaeology is usually assigned to the latter and prehistoric archaeology to the former, since prehistoric material may be studied to the best advantage by the use of the natural history methods which have been adopted by anthropologists, but not as yet by students of history. Ethnographic museums were proposed by the French geographer Jomard, and the idea was first carried into effect about 1840 in the establishment of the Danish Ethnographical Museum. In Germany the best are in Berlin, Dresden, Munich, and Leipzig. Austria has in Vienna two for ethnography, the Court and the Oriental Museums. Holland has the National Ethnographic Museum in Leyden, and smaller collections in Amsterdam, Rotterdam, and at The Hague. France has the Trocadéro; Italy the important prehistoric and ethnographic museums in Rome and Florence. The Philippine collections in the Museo de Ultramar in Madrid and the Hawaiian collections in the Bernice Pauahi Bishop Museum at Honolulu are important. In England less attention has been given to this subject than elsewhere in Europe, the Christy collection in the British Museum being the only important one specially devoted to ethnography, except the Blackmore Museum at Salisbury. In the U. S. the principal establishments arranged on the ethnographic plan are the Peabody Museum of Archaeology in Cambridge, and the collections in the Peabody Academy of Sciences at Salem and the American Museum of Natural History in New York. The vast ethnological collections in the National Museum in Washington are classified on a double system, in one of its features corresponding to that of the European, in the other, like the famous Pitt Rivers collection at Oxford, arranged to show the evolution of culture and civilization without regard to race. This broader plan admits much material excluded by the advocates of ethnographic museums, who devote their attention almost exclusively to the primitive or non-European peoples.

In close relation to the ethnographic museums are those which are devoted to some special field of general thought and interest. Most remarkable among these is the Musée Guimet, founded in Lyons in 1878 and removed to Paris in 1886, which is intended to illustrate the history of religious ceremonials among all races of men, a field also occupied by one department of the National Museum in Washington. Other good examples of this class are some of those in Paris, such as the Musée de Marine, which shows not only the development of the naval and merchant marine of the country, but also, by trophies and other historical souvenirs, the history of the naval battles of the nation. The Musée d'Artillerie does for war, but less thoroughly, what the Marine Museum does in its own department, and there are similar museums in other countries. Of musical museums, perhaps the most important is the Musée Instrumental, founded by Clapisson, attached to the Conservatory of Music in Paris, that in Brussels, and that in the National Museum in Washington. There is a magnificent collection of musical instruments at South Kensington, but its contents are selected with reference to their suggestiveness in decorative art. There is a Theatrical Museum at the Académie Française in Paris, a Museum of Journalism at Antwerp, and Museums of Pedagogy in Paris and St. Petersburg. These are professional rather than scientific or educational, as are perhaps also

the Museum of Practical Fish-culture at South Kensington and the Museums of Hygiene in London and Washington. The Psychological Museum founded by Mantegazza in Florence in 1886 is the only one of its kind.

The value of archaeological collections, both historic and prehistoric, has long been understood. The museums of London, Paris, Berlin, Copenhagen, and Rome need no comment. In the Peabody Museum in Cambridge, the Metropolitan Museum in New York, and the National Museum in Washington are immense collections of the remains of man in America in the pre-Columbian period, collections which are yearly growing in significance as they are made the subject of investigation, and there is an immense amount of material of this kind in the hands of other institutions and of private collectors in the U. S.

Museums of natural history contain those objects which illustrate the phenomena of nature in animals, minerals, and plants, and whatever illustrates their origin, growth, functions, structure, and geographical distribution, in the present and in the past. Museums of natural history and anthropology meet on common ground in man. In practice the former usually illustrates the relations of man to other animals; the latter, man in his relations to other men. Every great nation has its museum of nature. Probably the natural history department of the British Museum is the most extensive, with its three great divisions—zoölogical, botanical, and geological. The Musée d'Histoire Naturelle, in the Garden of Plants in Paris, founded in 1795, with its galleries of anatomy, anthropology, zoölogy, botany, mineralogy, and geology, is one of the most extensive, but far less potent in science now than in the days of Cuvier. In Washington there is the National Museum, with its great anthropological, zoölogical, botanical, mineralogical, and geological collections, administered under one organization, together with a large additional department of arts and industries or technology. The American Museum of Natural History in New York, the Museum of the Academy of Natural Sciences in Philadelphia, the Boston Society of Natural History, the California Academy of Sciences, the Peabody Museum of Yale College, the E. M. Museum of Princeton University, the Museum of Archaeology and Palæontology of the University of Pennsylvania, and the Milwaukee Public Museum are also important.

Passing to specialized natural history collections, perhaps the most noteworthy are those devoted to zoölogy, and chief among them is that at Harvard University, known as the Museum of Comparative Zoölogy, which was founded by Agassiz "to illustrate the history of creation as far as the present state of knowledge reveals that history," and was in 1887 pronounced by the English naturalist Alfred Russel Wallace "to be far in advance of similar institutions in Europe as an educational institution, whether as regards the general public, the private student, or the specialist." Next to Cambridge, after the zoölogical sections of the museums of London and Paris, stand the collections in the Imperial Cabinet in Vienna, and those of the zoölogical museums in Berlin, Leyden, Copenhagen, and Christiania, and the museums of Brussels, Florence, and La Plata, so rich in palæontological materials. The university museums at Oxford and Cambridge and the Liverpool museums are also noteworthy.

Among botanical museums, that in the Royal Gardens at Kew, near London, is pre-eminent, with its colossal herbarium containing the finest collection in the world, and its special museum of economic botany, founded in 1847, both standing in the midst of a collection of living plants. There is also in Berlin the Royal Botanical Museum, founded in 1818 as the Royal Herbarium; in St. Petersburg, the Herbaria of the Imperial Botanical Garden. The Natural Herbarium in Washington is the property of the Smithsonian Institute and of the Department of Agriculture.

Among the geological and mineralogical collections the mineral cabinet in Vienna, arranged in the imperial castle, is among the first. The Museum of Practical Geology in London, which is attached to the Geological Survey of the United Kingdom, was founded in 1837 to exhibit the collections of the survey, in order to show the applications of geology to the useful purposes of life. The department of economic geology in the Field Columbian Museum in Chicago, an outgrowth of the department of mines in the exhibition of 1893, is one of its most striking features.

Of museums of anatomy there are thirty of considerable magnitude, all of which have grown up in connection with schools of medicine and surgery, except the magnificent

Army Medical Museum in Washington. The Medical Museum of the Royal College of Surgeons in London is probably first in importance.

Museums of technology, or industrial museums, are devoted to the industrial arts and to manufactures, and exhibit (1) materials and their uses; (2) tools and machinery; (3) methods and processes; (4) products and by-products. In this group would be included museums of agriculture, such as that of the U. S. Department of Agriculture in Washington; of mining, such as the Museum of Practical Geology in London, in part, and the Museum of the School of Mines in Paris; and of fisheries, such as the Museum of Practical Fish-culture in South Kensington, and the fisheries section of the National Museum in Washington, which formed so important a feature of the International Fisheries Exhibition in Berlin in 1880 and in London in 1883; museums of textiles, such as the museums of tapestries in Florence, that in the Escorial in Spain, and that at the Gobelins establishment near Paris; of the ceramic industries, such as the Sèvres Museum in Paris, and indeed such collections are usually included in museums of decorative art, one of which may be found in every great city; museums of transportation, by far the most important of which is the Railway Museum now (1894) being formed in connection with the Field Columbian Museum in Chicago, which has also important collections in other technological fields. A collection of waste products and undeveloped substances usually forms a part of the technological museums; and there are special museums of animal products, such as that at the Bethnal Green Museum in London, and of vegetable products, such as the Museum of Economic Botany at Kew, near London.

Commercial museums exhibit salable articles of all kinds, with illustrations of markets, means of commercial distribution, prices, and commercial demand and supply. One of the best of these is the Musée de Melle at Ghent. Commercial museums are especially useful in great centers of manufacture and trade, especially when coupled with an efficient service of foreign correspondents. Such museums may be properly connected with a technological museum, although its methods are likely to be more akin to the exhibition, exposition, or fair, involving a frequent renewal of exhibits in connection with commercial changes, and also certain features of competition and advertising display on the part of private exhibitors.

The principal types of museums have been referred to in connection with a classification based on their contents. It is therefore unnecessary to review them under the second form of classification proposed at the beginning of this article. It should be said, however, that every great national capital has a single museum, or a group of them, supported by the national government, and intimately connected with national educational enterprises.

In Italy, while there are national museums in Rome and Florence, the whole country is under the control of a Government commission charged with the preservation of the treasures of history and art. The treasures of every church and monastery are under public control, and many of these and other public edifices have been declared public monuments. The tract in which the Forum at Rome is situated has been constituted an outdoor museum, under the name of the Passaggiata Archeologica.

In the U. S. the National Museum at Washington, established as a part of the Smithsonian Institute in 1846, is charged with the care of all the collections of the Government. There are also, however, the Army Medical Museum, the Naval Museum of Hygiene, and the Corcoran Gallery of Art, the latter under the control of a private corporation.

The modern museum is the latest of the great agencies which have been developed for the increase and diffusion of knowledge, and in this capacity it stands by the side of the university, the learned society, and the public library. The museum is even more closely in touch with the masses than the university or the learned society, and quite as much so as the public library, while, even more than the library, it is a most important educational agency. It is maintained by many that the degree of civilization to which any nation, city, or province, has attained is best shown by the character of its public museums and the liberality with which they are maintained. — GEORGE BROWN GOODE.

Mushroom poisoning. See TOADSTOOLS.

Mushrooms (Fungi, Basidiomycetes, Agaricales, and Boletales) from O. Fr. *manuscript*. — Fr. *manuscript*. — L. *manuscript*.

popular name of edible Fungi of the order *Hymenomycetes*, especially species of the genus *Agaricus*. (See Food.) In the U. S. the name toadstool is applied to nearly every kind of parasol-shaped mushroom, the common belief being that they are poisonous.

The commonest edible *Agaricus* is *A. campestris* (see Fig. 1), (see FIGURE), growing almost everywhere. It is the famous *champignon* of the French, *pratiola* of the Italians, and was known to the ancients by upward of a score of synonyms. The fleshy pileus is white in the young state, becoming of a yellowish brown when mature. It usually grows in clusters and never attains a great size. The ring is present and conspicuous. Though subject to many variations, it is easily recognized by its fleshy pileus, solid stipe, and pink-colored gills, often becoming purple with age. It is the most generally eaten of esculent fungi. This mushroom is used to a great extent as an article of food in France, and especially in Paris, around which it is largely cultivated; old deserted mining-caves have been appropriated for the purpose, and many miles of mushroom-beds are reached by the aid of ladders and lanterns. It is usually found in the wild state scattered over a rich meadow or pasture in early morning after a warm shower in the night. The mushroom is only one of over 1,000 well-defined species of the genus *Agaricus*, at least one-fourth of which are not only harmless, but well worthy the time and care of the market-gardener. Closely related to *A. campestris* is *A. arvensis*, popularly called "meadow-mushroom," from its place of growth. It is larger than *A. campestris*, stronger in flavor, and less esteemed. From its size and coarseness it has in England received the name of "horse-mushroom." Specimens are mentioned weighing 14 lb. The "nail fungus," *A. esculentus*, is the smallest species used for food. The pileus does not exceed an inch in diameter, and is flat and clay colored. It is found in fir woods, and is used largely in Vienna as a flavor for sauces under the name of *Nagelschwamm*. One of the most poisonous species of the genus is the "fly agaric," *A. muscarius*, so named because the fungus is often steeped and the solution used for the destruction of the house-fly. The pileus is raised upon a long stipe, reaching a diameter of 4 to 6 inches, having its bright red surface studded with large white protuberances. Very closely allied to the fly agaric is *A. caesareus*, though not poisonous and very excellent for food. It can always be distinguished by its yellow gills, while *A. muscarius* has them of a pure dead white. The genus *Coprinus* differs from *Agaricus* mainly in the deliquescent character of the gills. *C. comatus* is the leading esculent species, and commands attention by its singular and graceful form. The whole surface is delicate and silky, the cap tinged with brown at the top and grayish at the base, soon becoming covered with scales. The gills are very close together, and pass in color from pink to brown. These plants should always be gathered before they begin to deliquesce. In the genus *Cortinarius* the veil is composed of arachnoid threads and the spores are rusty. The edible species are few in number. In *Hygrophorus* the main feature is the waxy character of the hymenium. There are three species of culinary importance, the best being the small pure white *H. virgineus*. It is common, and, like the brown *H. pratensis*, is found in open pastures. The members of the genus *Lactarius* are distinguished by the milky juice which exudes from them when bruised. *L. deliciosus* has the orange-colored pileus marked with zones of a darker color. The milk is at first yellow, soon turning green. This species deserves its name *deliciosus*, and is sought for and highly prized by all lovers of edible Fungi. *Russula emetica*, as its name would indicate, acts as an emetic to most persons, though a few can eat it with impunity. It may be distinguished by its rosy pileus, brittle gills, and white stipe dotted with red spots. The genus *Cantharellus* has thick branched gills, with edges blunt and roundish. *C. cibarius* is the beautiful little yellow chanterelle so highly esteemed by the French. It is easily distinguished by its bright golden-yellow color, and odor much resembling ripe apricots. In *Marasmius* the species are characterized by having a dry hymenium, folds thick and tough and acute at the edge. The species are generally quite small. *M. oroides*, from its peculiarity of growing in circles, and the early superstitious belief that these rings had some connection with elfs and goblins, has long been known as the "fairy-ring fungus." The genus *Psathyra* is distinguished by the

plants, the result of the exhaustion of the nourishment directly beneath. It is a very small and common species, and has gained a good reputation among mushroom-eaters as furnishing a delicate dish.

In the second family of the *Hymenomycetæ*, *Polyporaceæ*, the gills of the *Agaricacæ* are replaced by pores or tubes. The genus *Boletus* has the pores easily separated, and furnishes a number of esculent species, of which *B. edulis* is the most important. The pileus is smooth and brown, with the tubes at first yellow, becoming green by age. The reticulation of the stem is one of the leading characteristics of the species. It is an inhabitant of the woods. Some prefer to this the *B. aestivalis*, which is an early summer species. *B. luridus* is sometimes eaten without harm, but should not rank among esculent species. It has a pileus 3 to 6 inches broad, and varying in color from a brick-red to brown. The flesh is at first yellow, changing to blue. In the genus *Polyporus* the pores are not easily separated, and many of them are without stems. A few species are of worth as articles of diet. *P. giganteus* and *P. intybaceus* are of very large size, a single specimen sometimes weighing 40 lb. They both, like many other species of the genus, grow upon the trunks of trees. In gathering them for food it is best to select the younger specimens, and use only the inner portion. *P. fomentarius* is touch-wood or "punk," and grows to a great extent on the trunks of dead and decaying trees. The property of its being luminous in the dark has long been known. Amadou or German tinder is a commercial product from this and several other species of *Polyporus*. It consists of slices of the plant beaten out in thin strips and saturated with a solution of nitrate of potash. It is used as a rapid and easy means of starting a fire. The last genus of *Polyporaceæ* is *Fistulina*, characterized by having the hymenium inferior and a papillated surface when young, which changes into tubes bearing the spores. *F. hepatica*, so named from its resemblance to the liver, is fleshy and juicy, and very appropriately bears the common name of beefsteak fungus. It assumes a great variety of forms, from that of a strawberry to that of a tongue. When cut it resembles a beet-root. It grows upon trunks of trees throughout the summer, and is eagerly sought for.

The third family of the *Hymenomycetæ* is termed *Hydnaceæ*, in which the leading characteristic is the numerous projecting spines or teeth, over the surface of which the hymenium is spread. The most common edible species is *Hydnum repandum*, found in woods and shady places. The pileus is fleshy, regular, and red, lobed, or undulated, spines pale-yellow, stem 2 inches long. When raw it has a peppery taste and the odor of horseradish. Less common, *H. coraloides* in its young state much resembles a cauliflower, because of its peculiar branching. It is a tree-inhabiting plant, and is esculent. *H. caput-medusæ*, as its name would suggest, has the branching top of the one just mentioned. Among others used for food are *H. subsquamosum* and *H. rufescens*. The members of the family *Clavariaceæ* are easily recognized by being club-shaped, fleshy, and branching. Among these are found a number of edible species. The most beautiful colored species is *Clavaria amethystina*. It is of a fine violet color, and is seldom found in large quantities. Dr. Curtis enumerates thirteen species of *Clavaria* eaten in Carolina, but they are generally little known. In the family *Tremellaceæ*, or the gelatinous Fungi, only one species has received much attention as an article of food—viz., the curious "Jew's ear," *Hirneola auriculajudæ*. It gets its name from its strong resemblance to the human ear. This species is collected in large quantities in Tahiti and shipped in a dried state to China, where it is used for soap.

There are no simple rules that may be taken as infallible guides for distinguishing esculent from poisonous species. The following rules are only of a general character, having some exceptions: (1) *Avoid bright colors* (this would throw out the highly prized chanterelle of the French and several other species); (2) *avoid those that change color when cut or broken*; (3) *avoid those with a milky juice* (*Lactarius deliciosus* has a milky juice, and is still delicious); (4) *those that deliquesce should be avoided*—the *Coprinus comatus* is a grand exception to this rule. The safest of all rules is, never to use a fungus about which there is any doubt; this will require a thorough acquaintance with at least a few of the edible species, which will take no more time than to become familiar with the same number of shrubs or trees. Care should also be exercised to gather only the fresh plants, and they should not be allowed to remain a long

time before being eaten. Climate and the seasons seem to exert an influence over fungi as regards their edible qualities. A much larger per cent. of the spring species are edible than those of autumn.

Most fungi require for their best development a moist atmosphere, with the exclusion of bright sunlight. The common and most successful method of cultivating the mushroom and edible toadstools is to mix fresh horse-dung with loam in such proportions as to prevent too violent fermentation, when it is put in long narrow beds of a foot or 18 inches in height in the center, into which the mycelium or spawn is placed, and the whole coated over with a layer of loam. These beds are usually protected from the light and drying influences of the sun by low sheds, having the roofs thatched to prevent too rapid evaporation of moisture. A covering of hay or straw is often placed directly upon the beds.

BIBLIOGRAPHY.—For extended information, the reader may consult Robinson, *On Mushroom-culture* (London, 1870); Cuthill, *On the Culture of the Mushroom* (1861); Krombholz, *Abbildungen und Beschreibungen der Schwämme* (Prague, 1831); C. H. Persoon, *Traité sur les Champignons comestibles* (Paris, 1818); F. S. Cordier, *Hist. et Descr. des Champignons alimentaires et venéneux* (Paris, 1836); Dr. Badham, *Treatise on the Esculent Fungus of England* (London, 1863); M. C. Cooke, *British Edible Fungi* (1891); Mrs. T. J. Hussey, *Illustrations of British Mycology* (London, 1855); J. J. Paulet, *Iconographie des Champignons* (Paris, 1855). See also the articles FUNGI, MOREL, and VEGETABLE KINGDOM.

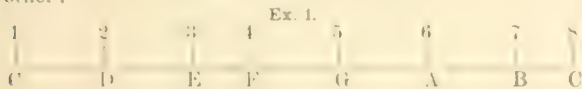
WILLIAM G. FARLOW.

Revised by CHARLES E. BESSEY.

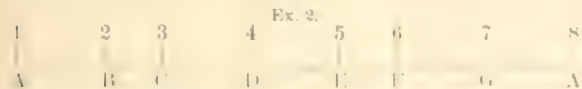
Music [viâ O. Fr. from Lat. *mûsica* = Gr. *μουσική* (sc. *τέχνη*), any art over which the Muses presided, especially lyric poetry set to music, lit. fem. of *μουσικός*, pertaining to the Muses, deriv. of *Μοῖσαι*, Muses]: a succession of combination of sounds arranged with such connection and mutual relation as to express to the ear some distinct form or train of thought, and awaken certain corresponding emotions. Sounds when thus regulated affect the mind through the ear, as painting and sculpture under similar conditions affect it through the eye. The latter, however, deal with tangible objects, or with ideas formed from material types and their attributes, while the agency of music is limited to certain relations existing between sounds, variously ordered and combined, and the inward springs of emotion. In all time past, and even among the rudest tribes and nations, we find traces of effort to make both the eye and the ear subservient to the stirring up of pleasurable or other feelings. (See ETHNOLOGY.) To some such impulse it is most natural to refer not only the production of the rough drawings, chiselings, and carvings often found among tribes and nations of barbarians, but also the varied and persevering attempts of the same untutored races to find gratification for the ear amid the din and clang of their imperfect musical instruments. The results in both cases could not be otherwise than strange in their conception and often marvelous in their ugliness. From this state of primitive rudeness the progress of the finer arts to higher stages of cultivation was not equally rapid. All historical records, and the still existing monuments and relics of antiquity, bear evidence that architecture, painting, and sculpture gradually rose to perfection, while music still remained a subject of dark and confused speculation. For long ages, and even through the most brilliant periods of ancient civilization and intellectual splendor, it was the fate of music to be an enigma defying all solution; and we read of no master-minds springing up to reveal its long-hidden beauties or to discover and systematize its real principles till near the close of the Middle Ages. The music of the present day, both as a science and an art, is therefore a growth of the last three or four centuries; and (with a rapidity equaled only by the rise and advance of Gothic architecture) it has already reached so high a stage of development as seemingly to leave little room for further discovery, either in its scientific or practical and mechanical departments.

In the present article it is purposed to give in a simple manner a general view or outline of the musical system as now ordinarily understood and received; and as it is presumed that the reader already possesses some elementary knowledge of music, it will be the less necessary to enter into details on NOTATION, SCALE, MODE, and other preliminary matters, concerning which full information will be found under their respective heads in the present work.

Sounds may conveniently be regarded as either musical or unmusical. This distinction is a perspective of their several qualities as loud or soft, harsh or smooth, &c.; but certain sounds which are essentially musical may nevertheless be painful to the ear, while, on the contrary, others which are strictly unmusical may have no such unpleasant effect. The radical peculiarity or mark of a musical sound is that it possesses a definite *pitch* or intonation, *pitch* of acuteness, arising from the number, capacity, and permeability of the vibrations given forth by the body from which the sound proceeds. The pitch (i. e. the degree of acuteness or gravity) of any such sound is dependent on the rapidity of the vibrations excited by the sonorous body. It is estimated that a string or the column of air in a pipe giving the sound represented by C C C C will make 32 vibrations in a second of time; for the octave above—viz., C C C—the vibrations will be 64, or double the original number; for C C the vibrations are quadrupled in rapidity, being 128 in a second; and so on for the still higher octaves. These various octave sounds differ from each other only in their relative acuteness, just as the letters A, A, A differ only in point of size. The intermediate sounds passed over in rising from one C to another have also their proportionate rates of vibration; and when theoretically considered such intermediate sounds may be almost infinite in number; but for practical purposes the system of music is founded on a select number of these possible musical sounds, forming a scale or series; and it is found, both by experiment and by a certain demand of the human ear, that the degrees or intervals thus selected must follow each other in a certain order, number, and inequality of distance to fit them for musical use. These intervals, counting upward from a root or starting-point, are known as the second, third, fourth, fifth, sixth, and seventh, and they are commonly ascertained by dividing a sounding string into one-half, one-third, one-fourth, etc., of its length, thus gaining all the sounds necessary for the filling up of the octave. (In the article *MONOCHORD* this process is described.) The notes or sounds thus obtained are named after the first seven letters of the alphabet, the letters being repeated for each successive octave. In Ex. 1 an octave of this scale (called the *diatonic scale*) is represented according to the order in which the large and small intervals stand to each other:



Here it will be seen that in the compass of the octave there are five *whole* degrees or "tones," and two *half* degrees or "semitones," and that in a series beginning on C these two semitones fall between the third and fourth and the seventh and eighth degrees. It will also be noticed that in the space from the first to the third degree two whole tones are comprised, making a "major" or greater third. All music written on a scale thus constructed is said to be in the *major mode*; and no similar scale can be formed from the notes in their common order by beginning elsewhere than on C, except by modifying them by means of flats or sharps. This modification is for the purpose of rendering their tonal succession ever similar, thus complying with the law which demands a semitone (or half step) only between the third and fourth and seventh and eighth degrees, in case of the major scale from whatever degree the scale may begin. Another series of notes equally well fitted for the expression of musical ideas may be obtained by beginning on A instead of C. In this the positions of the tones and semitones are widely different, as shown in Ex. 2:

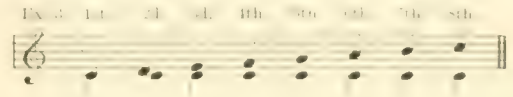


Here the semitones are from the second to the third and from the fifth to the sixth. This kind of scale constitutes the *minor mode*, and in the natural order of the notes it can begin only on A. The minor mode is less perfect than the major, as the whole tone between the seventh and eighth in the *ascending* scale is unsatisfactory to the ear, and needs to be raised one semitone higher; but in doing this it sometimes becomes necessary to elevate the sixth also. This scale also serves as a standard formula, and modified by the same means (sharps and flats) determines the

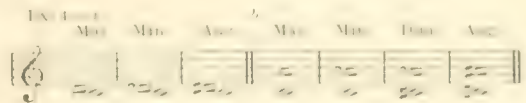
order of tones and semitones attached to each mode for all *minor* scales. This subject of the modes, with special reference to these peculiarities of the minor, is illustrated in the article *MODE*.

Thus far we have noticed only the *diatonic* scale, which consists of a mixture of tones and semitones in the order described; but as each whole tone in this scale admits of division into two semitones, we obtain by such a division another form of scale (called the *chromatic*), consisting of a complete series of twelve semitonic intervals in the compass of the octave. The chromatic scale may be variously written, either by the use of flats or sharps. These two scales (the diatonic and chromatic) furnish all the material from which modern music is constructed. However varied, discursive, or even capricious a composition may be, either in melody or harmony, all its tonal degrees are derived from the simple elements of one or other of these scales. It remains here to be noted that before the rise of the modern system of music several other "modes," different from the major and minor, were in common use. The ancient Greeks recognized three genera of scales and intervals—viz., the diatonic, the chromatic, and the enharmonic, the last consisting of quarter tones. Of these genera, however, the diatonic alone appears to have formed the basis of all the music in actual use, or which was capable of being conceived and performed with any approach to accuracy of intonation. For a more extended view of the formation and characteristics of the ancient scales, the reader is referred to the article *MODI—Ecclesiastical Modes*.

The term "interval" is used to denote the distance of one sound or note from another as reckoned by the degrees of the diatonic scale. Counting upward from any given degree, the intervals and their names are as represented in Ex. 3:



Simple intervals are those which lie within the compass of one octave, as those in the example. *Compound* intervals are those which reach beyond the limits of an octave, as the ninth, tenth, eleventh, etc. On the diatonic-chromatic scale the interval of a semitone admits of the distinction of major or diatonic, and minor or chromatic. The *major* semitone is that which involves two different degrees of the scale, as B, C or E, F; but the *minor* semitone has both of its terms on the same degree, as C, C \sharp , or B, B \flat . Each of the other intervals may be various in the number of tones and semitones comprised in it. Thus a second may be either major, minor, or augmented, and a sixth may be similarly varied, and also diminished, though the notes representing them remain on the same degrees. These differences are created by the elevation or depression of the terms of those intervals by the occurrence of sharps or flats. In illustration of this see at *a* in Ex. 4 the major, minor, and augmented second; and at *b*, the major, minor, diminished, and augmented sixth:

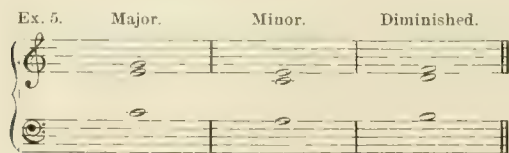


On examining the *contents* of these several intervals it will be found that the *minor* is one semitone less than the major, the *diminished* one semitone less than the minor, and the *augmented* one semitone greater than the major; in other words, the major sixth contains nine semitones, the minor contains eight, the diminished only seven, and the augmented ten. Though all the intervals may thus be subject to modification, and may be viewed in several aspects, yet the unison, octave, fifth (and the fourth as the inversion or complement of the fifth) are those alone which are called "perfect," because they are producible on the scale in only one form, as C C, D D, E E, F F, G G, A A, B B. The exception is the imperfect fifth, B—F, which, however, is treated as perfect in the progressions of the *minor* scale, as will be seen hereafter. In the article *INTERVAL* (q. v.), at Ex. 3, all the intervals of the octave (including also the ninth, as now in use, with their several names, are given in their proper order and relations.

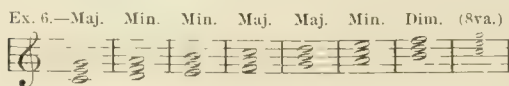
Certain names are also given to the intervals within the

octave, to indicate their relations to the root, prime, or keynote. Thus the keynote itself is called the *tonic*; the fifth above is the *dominant*; and the third midway between these is the *mediant*. Similarly, the fifth below the tonic is the *subdominant*, and the third between it and the tonic is the *submediant*; the note immediately above the tonic is called the *super-tonic*, and the interval directly below the tonic is the *sub-tonic* or *leading note*. Intervals are also classified as consonant and dissonant, fundamental and inverted, etc.; these distinctions will also be found explained in the article INTERVAL.

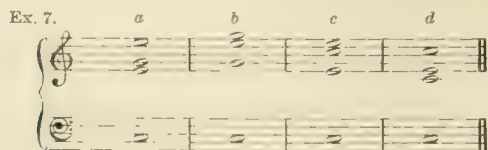
The intervals just enumerated are the elements of all musical compositions. When arranged in a continuous series of single sounds, selected and properly linked together, the composition so made is called a *melody*, and the union of two or more melodies in simultaneous utterance is called *harmony*. The subject of MELODY the reader will find already discussed in this work under its appropriate head, and attention will now be given to that far more intricate and extensive branch of the science which relates to *harmony*. The great primal maxim which forms the basis of the modern structure of harmony is thus expressed by an able writer of the German school: "All musical harmony arises from two chords, called the *fundamental concord* and the *fundamental discord*, and from the different uses that can be made of them by *inversion*, *suspension*, *anticipation*, and *transition*. All musical harmony, even the most complicated, if only regular, is reducible to the said two chords, the fundamental note of which is called the *fundamental bass*." These two chords are the *triad* and the *chord of the seventh*, of each of which there are several varieties. Any of these chords may be used in a complete or an incomplete form; i. e. with *all* their terms or intervals expressed, or with one or more omitted. The *triad*, which we are now to consider, is the first and simplest of the two fundamental chords. It consists of a bass, with its third and fifth, and may be major, minor, or diminished; the first having a major third, the second a minor third, and the last a minor third with a diminished fifth. These three triads are shown in Ex. 5:



A triad may be built on each of the natural degrees of the scale; and on experiment it will be seen that three of these triads are major, three are minor, and the remaining one is the diminished triad. See Ex. 6.

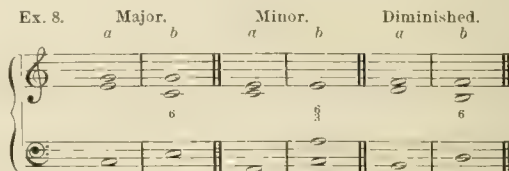


In this normal or original form of the triad the lowest note or term is the root or "fundamental bass"; and so long as this lowest term remains unchanged it is a matter of indifference whether the other terms (the third and fifth) stand in close or dispersed relation to it. One or more of the intervals of a triad may also be *doubled* (either on the unison or the octave), or in certain cases one of the terms may be omitted. Thus, in Ex. 7, the octave of the root is omitted and the third doubled; at *b* the octave is omitted and the fifth doubled; at *c* the fifth is omitted and the third doubled; and at *d* the fifth is omitted and the octave doubled:

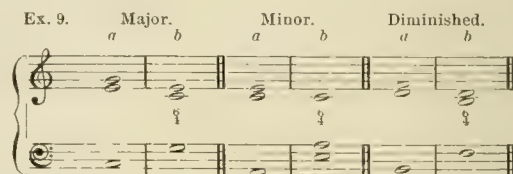


It is not to be understood that in composition all these forms are equally good; and they are here adduced merely to show what changes may take place among the *upper* intervals of the triad while the fundamental bass remains the same. When the root or fundamental bass is no longer the *lowest* term of a chord, but one of the higher terms is substituted for it, the chord is said to be *inverted*; and there

can be as many inversions of a chord as there are intervals to change places with the bass. As a triad consists of two such intervals besides the root—viz., a third and a fifth—it follows that it is capable of two inversions. (See INVERSION.) The first inversion of the major, minor, and diminished triads (in which the original third becomes the bass) may be seen at *b, b, b* in Ex. 8, with their respective fundamental forms prefixed at *a, a, a*:



As the triad originally consisted of a bass, third, and fifth, it assumes in this inversion the form of a bass, third, and sixth. Hence it is represented by the figures $\frac{3}{6}$ or 6. In the second inversion, the original fifth becomes the bass, while the former third makes the interval of a sixth, and the octave of the fundamental stands between them as a fourth, as in Ex. 9, at *b, b, b*:



The triad thus inverted is indicated by the figures $\frac{4}{6}$. Inversions are not to be confounded, as we have said, with mere "changes of position" among the *upper* parts of a chord. These changes, however various, do not affect the real nature and quality of a chord, or its standing in relation to its fundamental bass; but an *inversion* involves a radical change of that relation, and is productive of new and often far richer effects than those ordinarily attending the uninverted chord. Hence the large number of inverted chords in all compositions which rise above the rank of the simple choral or the plain ecclesiastical chant. Inverted triads have also a property—somewhat analogous to that of the chord of the seventh—of suggesting to the mind an idea of *progress* or continuance; and this oftentimes with such definiteness as to lead the hearer to anticipate, in a measure, the course of the ensuing progression, and to keep his thoughts in a sort of protracted suspense till the harmony brings the ear into repose on some expected turn or cadence. Impressions of this kind are not usually excited by triads in their original form, as each *such* triad has in itself a certain element of finality or conclusiveness, which either disappears or is not sensibly felt when the chord is inverted.

Besides the three *fundamental* triads, there are several others. Among these is the *augmented* triad, which has a major third and an augmented fifth. In modern works the augmented fifth is also frequently found in conjunction with the *minor* third. This augmentation is effected by an accidental sharp or its equivalent; and therefore, as *this* term of the chord is foreign to the diatonic scale, the real origin and nature of the augmented triad admit of a ready explanation as a passing note of greater or lesser duration. See Ex. 10, at *a, b, c, d*.



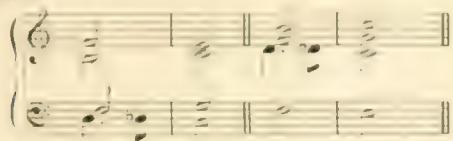
In this triad the elevated fifth becomes a "leading note" to the succeeding chord, and therefore always *ascends*, as in the example. See NOTE.

The same explanation will apply to the contrary process of depressing or flattening the third of the triad, as in Ex. 11.

From this review of the triad we now proceed to the *chord of the seventh*. This is formed by adding a third to

the triad, thus making it a chord of four parts or terms—viz., a bass, third, fifth, and seventh. As each degree of the

Ex. 11



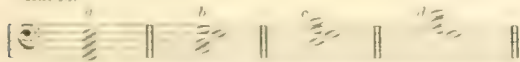
diatonic scale may be the basis of a triad (see Ex. 6), so by the addition of a third to each triad we obtain an equal number of chords of the seventh, as will appear from Ex. 12.

Ex. 12



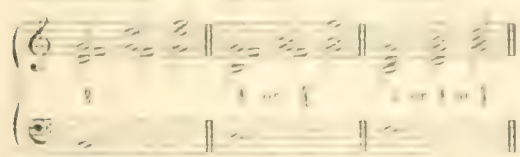
As all these are composed of major and minor thirds variously combined—several of them also being identical in structure—we may classify them thus: (1) That with a major triad and minor seventh—viz., G; (2) those with a minor triad and minor seventh—viz., D, E, and A; (3) that with a diminished triad and minor seventh—viz., B; and (4) those with a major triad and major seventh—viz., C and F. From the ordinary degrees of the scale we have thus four different forms of this chord, which for convenience may be referred to as the *sevenths* on G, A, B, and C. These four kinds of sevenths are called *fundamental*, but the most important is that founded on the dominant of the key or tonic, as it is not only the most pleasing to the ear, but also the chief agency in the formation of cadences and in digressions from one key to another. All the fundamental sevenths are, for the most part, subject to the same rules and are capable of the same inversions, which are three in number. (The *diminished* seventh has not here been mentioned, as from its very peculiar form and character it is reserved for treatment elsewhere.) In the three *inversions* of the chord of the seventh, the third, fifth, and seventh become successively the bass, and the other parts (including the octave of the root) will stand to the new bass in the order (1) of a third, fifth, and sixth; (2) a third, fourth, and sixth; and (3) a second, fourth, and sixth, as in Ex. 13, where *a* is the fundamental position of the chord, *b* the first inversion, *c* the second, and *d* the third:

Ex. 13



When represented by figures, the first inversion is known as the "chord of the sixth and fifth"; the second, the "chord of the fourth and third"; and the third, the "chord of the second"; these names being derived from the new positions assumed by the intervals of the chord under its several inversions. (See FIGURED BASS.) The above example is given in "close" harmony to show more clearly the nature of the changes made by inversion; but in each inversion the upper parts may be "dispersed," or taken at greater distances from the bass, without in any way affecting the nature of the inversion itself. See Ex. 14.

Ex. 14—1st Inv. 2d Inv. 3d Inv.



Besides the triads and the chords of the seventh there are three other combinations yet to be noticed, on account of their frequent occurrence and the different theories adopted for their explanation. These are the chords of the ninth, eleventh, and thirteenth. The chord of the ninth differs

Ex. 15



from the seventh by the addition of a third above. The ninth itself may be either major, as at *a*, or minor, as at *b*.

Like the triads and chords of the seventh, the chord of the ninth may be inverted, but several of its inversions are harsh, except in rapid movements, and are therefore little used. Ordinarily, one (or more) of the middle intervals is omitted, and the effect of the chord is generally more pleasing when thus incomplete. The "chord of the *eleventh*" exceeds the ninth by the addition of another third, and the "chord of the *thirteenth*" extends beyond the eleventh by the addition of still another third. Respecting the origin of these three chords there are various theories, of which the two principal ones only will be here noticed: first, that supported by Rameau, under which they are called "chords by *supposition*," or chords formed by *supposing* one, two, or three thirds to be added *below* a chord of the seventh. For example, by supposing a third to be placed below such a chord, the *ninth* is formed; by adding to this another third, we obtain the *eleventh*; and by yet another, the chord of the *thirteenth*. This process is exhibited in Ex. 16, where the thirds which are thus supposed are marked by black dots:

Ex. 16



To this system it is objected (1) that there is no apparent reason why those thirds should be supposed at all; (2) that such a theory ignores the natural bearings of the *sound* of the chords in question, and their possible relation to other sounds into which they may be resolved, and offers instead of this a mere mathematical calculation. On the other theory, that of Kirnberger, these chords are not considered as fundamental, but having their origin in *suspensions*; and when so regarded their explanation is rendered both easy and satisfactory.

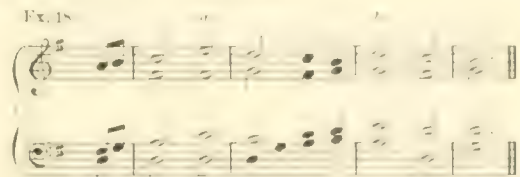
To illustrate Kirnberger's theory as briefly as possible, we give at *a* in Ex. 17 the ninth as suspension of the octave; at *b* the eleventh as suspension of the tenth; and at *c* the thirteenth as suspension of the twelfth; the dots are merely explanatory:

Ex. 17



It is to be observed, however, that though these chords have thus their *origin* in suspensions, yet they often occur independently—i. e. unconnected with actual or apparent suspensions. See Ex. 18, at *a* and *b*.

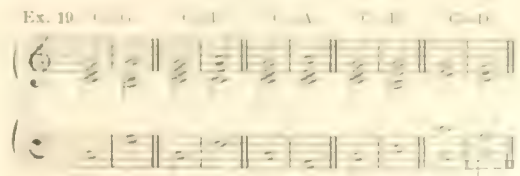
Ex. 18



In this respect they resemble many other harmonic combinations, which are traceable only to the numerous forms generated by anticipations, transitions, etc.

The *progressions* of the fundamental triads and chords of the seventh are next to be noted. "Progression" is the movement from one chord to another more or less related to it. We shall first consider the ordinary progressions of the *triads*. From a major triad (that of C, for example) we may proceed to the triads and inversions of the dominant (G), the subdominant (F), the relative minor (A), the mediant (E), and the super-tonic (D), these being the most nearly related triads to that of C. See Ex. 19.

Ex. 19



Also, to the chords of the seventh, the most nearly related are those of the seventh, the ninth, the eleventh, and the thirteenth.

Ex. 20.



From a *minor* triad we may proceed in like manner, the *order* of the related keys being slightly different. See Ex. 21.

The difference between these two chords is evident, as the bass and fifth at *a* in the example can not be doubled (the one being the leading note and the other the essential sev-

Ex. 21.

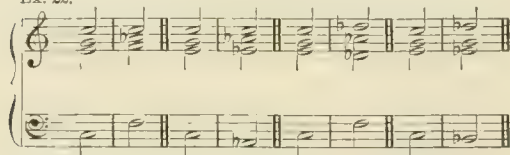


Or thus with leading chords:



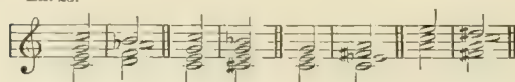
Besides these *natural* progressions, there is another class called the *abrupt*, in which the triad proceeds to chords more or less unrelated or remote. These progressions generally imply the omission of some intermediate chord; and sometimes the first chord is assumed to be not the tonic, but the dominant of its scale. See Ex. 22.

Ex. 22.



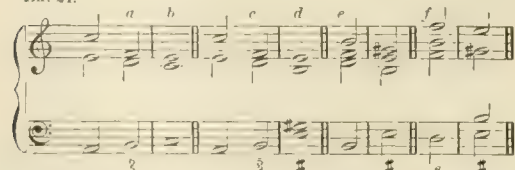
From a triad, either major or minor, we may proceed directly to any chord of the diminished seventh or its inversions, as in Ex. 23:

Ex. 23.



The progressions of the *diminished* (or *imperfect*) *triad* are peculiar, and require special notice, as the resemblance of that chord to an incomplete chord of the seventh often leads to mistakes. This triad consists of a bass, with a minor third and imperfect fifth. It has its place or seat on the second degree of the minor scale and the seventh of the major. The base or root is therefore the leading note in the major scale, and a triad so placed consists of precisely the same notes or intervals as the first inversion of the seventh on the dominant with the root omitted. Hence such a chord is ambiguous, and its real nature can only be determined by its connection and the harmony immediately following it. This will be apparent from Ex. 24, where the notes at *a* and *c*, though the same, are shown by their pro-

Ex. 24.

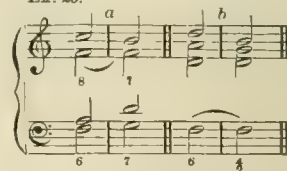


gressions at *b* and *d* to be essentially different chords, the first being an incomplete inversion of the seventh, and the other the real diminished triad.

enth), though either of these intervals may be doubled in the case of the diminished triad, as shown at *e* and *f*. The diminished triad is simply the supertonic harmony in the *minor* scale, and its treatment is in most respects similar to that of the supertonic of the *major* scale.

In the progressions of the *chord of the seventh* and all dissonances two points are to be noted—viz., *preparation* and *resolution*. Any such dissonance is said to be “prepared” when it has been heard as a consonance in the same part or voice in the *preceding* measure. Thus in Ex. 25

Ex. 25.



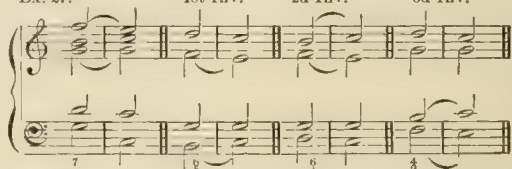
the first F in the alto is a concord followed by the same F as a discord of G. The two F's in the bass are respectively F the third of D and F the discord of G. In the strict style of composition this rule was held to be obligatory, except in a very few cases, but in the free style numerous instances of unprepared dissonances occur in the writings of the best composers. Like several other rules which have been modified or abrogated under the advances of modern harmony, that of preparation has lost much of its stringency, and is frequently overlooked in cases where it can add nothing to the clearness or compactness of the harmony. Such instances of unprepared sevenths as the following (Ex. 26) are frequent, and are approved by Albrechts-berger and other theorists:

Ex. 26.



In the *resolution* of the chord of the seventh the general rule is that the third (from the root) moves one degree upward, and the seventh one degree downward, the fifth being

Ex. 27.



unlimited. The fundamental bass also usually rises a fourth or descends a fifth. See Ex. 27.

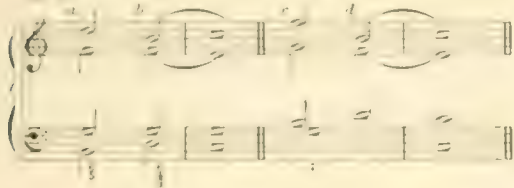
The resolution does not always take place on the very next note, but may be delayed by the intervention of several notes and even by extraneous harmonies. Compare *a* and *b* in Ex. 28.

Ex. 28



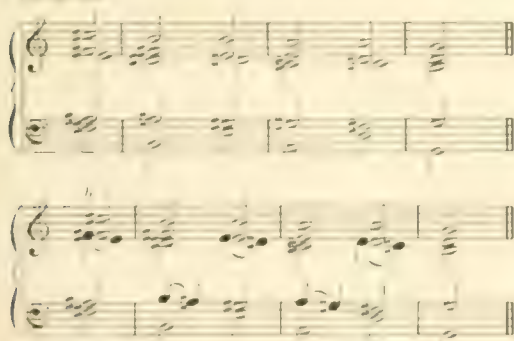
It is not necessary that the resolution of the chord should always occur in the *same part* which makes the dissonance, for any part may move from its own to another term of the chord by an exchange of place with its neighbor part; not in all cases the resolution must finally take place. Thus in Example 29, at *a*, the third (or leading note) is in the bass, and the fifth is in the treble; but at *b* these two parts make an exchange of notes, and the resolution proceeds accordingly. At *c* the seventh in the treble part is transferred to the bass, at *d*, and the treble takes the leading note, which before was in the tenor:

Ex. 29



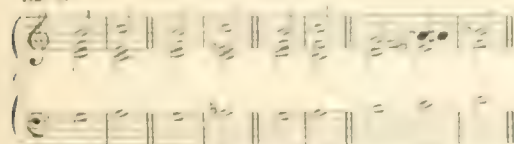
A seventh, instead of resolving into the perfect triad, may be succeeded by another seventh, and this also by another, thus forming a train ending with the usual resolution, as at *a* in Ex. 30. Theorists explain this kind of progression by supposing that the ear perceives a transient resolution after each seventh, which immediately passes into the next dissonance. This is shown by the crotchets at *b* in the example (Ex. 30), which make each chord first a triad and then a seventh:

Ex. 30



On the same theory of the skipping or omission of some intermediate note numerous other progressions of the seventh are to be explained. Several of these are given in Ex. 31:

Ex. 31



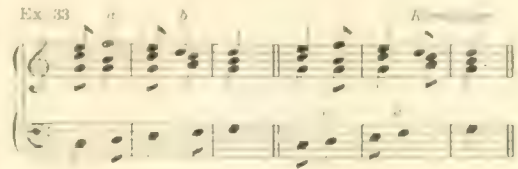
That the sevenths may proceed at once, like the triads, to any chord of the diminished seventh, will need no demonstration.

To the chords already described must be added those accidental resolutions called *cadences* and *cadenza*. An "authentic" is the perfect cadence of one of the terms of a chord by another triad, as it was explained

next chord. An instance of this may be seen at *a* in Ex. 32, where the second note of the bass, by skipping the crotchet too soon, comes in collision with the triad of C in the upper parts, and *cadence* into the harmony of *a* to which it properly belongs.

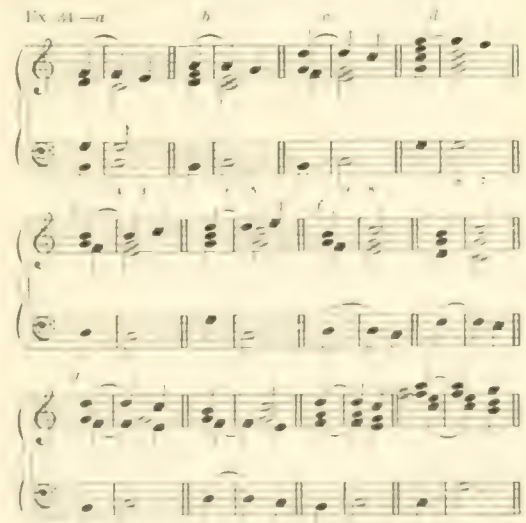
In Ex. 33, at *a* and *b*, the upper parts make anticipations by moving one quaver in advance of the bass; and at *c* and *d* the bass moves in a similar manner in advance of the upper parts:

Ex. 33

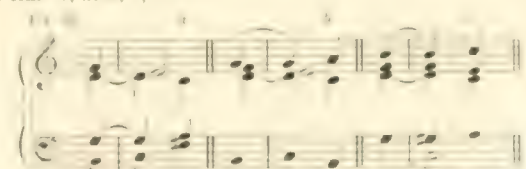


Anticipations are for the most part discordant, since they bring a foreign element into the harmony; in some cases, however, they contribute to the smoothness and elegance of a movement.

Suspensions are the reverse of anticipations. They occur "when one or more notes of a preceding chord are carried into a succeeding one to which they do not belong." Any one of the intervals of a triad or chord of the seventh (or two or more together) may be suspended. These suspensions are always on the accented part of a bar or note, and are resolved on the unaccented. A note may be suspended either from above or below. Illustrations are given in Ex. 34, where at *a* the third in the upper part is suspended from above by the fourth; at *b* the fifth is suspended by the sixth; at *c*, the octave by the ninth; and at *d*, the seventh by the octave. At *e* the suspensions are from below, and at *f* they occur in the bass. Instances of double, triple, and quadruple suspensions are added at *g*:

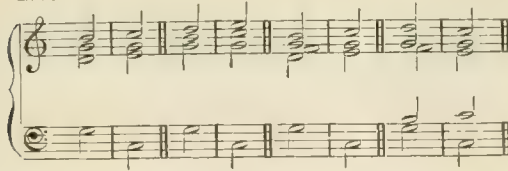
Ex. 34—*a*

Suspensions are not always resolved on their own proper triads, but another fundamental harmony is substituted, as in Ex. 35, at *a*, *b*, and *c*:



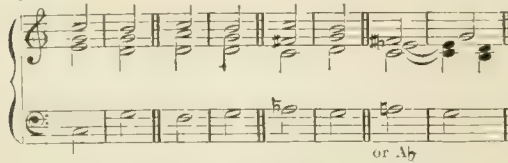
These are the *cadences* and *cadenza*. In their simple or radical form they contain the same ideas. The *perfect cadence* consists either of the

the dominant and tonic, or of the principal seventh and the triad of the tonic. See both forms illustrated at *a* and *b* in Example 36.

Ex. 36.—*a*

Almost all compositions end with this cadence, as its effect on the ear is final and satisfactory. It admits of numerous inversions (which will be understood without illustration by examples); but as these inversions are not conclusive, they are seldom used as terminations where there are more than two parts or voices. The *half* or *imperfect* cadence has various forms, all ending not with the tonic but the dominant harmony, and it is suitable only for such closes as are not final. See several forms of the half-cadence in Ex. 37.

Ex. 37.



The first of the two cadences which are shown in Ex. 38 is variously known as the *plagal* or the *ecclesiastical*; the second (at *b*), called the "*Phrygian*," is merely an incomplete form of the ordinary minor progression at *c*, with the fundamental note omitted:

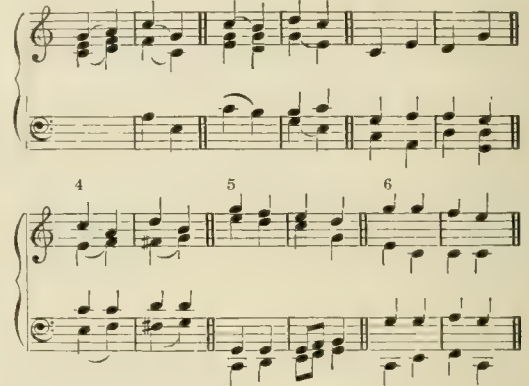
Ex. 38.—*a* or

Deceptive cadences are those in which the leading chord is not followed by that which it naturally suggests, but by another which is more or less foreign to the ear. See Ex. 31, in which each progression is essentially a cadence of this kind.

After this general view of chords and their inversions, suspensions and cadences, we come to their use and treatment in composition, concerning which we here refer the reader to some introductory and historical remarks in the article HARMONY. Preliminary to all study of the use of chords is that of their *duration*, and the mode by which the time of any series of musical sounds is regulated and expressed. On this subject, however, some elementary details have been offered in the article MEASURE, and a more particular exposition will be found under the head of TIME. On the kindred subject of RHYTHM also, of which only a brief notice could here be taken for want of room, a more extended treatment is given under its proper caption. *Counterpoint*, or the harmonizing of a given melody, is the setting of note against note, formerly written in points. *Simple counterpoint* comprises all those compositions, whether plain or florid, in which the parts are not invertible, but fixed. In *double counterpoint* the parts are so constructed by special rules that two or more of them may be inverted, the higher part changing place with the lower. (See the latter part of the article INVERSION.) In simple counterpoint the following general rules are to be observed: (1) Two perfect *fifths* in direct motion and succession, and in the same parts, are usually of bad effect, and should be avoided. (2) Two or more successive *octaves* in the same parts are inadmissible, except in special cases where it is desirable to strengthen the bass or make some idea particularly prominent. (3) As the third is the only discriminating term or element in triads by which we know whether they are major or minor, it should rarely be omitted. (4) Where two or more successive chords contain doubled in-

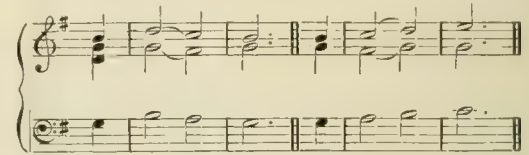
tervals, care should be taken not to double the *third* when it is leading note to the next chord, as the result would be consecutive octaves. (5) The two higher and two lower parts in a composition should not be placed at an excessive or disproportionate distance from each other. (6) The same rule applies to passages in dispersed harmony, as the effect is thin and unsatisfactory when the parts are widely separated. Instances of violation of these rules are severally given in Ex. 39:

Ex. 39.—1



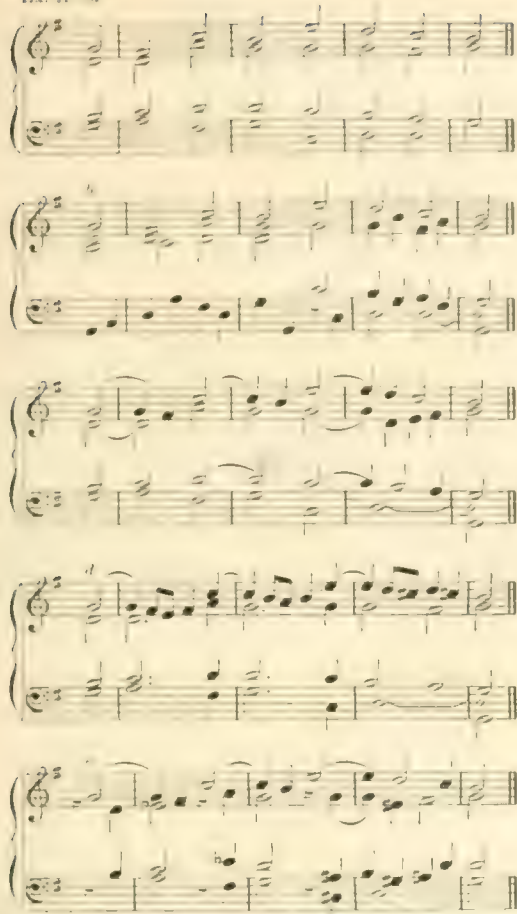
The rule respecting consecutive fifths is not violated when the first fifth is perfect and the second imperfect, as at *a* in Ex. 40. In modern music the contrary order frequently occurs, in which the imperfect fifth precedes the perfect, as at *b* in the example:

Ex. 40.

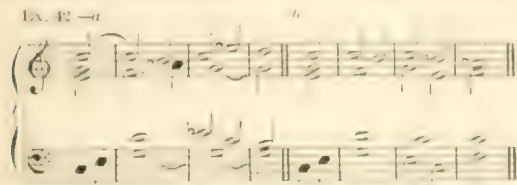


Successive fifths are not prohibited when the parts are in *contrary* motion, provided that the texture of the harmony is so woven as not to render them too prominent. In free composition the rule of the fifth is so far modified as to admit of numerous exceptions.

In two-part exercises every triad and chord of the seventh must necessarily be incomplete through the omission of one or more of their intervals or terms. In triads the third (or its inversion, the sixth) should be most frequently used, the fifth less freely, and the octave and unison only occasionally. When there are three parts each *triad*, as a general rule, should be complete; and of the *seventh*, the omitted interval may be the fifth, or less frequently the third or the root. In four parts each chord may appear complete in all its intervals. In triads one term will necessarily be *doubled*, either in the unison or the octave, and one of the terms may even be tripled or omitted, as shown already in Ex. 10 and its context. The third and seventh in the chord of the seventh, being its characteristic intervals, should not be doubled unless in exercises of five, six, or more parts, but the doublings should occur on the fundamental bass or the fifth. In harmonizing a plain theme in four parts each part should as much as possible have its own distinct quality, and more or less of a melodious progression. The simplest practical exercises are those having notes of equal length, confined to a single key, and consisting chiefly of triads and the principal chord of the seventh, with their inversions. A short theme thus treated is given at *a* in Example 41. (The example is merely elementary, for from such plain forms "simple counterpoint" extends to an area of almost unlimited expansion, freedom, and variety, including compositions which are oftentimes far more complex and ornate than ordinary exercises in *double counterpoint*.) The first step in the elaboration of the theme in the example given at *a* is shown at *b*, by the introduction of two notes against one; at *c* and *d* a further advance is made by suspensions of chords and other devices; and at *e* the theme receives additional ornament from chromatic harmony, syncopations, and variations of the time and movement of the parts:

Ex. 41—*a*

Though a piece of some length may be written in a single key, yet digressions into other keys, near or remote, are ordinarily essential to the beauty and interest of a composition. This passing from one key to another constitutes *modulation*; and it is generally effected by the introduction of the leading note or the minor seventh of the new key, the former generally requiring an accidental \sharp , \natural , or \times , and the latter a \flat , or \natural . Instances of such changes of key or mode may be seen in Exs. 20 and 21. More strictly, however, a modulation occurs only when a regular cadence in some new key is made at the close of a phrase or period. Modulation is of three kinds—viz., *natural*, *abrupt*, and *enharmonic*. The first of these is illustrated in Ex. 41, and has already been considered in the article MODULATION, which the reader should here consult. *Abrupt* modulations are so called because they proceed to foreign or unrelated keys or modes, and not on account of anything rough or strange in their effect. The simplest kind of abrupt modulation is

Ex. 42—*a*

that consisting of a mere change of *mode*, as from major to minor, or *vice versa*, while the keynote remains the same. In Ex. 42, at *a*, see a modulation from C major to C minor, and at *b* a change from C major to F minor, where both mode and key are relinquished. The latter modulation will

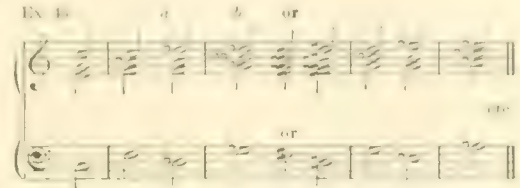
Ex. 43



be found on analysis to consist essentially of the triads of C major and F minor, the first and last notes; and the

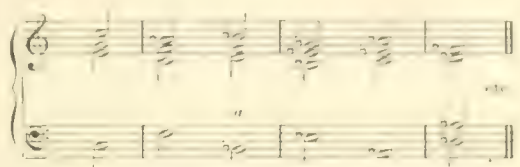
progression is one which furnishes the key to many developments both curious and important in abrupt modulation. Some of these we shall briefly notice. For instance, the C major triad is the dominant chord to the F minor triad, the bass rising a fourth. From the latter triad we may then proceed by ordinary rule to the major triad of D \flat , as at *a* in Ex. 43; which triad being the dominant chord (like the former C) is followed at *b* by the minor triad of its fourth—viz., G \flat minor (otherwise F \sharp minor); and by repeating this process continually we may proceed through the whole circle of the keys, as partly shown in the example:

Ex. 43



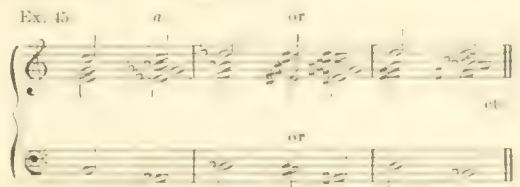
The progression from the second chord (F minor) may also be to the major triad of B \flat , the bass descending a perfect fifth, as at *a* in Ex. 44, on which another chain of harmonies may be formed, thus:

Ex. 44



From these suggestions the student will be able to construct many other circular progressions or chains of cadences. In some cases the modulation seems to imply the omission of an intermediate note, instances of which are given in Ex. 22. In this class may be placed the very abrupt but useful progression at *a* in Ex. 45, where the upper note of the tonic harmony (octave of the root) is taken as a *new leading note* (with or without the seventh), and resolved in the usual manner. Of course, the process may be repeated indefinitely, as in the former examples:

Ex. 45



Modulation by *enharmonic changes* is chiefly effected by means of the chord of the diminished seventh. This chord consists of three minor thirds, i. e. a minor third, an imperfect fifth, and a diminished seventh. And as a minor third contains only three semitones, it follows that only three different diminished sevenths are possible, for, after building the chord on three successive grades of the chromatic scale, a fourth grade would produce simply a replication or inversion of the first. The peculiarity of this chord lies in a certain mysterious, dreamy, and equivocal quality which for the time is so entrancing as to involve all sense of key and mode in a sort of bewildering obscurity. Hence the use of this chord in rendering digressions into remote keys is both easy and graceful. Its enharmonic quality arises from the circumstance that each of its elements may be regarded and treated as two entirely different notes in intervals—viz., as sharp of the note below, or flat of the note above, or in both cases as natural instead of sharp or flat. Consequently, each of the three diminished sevenths may be written in four or more different ways, according to the key or scale to which they belong. This will be evident on an inspection

of Ex. 46, where four various forms of each seventh are given at *a*, *b*, and *c* respectively.

Two other points also are to be observed: 1st, that each of these forms contains a *leading note* into some particular key; and 2d, that any such form may become the principal (or dominant) *seventh of that key* by dropping another of its terms a semitone lower. (In illustration of this see Ex. 47,

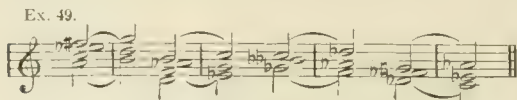


which is an exercise on the first of the above sevenths, with the parts distributed.) At *a* the lower term ($F\sharp$) is the leading note, and by dropping the $E\flat$ of the alto to D the chord becomes at once an inversion of the ordinary seventh on D , and resolves into the key of G (either major or minor). At *b* the alto, now written $D\sharp$, is the leading note, and the tenor being lowered a semitone, we have an inversion of the minor seventh on B , which resolves into the key of E . At *c* the upper part is leading note, and the $F\sharp$ of the bass (now become $G\flat$ by enharmonic change) descends a semitone, forming the minor seventh on F , which resolves into the triad of $B\flat$:



By this simple process we may readily pass from any key to any other (major or minor) without going through a tedious succession of intermediate chords or annoying the ear by a sudden plunge into a foreign scale. To become familiar with this species of modulation it is necessary to keep in mind the distinction between $F\sharp$ and $G\flat$, $C\sharp$ and $D\flat$, F and $E\sharp$, etc., as these two names or forms of expression indicate relations to two different keys. The actual *sound*, however, remains the same, and is in most cases equivocal till the progression decides its character. If, then, we wish to proceed from C major, for instance, to some other key, we select that particular diminished seventh which contains the *leading note* of such other key; and this will form the link connecting the two keys. Suppose the new key to be $D\flat$ major or $E\flat$ minor: of these, the leading notes will of course be C and D , and we accordingly select the diminished sevenths in which they are found. By interposing these between the tonic harmony of C and that of the new keys, the modulation is effected at once, because the middle term in each case is on one side related to C , and on the other (by enharmonic change) to $D\flat$ or $E\flat$. See Ex. 52.

Though in the examples which have been already given one of the intervals of the diminished seventh is dropped a semitone in order to make the ordinary minor seventh of the new key, yet this change is not really necessary, as this chord often proceeds *directly* to its resolution, as is shown in Ex. 49:



Frequently, also, two or more diminished sevenths occur in immediate succession before the modulation is effected. For a somewhat full treatment of other points more or less pertaining to the subject of simple counterpoint, see the articles IMITATIVE MUSIC, MODE, SCALE, SEQUENCE, and TRANSPOSITION.

Double counterpoint is that species of composition in which the parts or voices are susceptible of *inversion*, the higher part thus becoming the lower, and *vice versa*. Of such species of composition there are several varieties—viz., counterpoint of the *octave*, when one of the parts is moved an octave higher or lower than its original place, while the other part retains its position; and counterpoint of the *tenth*, of the *twelfth*, etc., in which the inversion takes place at those distances respectively. Each of these varieties of counterpoint has special rules by which it is governed in addition to those governing “simple” counterpoint. The intervals of the original composition thus become different by reason of the inversion of the parts. For instance, in “counterpoint of the *octave*” the octave becomes a unison,

the second a seventh, the third a sixth, etc., as shown in the following scheme:

Original, 87654321.

Inversion, 12345678.

This will also be evident on observing the notes and figures in Ex. 50, where the lower part becomes the higher by inversion:

Ex. 50.—Original.



Inversion.



In counterpoint of the *octave* no greater interval than an octave is admissible between the two parts, as every note that exceeds an octave will remain uninverted. This fault will be noticed at *a* and *b* in Ex. 51, where two notes are unchanged in the inversion because they violate the rule. Two perfect fourths in succession are to be avoided, because in the inversion they become two fifths; but two fourths, of which the last is augmented, may be admitted. The two parts should also be various in quality of notes for the sake of distinction. By observing these rules

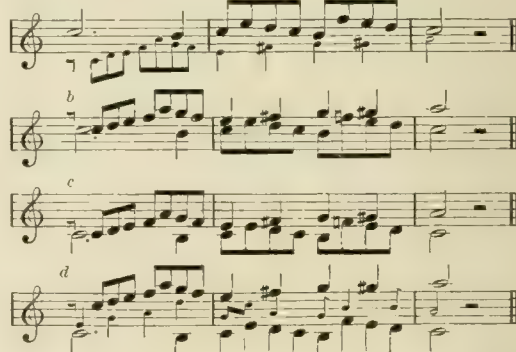
many new and striking effects may be produced from a subject apparently insignificant. To illustrate this very

Ex. 51.—Original.



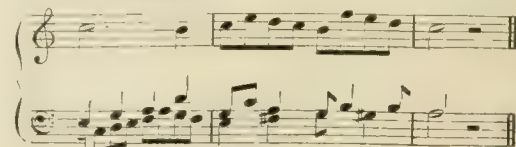
briefly we shall take the following simple theme, and treat it in counterpoint of the octave. In Ex. 52 see the theme at *a*, with an under part in small notes; at *b* is the first inversion, in which the lower part is moved an octave *upward*, thereby becoming the higher; at *c* and *d* are two other inversions, though the first is the only *real* one:

Ex. 52.—a



In the latter case, however, the effect is thin and unpleasant, owing to the great distance between the parts. And this very fault suggests another feature—viz., the introduction of a *third* part to fill up the vacant space; which new part we have inserted in small notes. This middle part is also constructed in such a manner as to be capable of inversion like the other parts, and thus several new and beautiful changes may be produced by carrying out the inversions. These inversions are five in number, of which we give the first entire, and the others with only a few notes to indicate the positions which the several parts will assume. See Ex. 53.

Ex. 53. 1st Inversion.





To afford room for inner parts the inverted part may be set at the distance of *two octaves*, as in the above example and also in the next following.—To a two-part counterpoint of the octave two other parts, consisting *entirely of thirds*, may be added by observing the following rules: (1) The original parts should always proceed by contrary or oblique motion; (2) only thirds, sixths, and octaves should be used on the essential or strong parts of the harmony; (3) if a leading note occurs in the lower part, and its third above in the higher, the latter must be resolved downward. We may then form two new parts by writing thirds *above* all the notes of the original parts, as in Ex. 54, where the added parts are given in small notes:

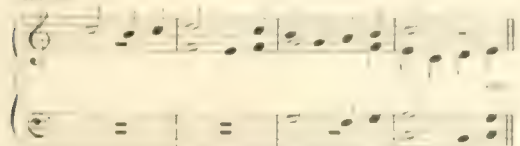
EX. 54



The rules for the other counterpoints are in like manner deduced, for the most part, from a comparison of the intervals in the composition before and after inversion. Thus, in counterpoint of the *tenth*, as thirds, fourths, sixths, and tenths become by inversion octaves, sevenths, fifths, and unisons, two of them in succession are not allowable, except in certain cases when such sevenths or fifths are not of the same quality. In counterpoint of the *twelfth*, successive fourths and sixths are forbidden except under similar limitations, as they produce ninths and sevenths in the inversion. To all these counterpoints two middle parts may be added, either as "free" or as parts capable of inversion; and when a composition has four parts of the latter construction, it may be inverted *twenty-three times* by merely arranging the four parts in correspondence with the changes which can be made with the numbers 1, 2, 3, 4—viz., 1, 3, 2, 4—2, 1, 3, 4, etc. Double counterpoint thus throws open a rich field of ideas which would never occur to a composer whose studies had been confined to the simpler departments of harmony.

The subject of *Fugue*, which comes next in order, has already received attention under its own proper head, and we shall close the present article with a few lines on the nature and structure of *canon*. A canon is a composition in which the several parts are substantially one and the same train of notes, one part beginning, and the others falling in successively at prescribed distances, as in Ex. 55.

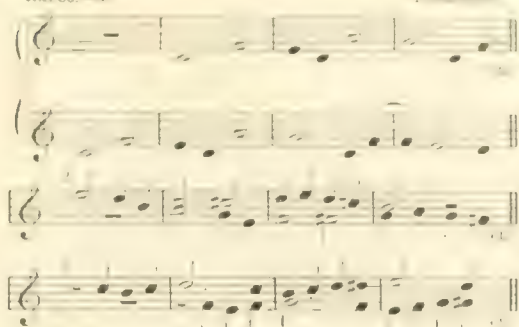
EX. 55



The parts thus formed by mere imitation of the first may be exact repetitions or may be varied by ascending or descending the second, third, fifth, etc., of the original; but in all cases the answer should contain the same number of notes as the length of notes. "The truest, easiest, and at the same time, strictest canon," says Alexander, "is one in the unison and in the octave; for only on these intervals can

the answers correspond exactly as to all the half and whole tones, although those on the fifth and fourth may be made to correspond sufficiently well." In Ex. 56—

EX. 56—



of three two-part canons, in which at *a* the answer is in the unison, and *b* in the third below, and at *c* in the fifth below: Canons are said to be *finite* when provided with a proper termination or ordinary ending. On the contrary, an *infinite* canon is one in which there is no such conclusion, but a constant circular repetition, which is usually terminated by a signal agreed upon by the performers.

Among the multitude of works on musical science, embracing both the strict and free schools, the following may here be mentioned, all of which are accessible in the English language: Albrechtsberger, *Harmony, Counterpoint, and Fugue* (London and New York); the same by Cherubini; E. F. Richter, *Harmony, Counterpoint, and Fugue* (3 vols., sold separately); B. Jindass, *Harmony and Counterpoint* (New York); Weitzman, *Theory of Harmony*, etc., edited by E. M. Bowman (New York). In matters of musical history, W. S. B. Mathews, *Popular History of Music* (Chicago); Sir George Grove, *Dictionary of Music and Musicians* (London and New York). In musical "form," Büssler's *Treatise*, translated and adapted by J. H. Cornell; W. S. B. Mathews, *Elements of Musical Form* (New York). In orchestration, Berlioz's *Treatise* (London); E. Prout, *Instrumentation* (London); Oscar Coon, *Harmony and Instrumentation* (New York). This latter work is almost unique in matters concerning arrangements and scoring for small orchestras and brass bands.

Revised by DUDLEY BUCK.

Musk [from O. Fr. *musc*, Lat. *musculus*, from Gr. *μῦσος*, from Pers. *musk*. Cf. Arab. *mushk*, musk]; a concrete, strong-smelling, brownish, inflammable substance extensively employed in medicine and in perfumery. It is obtained from the preputial sac of the MUSK-DEER (q. v.), and is brought to market from China, Russia, and Calcutta; the musk of the warmer regions is by far the best. On killing the animal, the musk-bag is carefully removed, so as to defend its precious contents from exposure to the air. When recently taken the musk is of so powerful an odor as to cause headache to those who inhale its overpowering fragrance. The affluence of perfume in musk is almost incredible, being apparently undiminished by lapse of time. The price of musk is very high, and it is in consequence excessively adulterated. Some similarly smelling animal products (as the perfume of the desman, etc.) are sold for it. The volatile oils of some plants, such as *Malva moschata*, *Myrica moschata*, and *Sassafras*, are found to possess its odor and its medicinal qualities, which are strongly antispasmodic and stimulant. Artificial musk is obtained by treating rectified oil of amber with strong nitric acid. It is superior to much of the musk of commerce, but not equal to the genuine article. It has a limited use in medicine. The drug sambul or sambal is also a fair musk substitute.

Revised by H. A. HARE.

Musk-deer: a small deer (*Moschus moschiferus*) inhabiting the highlands of Central and Eastern Asia, and rarely found in the mountains of the Himalayas. The deer is about 20 inches high at the shoulder, of a grayish brown, sometimes of a reddish tinge, sometimes mottled with lighter blotches. The hair is long and coarse. Antlers are lacking, but the male has a pair of long canine teeth in the upper jaw. This species is remarkable for the great development of the small side-hoofs, and differs from all other deer in having a gall-bladder. It is an aberrant member of the family *Cervidae*, and is only distantly related to the little

chevrotains; for these, although often called pygmy musk-deer, belong to another family, the *Tragulidæ*. The flesh is esteemed, though that of the male is very rank and musky.



The musk-deer.

On account of the value of the musk, the animal, which furnishes the precious substance, is subjected to great persecution on the part of hunters, who annually destroy great numbers.

F. A. LUCAS.

Muskegon: city (incorporated as a village in 1861, chartered as a city in 1870); capital of Muskegon co., Mich. (for location of county, see map of Michigan, ref. 6-H); on the Muskegon river, and the Chi. and W. Mich., the Gr. Rap. and Ind., and the Toledo, Sag. and Musk. railways; 38 miles N. W. of Grand Rapids, 120 miles by water N. E. of Chicago. The river here enlarges to a width of about 2 miles, and is locally known as Muskegon Lake. It has a water frontage of about 12 miles. The harbor, almost entirely landlocked and open all the year, is one of the best on Lake Michigan, and has regular steamboat communication with all the principal lake ports. The city has an area of about 12 sq. miles, of which 5 are water surface; is lighted with gas and electricity, and has a water plant on the Holly system, completed in 1891, and taking its supply from Lake Michigan; well-paved streets, and an improved sewerage plant. There are 24 churches, 17 public-school buildings, a central school, a high school, 6 kindergarten cottages, and 5 parochial schools, Hackley Public Library (founded in 1888) with over 20,000 volumes; soldiers' monument: public fountain; public park; a park of 58 acres between Lake Michigan and Muskegon Lake, on the west side of the city; 4 national banks with combined capital of \$400,000, a State bank with capital of \$50,000, and 2 daily and 2 weekly newspapers. The city has been noted for many years for the variety and extent of its manufactures, and particularly for its great lumber interests. The census returns of 1890 showed that 310 manufacturing establishments (representing 53 industries) reported. These had a combined capital of \$11,443,967; employed 4,956 persons; paid \$2,151,820 for wages and \$5,540,042 for materials; and had products valued at \$9,464,105. The principal industry, according to the amount of capital employed, was the manufacture of lumber and other mill products from logs or bolts, which had 29 establishments; employed \$9,091,979 capital and 2,532 persons; paid \$1,022,073 for wages and \$3,257,473 for materials; and had products valued at \$5,326,058. Next was the manufacture of planing-mill products, which had 9 establishments; employed \$345,597 capital and 415 persons; paid \$167,283 for wages and \$382,694 for materials; and had products valued at \$602,541. Then followed the manufacture of foundry and machine-shop products and of furniture. The aggregate shipments by water of lumber products in 1890 were 355,515,000 feet of lumber, 90,808,000 shingles, and 22,670,000 lath. In 1890-94 there were 12 new and large manufacturing establishments in the city, and in the latter year the industrial establishments included iron and steel works, iron-works, boiler-works, about 20 saw and planing mills, furniture-factory, flour-mill, brewery, marble and granite works, and chemical-engine, revolving bookcase, patent

earth-closet, library supplies, invalid-chair, portable-desk, army-cot, and brick and tile factories. Pop. (1880) 11,262; (1890) 22,702; (1894) 20,222.

Muskhogeian (musk-hō'-gē-ān) **Indians** [*Muskhogeian* is from Algonquian for swamplanders, swamp-dwellers]: a linguistic stock composed of tribes formerly occupying almost the whole of Mississippi and Alabama and large portions of Georgia, Florida, and South Carolina; now the majority are settled in the Indian Territory. Various names have been proposed to designate this family: Choctaw-Muskoki, Muskhogie, Choktah, Tschahtha, Mobilians, and others; but the Indian name of its most powerful and central portion, the Creek, is now adopted.

The tribes formed confederacies, but the political power exercised by these was not always coincident with their territorial extent, and only the Creek and Chickasaw confederacy has ever been of decisive influence upon the destinies of the southern Indians. A subdivision of the various tribes of Muskhogeian affiliation can be attempted upon a linguistic basis only. The following classification embodies present knowledge:

I. First branch, or Maskoki, comprises the Creek Indians also called Maskoki, isti Maskoki, or Maskokalgi. They are subdivided into Upper Creek, on the Coosa and Tallapoosa rivers, and Lower Creek, on the Chattahoochee river and E. from there; they comprised also the Creek part of the Seminole and of the Yamasi.

II. Second branch, or Hitchiti towns. This southeastern division comprised towns on the lower Chattahoochee river speaking the Hitchiti dialect; also that portion of the Yamasi and Seminole Indians who had politically separated from the towns just mentioned.

III. Third or Apalache branch; historically known to have lived about St. Mark's river, Florida.

IV. Fourth or Alibamu branch; embraced the Alibamu and Koassati villages on Alabama river, in the vicinity of the present capital, Montgomery.

V. Fifth, Western or Choctaw branch. The Choctaw, living in Central and Southern Mississippi, were the principal people of this division. It branched off into the Chickasaw, Choktchuma, and Mugulasha; and some other tribes on the Mississippi river were probably of Choctaw affinity.

Tribes of the Muskhogeian Indians.—In the following alphabetic list of the principal tribes the topographic locations given are mostly those of their historic seats E. of the Mississippi river, in which they remained until 1830 to 1840. The larger portion of these tribes still exist in the Indian Territory, preserving the same names, and this may be said more especially of the Creek Indians.

Abika or Apihka: a very ancient Upper Creek town on Coosa river. It was probably identical with the historical Kusa. Abikudshi, or Little Abika, is a colony of it.—Acolapissa, *Spies, Guardians*: a generic term for a class of Choctaw Indians on the Gulf coast. They are said to have inhabited seven villages.—Alibamu or Albamu: a people with a special dialect, settled in four villages W. of Montgomery, Ala. They live now scattered through the Creek Nation, one town being on the North Fork of the Canadian. There is a settlement of about 100 Alibamu in Polk co., Eastern Texas.—Apalachi: a town and "province" N. of St. Mark's Bay, Florida, the inhabitants of which spoke a Muskhogeian dialect of their own. After being subjugated by the Spaniards about 1638, a portion of them removed in 1705 to Mobile Bay, and subsequently went to Louisiana.—Apalaehuala: a Hitchiti town on lower Chattahoochee river, and a large center of population; it was called also Tálwa tlhák, *Great town*. Under this name is a village in the Indian Territory.—Atasi, *War-club*: an Upper Creek town formerly on lower Tallapoosa river.—Attapulgas, *Dogwood thicket*: a Seminole settlement of Northern Florida.—Bayougoula, *White oak people*: a Choctaw tribe on the western bank of the Mississippi.

Chikasa or Chickasaw Indians: originally inhabiting seven palisaded towns in Pontotoc County, on a table-land in Northern Mississippi. They were a warrior tribe of political importance, stood at the head of a confederacy dwelling along Yazoo and Mississippi rivers, and were the constant antagonists of their congeners, the Choctaw, and of the French colonists. Their dialect differs considerably from the Choctaw lexically, but for oratorical purposes they make use of Choctaw.

Chikasawhay Indians, *Eaters of the bog-potato* (ahi): once on an affluent of Pascagoula river; also known as Ahi-pat

ókla, the Choctaw term for *potato-eating people*.—*Chahla*, *Where others live*: a Lower Creek town on Chattahoochee river; its language and that of its colony, Chahla'satli, is the Hitchiti dialect, though the name of the town itself is Cherokee.

Choctaw, more properly Cha'hta, of Central and Southern Mississippi. Many of them resided on table-lands of the interior, being more agricultural than warlike in character. A nickname of theirs is "Timbers," apparently taken from their stout or tub-like exterior, but in fact recalling the frequent ending of their war-titles, *abi*, *killer*. Many Choctaw settled in Louisiana during the eighteenth and nineteenth centuries. Some of the principal subdivisions of the people were the Sixtowns, the Long House, Cusha, Boguechito, Heyowani, and Chikassaway.

Choktchúma, *Red crabs*: a Choctaw tribe settled on the Yazoo river; mentioned as early as 1540 as Saquechuma, *a great town*.

Creek Indians, the most centralized, warlike, and politically powerful of the southern tribes, lived in compactly built villages along the fertile bottom-lands of the Coosa, Tallapoosa, Chattahoochee, and Flint rivers. They advanced from the Northwest to Georgia and Florida, subjugating the populations they encountered. Their settlements were divided into two parties: the red towns, also called *war* or *kipáya* towns, and the white or peace towns, *tálua mikagi*, conservative communities. These were governed by civil magistrates, whereas the red towns were controlled by the warriors only, and both parties appear to have been equally strong in numbers. Among the ancient Creeks two forms of speech prevailed: the archaic or female language, now in use among old people only, and the modern or male language; they differ chiefly in verbal endings, not in lexie elements. Historically, the Creek, or parts of their nation, were known as Conshac (*reed-knives*), Coosa, Tallapoosa, Kawita, and Osetchi. The present appellation, "Maskoki," appears to be of comparatively late origin. Among the peoples incorporated into the Maskoki confederacy were the Yuchi, the Natchez, the Alibamu, and the Koassati, some Shawanos, the Nukfulagi of Southern Georgia, and some Cherokee and Yamasí. The Taskigi and the Tukabatchi are said to have formerly spoken an alien language.

Heyowani, abbreviated to Towani: a Choctaw or Cha'hta town on Pascagoula river, once strongly fortified. After their removal to the West, these Indians had a village at Lamourie Bridge, Rapids parish, La.—Hickory Ground, or Odshí-apófa: a Creek town on Coosa river, a mile below the falls.—Hilabi: an Upper Creek town between the Coosa and the Tallapoosa rivers.—Huthli-Wahli, *Sharing-out war*: an Upper Creek town on Tallapoosa river.—Huma, or Ouma, *The red ones*: a tribe once settled on the western bank of the Mississippi river, about 20 miles above the Red river junction. Probably of Cha'hta lineage.—Ka-ilá'dshi: an Upper Creek town in the "central" district, between the Coosa and Tallapoosa rivers, Alabama.—Kusi'hta, often spelled Cussetaw: a Lower Creek town on Chattahoochee river. This white town was considered to be, with Kawita, the oldest of the Creek towns on Chattahoochee river.—Kawita, often spelled Coweta, and Kawita Tallahassi: two Lower Creek towns on Chattahoochee river, the latter being a "capital" of the people in the earlier periods. Both were red towns, ruled by the warrior class.—Koassati, or Coushatta: a tribe once settled near the confluence of the Coosa with the Tallapoosa river. Two townships in the Creek nation are now inhabited by them; about twenty-five live at Shepherd, San Jacinto co., Texas. They speak a dialect approximating nearest to Alibamu.—Muklasa: a Creek town on the southern shore of the lower Tallapoosa river, speaking Alibamu.—Opát ókla, *Smaller people*: an ancient territorial division of the Cha'hta people, embodying the Cusha and other districts; called so to distinguish it from the Ukla fulaya, *Long people*, whose villages extended along a considerable space in the shape of a square.—Okfaski, or Akfaski, *Confluence tongue*: a Creek town built on both sides of Tallapoosa river. It gave origin to seven branch villages.—Okóni: a Hitchiti-speaking town on Okoni river, Georgia, from which the Hitchiti towns claimed descent; abandoned about 1710. Okóni is also the name of a town on Chattahoochee river settled by immigration from the Okoni above.—Sáwokli, *Raccoon town*: a very ancient town of the Hitchiti connection on lower Chattahoochee river. Near by was a colony or branch of it, Sáwokli-ú-dshi, *Little raccoon town*.

Seminole Indians of Florida and Georgia: chiefly known

as history for the heroic struggle (1812-18) for the cession of their territory and their removal to the West (1835-42). After the end of this struggle about 400 of these Indians remained in the south of the peninsula. The majority are in the Indian Territory, on a separate tract, and in 1890 numbered 2,539 persons. The tribal name is Creek, and means *separatists*, seceders from the main body of the Upper and especially the Lower Creeks; the proper Indian form is isti isimanóle, or isti Simanóhagi. The Seminoles appear as a distinct political body about 1750, and many authors used the name as synonymous with Lower Creeks. Creek immigrants and invaders, however, are mentioned on the coasts of the peninsula long before that date. The Hitchiti portion of this national conglomerate had a political center in Mikasuki, Northern Florida, and, together with the Creek ingredient, possessed an unenviable reputation among the other Creeks.

Sixtowns, English Towns, or Ukla hánnali: a Cha'hta territorial division still kept up in the Choctaw nation, Indian Territory. Their numbers were subsequently increased. They were located in Smith and Jasper cos., Miss., and were called as follows: Chinokabi, Okatallia, Kilis-tamaha, Talla town, Nashoweya, Bishkon.—Taskigi, *Jumpers*: a Creek town formerly at the junction of Coosa and Tallapoosa rivers. A town named Tuskegee is now built E. from there.—Tukabatchi, below the falls of Tallapoosa river; the largest town of the Upper and Lower Creeks, and a capital of theirs as late as the end of the eighteenth century.—Wawoka, *Boating waters*: an Upper Creek town E. of Coosa river.—Witumka, *Rumbling waters*: a town at the Cascade Falls of Coosa river, whose dialect was that of Koassati.—Yamacraw, the misspelled Hitchiti form of the name Yamasí: a small Lower Creek settlement on Savannah river, 4 miles above the city of Savannah. This fragment of a tribe is mainly known to us through its chief, Tomochichi (d. 1739); its name should be spelled Yamathla, or Yamathi.

Yamasí Indians, or Yamasatgi, *The peaceables*: a body of Indians, mostly of Creek descent, who early in the eighteenth century dwelt on both sides of the Savannah river. At first they sided with the English colonists, then passed over to the Spanish side, and finally were annihilated by Creek war-parties after they had retired into Florida. They may be regarded as the early precursors of the Seminoles.

General Characteristics.—The Muskogean family is so extensive that it is difficult to give any somatological characteristics which will apply to all of its population. Prognathism is not frequent among them, and their complexion is rather dark cinnamon, with the southern olive tinge. Their general intelligence renders them highly susceptible to civilizing influences. All the tribes were well advanced in agriculture, which rendered them relatively independent of the uncertainties of the chase. The members of the two main branches of the stock, the Creek and the Choctaw, differ in stature, the latter being thick-set and heavy, while the former, with the Hitchiti, are more lithe and tall.

The Muskogeans had extensive systems of totemic clans, which were organized into tribes. Each tribe occupied a distinct village. The clans of every village were organized into two groups, symbolized by the colors white and red. From the white clans the councilors and civil chiefs were selected, while the warriors came from the red clans. Between many of the tribes a reciprocal promotion existed; that is, the white clans, gathered in council, selected the chiefs of the red clan, while the red clans in council selected the chiefs of the white clan. They used the *Ilex cassine* for the preparation of the black drink, erected artificial mounds, in the earlier periods worshipped the sun, and believed in a deity sometimes called the "holder of life." Their fire-worship was connected with their adoration of the sun, and they had many animal-gods. The children belong to the clan of the mother, an antique custom which must have prevailed throughout the Gulf territories. The Muskogean, as well as other eastern tribes, had town-squares, where an annual festival called a fast (*psikita* in Creek) was celebrated. No instances of cannibalism are recorded, but scalping was a common custom. Artificial flattening of the foreheads prevailed in the western tribes, other deformations of the skull among the eastern tribes. The reinterment of bodies, after the bones were cleaned from the adhering muscles and ligaments several months after death, is recorded, more especially for the western tribes of the Creek.

History.—Historically, the Muskogean family is known for the first two centuries after the Columbian discovery is

exceedingly meager. In the sixteenth century three Spanish expeditions passed through the territories held by their tribes—Hernando de Soto, 1539; Tristan de Luna, 1559; and Juan del Pardo, 1567. From their reports it appears that the majority of these tribes were then inhabiting the same tracts and spoke the same dialects as they did about the year 1800.

During the seventeenth century the Spanish colonists had several contests with the Creeks on Tallapoosa river and with the Alabama Indians, as may be gathered from Barcia's *Ensayo cronológico*, and the Apalachia Indians of St. Mark's river, Florida, were subjugated by the Spaniards about the middle of the century. French colonists settled near the mouth of the Mississippi river and English pioneers on the shores of the Atlantic. The French could never overcome the hostile feelings of the Chickasaw and their confederates, and in several wars waged against them the Chickasaw experienced severe losses, until they were obliged to cede their territories to Great Britain by the peace of 1763. Oglethorpe was the first to conclude treaties with the inland Creek, and the British henceforth established trading-posts in their country. The war against the Cherokee and attacks of some turbulent bands of Creek Indians alternated with intertribal quarrels. The great rebellion of the Creek Indians (1812-14) was instigated by the British and by Tecumseh, their Indian emissary, to imperil the U. S. by an attack from the southern side; but the Creek were reduced by a series of defeats, and after the annihilation of their warriors at the Horseshoe Bend of the Tallapoosa (Mar., 1814) they made peace on the condition of ceding much valuable territory. The urgent pressure of the white population finally caused the removal of all the southern tribes to what is now called Indian Territory. The Cherokee began to emigrate thither in 1819, and were followed by the Seminole and Creek (1836-40), and by the Choctaw and Chickasaw (1840-44). Peace being secured to them, they have since acquired a considerable degree of wealth and mental culture.

Population.—According to the census of 1890, the number of pure-blood Indians in the Territory is as follows: Choctaw, 9,996; Chickasaw, 3,464; Creek, 9,291; Seminole, 2,539.

AUTHORITIES.—Adair, *The History of the American Indians* (London, 1775); Romans, *A Concise Natural History of East and West Florida* (New York, 1775 and 1776); Jefferys, *History of the French Dominions in America* (London, 1760 and 1761); Bartram, *Travels through North and South Carolina, Georgia, etc.* (Philadelphia, 1791); Lawson, *The History of Carolina* (Raleigh, 1860); Le Page du Pratz, *Histoire de la Louisiane* (3 vols., Paris, 1758); Hawkins, *A Sketch of the Creek Country in 1798 and '99* (Savannah, 1848); Milfort, *Mémoire ou Coup d'œil Rapide sur mes Différens Voyages et mon Séjour dans la Nation Crèek* (Paris, 1802); Margry, *Découvertes et Établissements des Français dans l'Amérique Septentrionale* (6 vols., Paris, 1880, etc.); Claiborne, *History of Mississippi*, vol. i. (1881). See INDIANS OF NORTH AMERICA. J. W. POWELL.

Muskingum: the longest river wholly in Ohio; formed at Coshocton by the confluence of the Tuscarawas and the Walhonding rivers. Thence it flows generally S. E., 112 miles to the Ohio at Marietta. Zanesville is on its banks. The river is navigable by slackwater improvements 90 miles to Dresden, which is 130 feet higher than its mouth. Its valley is fertile and beautiful.

Muskmelon: See MELON.

Musko'ka: a lake, river, and county of Ontario, Canada; on the eastern side of Georgian Bay; but the name is loosely applied to the entire district from Severn river to Lake Nipissing, and northeastward to the Ottawa river. Thus defined it is about half as large as Maine, a tangle of forests, rivers, and lakes (of which last there are said to be 800 of considerable size). It was long practically uninhabited, but is now crossed by railways and dotted by summer hotels. The waters of the lake are deep, clear, and cool, and swarm with fish. M. W. H.

Musk-ox: the sole member (*Ovibos moschatus*) of a peculiar sub-family (*Ovibovine*) of the ox family (*Bovidae*); so named from the musky flavor of the bulls and old cows. It is about the size of a small heifer. The horns, which suggest on a small scale those of the African buffalo, are large at the base, in old males almost meeting on the forehead; they curve at first downward and outward, then upward and slightly forward. The body is heavy and legs short, but the coat of very long, thick, dark-brown hair makes the

animal look still heavier. There is an undercoat of thick woolly fur, shed in summer. The musk-ox feeds on grass, lichens, and the twigs of pine and willow. This animal is at present confined to the extreme northern parts of the North American continent, where it ranges over the barren grounds to the N. of lat. 60°, roaming in summer to the islands within the Arctic Circle. During the glacial period its range must have been far more extensive, as its bones have been found in drift-gravel in the valley of the Avon at Bath, and elsewhere in England; while the remains of allied species, termed *Bootherium* by Leidy, have been found in the U. S. Revised by F. A. LUCAS.



Musk-ox.

Muskrat: a name applied in different countries to several rat-like mammals distinguished by musky exhalations. (1) In North America it is conferred on the *Fiber zibethicus* (by some called also *musquash*), a rodent of the family *Muridae*, and the group which contains the field-mice. It is larger than most of the family, being some 15 inches in length, with a tail of 10 inches. It is aquatic, sometimes building houses like those of the beaver, and oftener burrowing in river-banks. It is abundant in many parts of North America. Its fur (the "river sable" of commerce) is extensively sold in Europe. The creature has a strong smell of musk. (2) In India the name is given to the *Crocidura myosurus*, a large rat-like shrew, which possesses and communicates to whatever it touches an intolerable and nearly indelible musk-like smell. (3) It is also applied to the European *Myogale moschata*, or desman, a representative of the family of *Talpidae* or moles.

Musk-wood: the wood of *Guarea grandiflora* and *G. swartzii*, meliaceous trees of the West Indies, whose wood is finely redolent of musk. The name is also given to *Olearia argophylla*, a composite-flowered shrub of Tasmania, sometimes cultivated.

Muspratt, JAMES SHERIDAN, Ph. D., M. D., F. R. S. E.: chemist; b. in Dublin, Mar. 8, 1821; was educated in Liverpool, where his father established a large manufactory of chemicals; traveled in Germany and France; studied chemistry at Andersonian University, Glasgow, in the laboratory of Prof. Graham, whom he afterward accompanied to London; became when sixteen years old chemist for a large manufactory of chemicals in Manchester; tried mercantile life in the U. S. without success; studied chemistry under Liebig 1843-45, graduating as Ph. D. at Giessen; made numerous discoveries, chiefly in organic chemistry, especially concerning the remarkable bodies produced from the sulphocyanides of ethyl and methyl; founded the Liverpool College of Chemistry, and became a professor there. Among his works are a valuable translation of Plattner on the blowpipe (1844); *Outlines of Qualitative Analysis* (1849); and a *Dictionary of Chemistry* (1854, seq.), which found a wide circulation in both England and the U. S., and was translated into German and French. D. at West Derby, England, Feb. 3, 1871.

Musquash: See MUSKRAT.

Mussafia, ADOLF: philologist; b. at Spalato, Dalmatia, Jan. 15, 1834; studied at first medicine and then philology at Vienna, where he is Professor of Romance Philology at the university and member of the Academy of Sciences. He is one of the eminent scholars of the time in the Romance languages, particularly in text-criticism, old Italian dialects, and mediæval legends, and has contributed many articles and reviews to German, French, and Italian linguistic periodicals, many of his most valuable papers appearing in the publications of the Vienna Academy. Among his writings are *Italianische Sprachlehre* (1860); *Altfranzösische Gedichte aus venezianischen Handschriften* (1864); *Monumenti antichi di dialetti italiani* (1864); *Darstellung der altmailändischen Mundart* (1868); *Darstellung der romagnolischen Mundart* (1871); *Beitrag zur Kunde der norditalienischen Mundarten im XV. Jahrhundert* (1873); *Die catalanische metrische Version der sieben weisen Meister* (1876); *Studien zu den mittelalterlichen Marienlegenden* (i., 1886; ii., 1887; iii., 1889); *Zur Christophlegende* (i., 1893, etc.). E. S. SHELDON.

Mustel'idæ [Mod. Lat., named from *Mustela*, the typical genus, from Lat. *mūs* *la*, weasel, a dimin. of *mus*; cf. O. Fr. *musteile*]: name of a family of mammals of the order *Feræ* or *Carnivora*, comprising many species, such as the weasels, skunks, badgers, otters, etc. The form is very variable according to the genus, in some, such as the small weasels, the trunk being very much elongated, and in others, such as the gluttons and badgers, being comparatively concentrated and robust; the teeth are adapted to a purely carnivorous diet, the molars of the upper jaw and the last premolar of the upper jaw being typically sectorial, or adapted for cutting. The true molars are reduced in number to one above and two (or, as in *Mellivora*, one) below. The skull exhibits many characters in common; the paroccipital process is closely applied to the auditory bulla; the mastoid process prominent, and projecting outward or backward behind the external auditory meatus; the carotid canal is distinct, and more or less in advance of the foramen lacerum posticum; the condyloid foramen is distinct from the latter; the glenoid foramen is generally well defined; the intestinal canal has no cæcum; the prostate gland is not salient, being contained in the thickened walls of the urethra; Cowper's glands are not developed; the os penis is large. The family in most of the characters thus referred to exhibits decided affinity with the bears, raccoons, and allied forms, and not at all with the cats and dogs, agreeing with the last simply in adaptation for carnivorous diet. It contains numerous species, which have been distributed among eight sub-families—viz., (1) *Mustelinæ*, including the genera *Mustela*—i. e. the large weasels; *Putorius*—i. e. the small weasels; *Galeictis*—i. e. the weasels of tropical America; and *Gulo*—i. e. the gluttons or carcajou; (2) *Melinæ*, with the genera *Meles* and *Arctonyx*, or Old World badgers; *Mydous*, or African teledu, and *Taxidæ*, or American badgers; (3) *Mellivorinæ*, with its single genus, *Mellivora*—i. e. the African and Indian ratsels or honey-badgers; (4) *Mephitinæ*, or the American skunks, including the genera *Mephitis*, *Conepatus*, and *Spilogale*; (5) *Ictonychinæ*, with the South African genus *Ictonyx* or *Zorilla*; (6) *Helictidinæ*, with the Asiatic genus *Helictis*; (7) *Lutrinæ*, with the various genera of fresh-water otters of all parts of the world; and (8) *Enhydrinæ*, with the genus *Enhydra*, or the sea-otters of the North Pacific.

Mut: an Egyptian goddess; the second member of the Theban triad (Amon, Mut, and Khonsu), and wife of Amon. She symbolized Nature as the mother of all things. She is represented as a woman with a vulture head-dress, the uræus, and the double crown of Egypt, and with the life-sign in her right hand. C. R. G.

Mutata: See IMMUTATA.

Mutation: See UMLAUT.

Mutes [from Lat. *mūta* plur., translation of Gr. ἀφωνα, sc. γράμματα, toneless; ἀ-, not + φωνή, tone. The Greek grammarians commonly divided the letters into φωνήεντα, vowels, and σύμφωνα, consonants, and the latter into ἡμίφωνα, half-toned (ζ, ξ, ψ, λ, μ, ν, ρ, σ), and ἀφωνα, toneless (β, γ, δ, κ, π, τ, θ, φ, χ)]: a traditional term of phonetics, for which modern science generally substitutes the term explosives or stops (Germ. *Verschlusslaute* or *Explosivlaute*). These sounds are the result of a check upon the breath or the breaking of a check. The commonest illustrations are *k*, *g*, *t*, *d*, *p*, *b*. See PHONETICS. BENJ. IDE WHEELER.

Mutsu Hito, moot'sō sh'tō: the reigning Mikado or Emperor of Japan; b. Nov. 3, 1852; ascended the throne Feb. 3, 1867. His administration is notable for the great reforms that have been introduced and the remarkable development of the empire. The official designation of his reign-period is Mei-ji (pronounced mā'jee').

Mutton-bird: a popular name, used in Australia and New Zealand, for the large petrels of the genus *Oestrelata*, particularly for (*Oestrelata lessona*).

Mut'tra: town of British India, in the Northwestern Provinces; on the banks of the Jumna (see map of N. India, ref. 5-E). It is built on high and hilly ground, with magnificent flights of steps, adorned with temples, leading down to the river, which is kept sacred by the Hindus, and annually attracts vast numbers of pilgrims. The enormous riches which the town formerly contained have been carried away by various conquerors, its fortifications have fallen into ruins, and nothing is left but the narrow, dirty streets, which swarm with so-called sacred apes, parrots, peacocks, and bulls. Pop. (1891) 61,195.

Mužáková, mōzh'āk-ov'ā, JOHANNA: Bohemian novelist, better known by her pseudonym SVĚTLÁ (q. v.).

Myc'ale [= Lat. = Gr. Μυκάλη]: the modern *Samsum*; the westernmost branch of Mt. Mesogis, in Lydia, Asia Minor, terminating in the promontory called Trogylium (now Cape Santa Maria). In the narrow channel between this promontory and the island of Samos the Persian fleet was defeated and destroyed by the Greeks in 479 B. C. It is probable that at the time of the battle there was a town—Mycale or Mycallessus—at the foot of the promontory, but no certain account of it is extant.

Mycen'ae, or **Mycen'ne** [= Lat. = Gr. Μυκῆναι, or Μυκῆνη]: one of the oldest cities of Greece; situated on a rocky eminence in the plain of Argos, in the Peloponnesus. It was the residence of the Pelopidae, and at the time of Agamemnon it was the principal city of Greece. In 468 B. C. it was totally destroyed, and it was never rebuilt, but the remains of it, the cyclopean walls, the gate of lions, and the treasury of Atreus, are among the grandest and most interesting antiquities in Greece. The ruins are near the little village of *Charvati*, 5 miles N. E. of Argos. The excavations of Schliemann in 1876 and of the Greek Archaeological Society from 1886 to 1888 have added much to our knowledge of the importance of Mycenæ, for they brought vast treasures to light, and have opened up an entirely new chapter in the history of early art. See Schuchhardt, *Schliemann's Excavations* (London, 1891); Brunn, *Griechische Kunstgeschichte* (Munich, 1893); Overbeck, *Geschichte der Griechischen Plastik* (Leipzig, 1893); Collignon, *Histoire de la Sculpture Grecque* (Paris, 1892); Perrot and Chipiez, *Histoire de l'Art dans l'Antiquité, La Grèce Primitive, l'Art Mycénien* (Paris, 1893). See also Milchhoefer, *Die Anfänge der Kunst in Griechenland* (Leipzig, 1883); Loeschke and Furtwaengler, *Mykenische Vasen* (Berlin, 1886); Steffen, *Karten von Mykenæ* (Berlin, 1884). J. R. S. STERRETT.

Mycerinos (Egypt. *Menkara*): the Meehirinos of Diodorus; the sixth king of the fourth Egyptian dynasty; builder of the third largest pyramid at the S. W. of Gizeh. In 1837 Col. Vyse found his stone sarcophagus intact and also some pieces of the wooden coffin in his pyramid. The former was lost at sea off Gibraltar. The inscriptions of the latter show a definite form of the Egyptian belief in a future existence. His reputation for piety was enduring, and the thirtieth and sixty-fourth chapters of the RITUAL OF THE DEAD (q. v.) were said to have been discovered during his reign, being then already old. CHARLES R. GILLET.

Mycetozoa: See SLIME MOULDS.

Mycoderm: See FERMENTATION.

Myeli'tis [Mod. Lat. *my'elon*, spinal marrow, spinal cord (from Gr. μυελόν, earlier μυελός, marrow) + suffix -itis, denoting a disease of the part to whose name it is added]: a common nervous disease. Formerly the term was applied also to diseases which are allied but now easily distinguishable from it in life and *post mortem*. Myelitis may affect limited or extensive portions of the cord, and we speak of localized and diffuse or disseminated myelitis. The gray matter of the cord alone may be involved (central myelitis), or only the cortical white substance may be affected. An interesting form is that in which a transverse section of the cord, of limited extent, upward and downward, is inflamed in consequence of angulation of the spinal column or pressure from some other cause. This is known as transverse myelitis.

The causes of myelitis are varied. Sometimes it results from exposure to cold or from over-exertion. At other times it seems to result from infectious diseases, from injury, or from intemperance. The appearance of the spinal cord varies widely in myelitis, in accordance with the rapidity of development. In very acute cases and in those in which the disease results from pressure on some part of the cord, the affected area is softened and pulpy. When the process is more gradual, reparative changes take place at the same time as degeneration, and the cord may be gray and tough. Microscopically, the nerve-fibers of the cord are found in a state of greater or less degeneration, and there is an evident attempt at repair by new growth of fibrous tissue, as in destructive diseases of other organs.

The symptoms manifested in myelitis vary somewhat with its rapidity of development and with the distribution of the inflammation. Generally mild disturbances of sensation are the initial indications of spinal irritation. Among these

sensory symptoms are such as the feeling of ants crawling over the skin, numbness of the feet, a woolly feeling in the skin, pricking sensations, heat, cool, and the like. Soon after this, or considerably, power fails in the legs and tends to grow worse. Paralysis of the legs is known as paraplegia, and in the great majority of cases is due to myelitis. In exceptional instances the disease in the cord rises so high that the arms may be involved in the palsy, but more generally death takes place when the upper part of the spinal cord is diseased, before the distribution of the paralysis is defined. As the disease advances, some wasting of the legs is noted; sensation, in place of perversion, becomes benumbed, and there may be complete loss of feeling in the skin of the legs and body to the level of the disease. Finally, bed-sores are apt to develop, and serious disease of the urinary bladder and kidneys may result from inability to void the urine properly.

Myelitis is always a serious disease, very acute cases tending to early fatal termination, and only in its milder forms is treatment of much value in a curative sense. Much may be done to prevent unpleasant or dangerous complications, but complete recovery is rare even in mild cases. Absolute physical and mental rest may do much in the early stages to limit the disease. Careful diet and cleanliness are essential, especially the latter. Strict attention should be paid to the bed and to bathing the patient's back to prevent bed-sores. Certain remedies, like ergot, may occasionally have value at the onset of the disease; and after it has become established, cool bathing, the use of electricity to the limbs, strychnia, and nitrate of silver are to be recommended.

WILLIAM PEPPER.

Myers, Frederic William Henry; author; b. at Votwick, England, Feb. 6, 1843; was educated at Cheltenham College and Trinity College, Cambridge; was fellow of Trinity and classical lecturer 1865-68; published *St. Paul* (poem, 1867); *The Renewal of Youth, and other Poems* (1882); *Essays, Modern and Classical* (1883); *Science and a Future Life, and other Essays* (1893). He was collaborator in *Proceedings of the Society for Psychical Research* (1882 onward) and in *Phantoms of the Living* (1886).

J. M. BALDWIN.

Myliobat'idæ [Mod. Lat., named from *Mylio batifis*, the typical genus, liter., the millstone skate; Gr. *μύλας*, millstone (deriv. of *μύλη*, mill) + *βαρίς*, a flat fish, named from having teeth adapted for grinding]: a family of the class of selachians and order *Raie*, or rays; rather to be called *Aetobatidæ*, as *Aetobatis* is an older name for the genus often called *Myliobatis*. The disk formed by the union of the pectoral fins with the body is very broad, by reason of the lateral extension of the latter, and the tail is very long and attenuated; the dorsal fin is developed near its root, and behind it is one or a pair of spines serrated at their lateral edges; the pectoral fins are atrophied at the sides of the head, but at the extremity of the snout are developed as a pair of detached cephalic fins; the skin is smooth and destitute of spines; the head quite deep; the mouth inferior and transverse; the teeth have flat grinding surfaces, and are quadrangular or hexangular, and in one or several interlocking longitudinal rows. The family is divisible into two sub-families, the one with a median row of teeth, besides several lateral rows, which alternate and interlock with the adjoining ones, the other, with the teeth broad and in a single row, answering to the median row in the former. Several species are found on the coast of the U. S. On the eastern coast the *Rhinoptera bonasus* is sometimes called clam-cracker, sting-ray, and cow-nose ray; the *Aetobatis frenenillei*, sharp-nosed ray; and the *A. aquila* is in Eng. and known as eagle-ray. Referred to by D. S. JOSEPH.

Myli'ta (Gr. *Μύλιττα*): a goddess worshipped in Babylon, Assyria, and Persia; corresponding in some respects to the Greek Aphrodite Urania. She was the great cosmic principle, the great mother, who produced all life in conjunction with Bel (or Baal), her male counterpart. She was worshipped under a variety of names in Asia, and in Greece she was known now as Cybele and now as the Artemis (Diana) of Ephesus. J. K. S. See MYSTICISM.

Myocarditis: See HEART DISEASE.

Myopia [Mod. Lat., from Gr. *μύωψ*, short-sighted, liter., blinking the eyes; *μύειν*, close + *ὄψ*, eye]: short-sightedness due to excessive convexity of the cornea or to convergence of the visual axes of the eyes. The defect is remedied by concave glasses.

Myriap'oda (Gr. *μύριον*, ten thousand + *πύδος*, foot, hall) a class of elongated animals with homonomously segmented bodies. Popularly they are known as centipedes, millipedes, galley-worms, and army-worms. In structure they show considerable similarity to the so-called Protneheuta (*Peripatus*) and some of the annelid worms on the one hand, and to the Hexapoda (see ESTOMOLOGY) on the other. At one time they were classed with the Hexapoda under the term *Insecta*, or its equivalent *Antennata*, and at another as forming a distinct class by themselves. More recent studies have shown that half (Chilopoda) of the group have unimportant Hexapodan affinities, while the other half (Diplopoda) must stand by itself, as having no connection with the Hexapodan phylum. Herefore the two groups have been kept together chiefly on account of the common character of a multi-segmented and many-legged body. This, however, is overbalanced by the decided differences in the structure of the mouth-parts and in the position of the sexual organs, which can not be explained except by supposing an independent origin for the two groups. All previous endeavors to derive one group from the other have been based on an ignorance of the value of these differences, and on an exaggerated value of unimportant similarities or on those now readily explained without supposing the existence of a genetic relationship.

In both groups the number of legs varies greatly. Thus among the Diplopoda *Pauropus* has 9 pairs, *Polyxenus* 15, the *Polydesmidae* have 28 to 31, and the *Polyzonidae* from 56 to 196 or more. Among the Chilopoda the number varies from 15 in the *Scutigerridae* and *Lithobiidae* to 21 and 23 in *Scelopendridæ* and to as many as 170 and more in one of the *Geophilidae*. It is to be noted that only in the forms with comparatively few legs is the number constant for the species. In one of the common species of *Geophilus* (*G. bipuncticeps*) adults may be found with from 61 to 67 pairs of legs. There is a body segment for every pair of legs, although in the Diplopoda the upper half of the segment has become so modified that there are apparently two pairs of legs to a segment. Hence the name Diplopoda. In each ring either the dorsal portions of two segments have grown together, or one has covered two segments. Then this has grown downward, crowding the bases of the legs together until, in many instances, there is scarcely any sternal space between them. This explanation of the anomalous double-footed condition is based upon a comparison with the fused segments in certain Crustacea, and upon the development of the young Diplopod.

In the number and character of the mouth-parts real differences occur. While the number of oral appendages in the Chilopoda is three, which bear comparison with those of Hexapods (see ESTOMOLOGY), in the Diplopoda there are only two pairs, a pair of mandibles and a large plate-like lower lip (gnathochilarium), which, according to the embryological studies of Metschnikoff and others, is developed from a pair of primitive appendages. In the Chilopoda the first pair of legs become very much enlarged, and lie beneath the head as a pair of prehensorial jaws. In the terminal joint of these is a poison gland, which opens by a small pore near the tip of the terminal joint.

The internal anatomy in both groups is primitive in general character. The alimentary canal runs straight through the body without a stomach or a large intestine.



MYRIAPODS. A, *Scolopendra* (Chilopoda); B, *Dubia* (Diplopoda).

into regions such as are readily observed in the Hexapoda. The Malpighian tubules are two in number in all excepting the one genus *Scutigera*, in which there are four. The nervous system consists of a long chain of ganglia, one to each pair of legs, and a sub- and a supra-oesophageal ganglion. In the Diplopoda the two strands composing the chain are completely fused, and the ganglionic swellings are very slight. The respiratory system in the Chilopoda may be very complex from the interlacing and anastomosing of the tracheal branches. In the Diplopoda no such branching occurs; the tracheæ arise from the spiracles near the base of the leg and run into the body as simple tubes. To this *Glomeris* offers the only exception, but even here the branching is very simple. Though apparently ventral in the Diplopoda, the spiracles in both groups are on the side of the body, excepting in the genus *Scutigera*, where there is a row of spiracles in the median dorsal line. In this genus the internal structure also of the respiratory apparatus differs from that of the others. The spiracle opens into a small chamber from which radiate small tracheæ branching dichotomously and ending bluntly in the tissue surrounding the heart. There are seven of these organs, each situated on the posterior margin of a dorsal shield. In other forms of the Chilopod group the spiracles may be on every segment except the last two, as in the *Geophilidæ*, or on approximately every other one. Thus in the *Scolopendridæ* and the genus *Lithobius* they are found on segments 3, 5, 8, 10, 12, etc., while in the genus *Henicops* the arrangement is the same, with the addition of a pair on the first segment. The reproductive system of the Diplopoda is in marked contrast with that of the Chilopoda. In the latter the ovaries and testes lie above the intestine. The two oviducts pass along the sides of the intestine, unite under it, and open by a single opening in the penultimate segment. In the Diplopoda the genital glands lie underneath the intestine, and open by two short ducts in the third body segment or between the second and third pairs of legs. In both groups so-called salivary glands occur. In the Chilopoda these are short and racemose; in the Diplopoda they consist of two pairs of elongated simple tubes. These are so fused together as to appear like two elongated threads, one on either side of the intestine, comparable to the spinning glands of Lepidopterous larvæ, or to the slime-glands of *Peripatus*. Protective dermal or repugnatorial glands occur in both groups. On the majority of the rings in the Diplopoda there is a pair of repugnatorial pores, secreting a fluid with the odor of crushed almonds, due to the presence of hydrocyanic acid. In the *Geophilidæ* numerous pores are gathered into areas on each sternum. Besides these small pores there may be large ones on the coxæ of the penultimate segment, or on the anal segment. In the *Lithobiidæ* they occur on the under side of the coxæ of the last four pairs of legs. In some cases, as in one of the *Polydesmidæ* and several of the *Geophilidæ*, the animals are phosphorescent. In the former family the phosphorescence is plainly due to the action of the repugnatorial glands, but in the *Geophilidæ* observers differ as to whether it is produced by the ventral pores or in the intestinal region. Sensory organs are more or less developed. The eyes, where present, consist of simple ocelli, in numbers ranging from a single pair in one of the *Lithobiidæ* to very many in *Scutigera*. In *Scutigera* the ocelli are so numerous as to form a compound eye, comparable with that of Hexapods. The *Polydesmidæ* and some others among the Diplopoda, and the *Geophilidæ* and some of the *Scolopendridæ* among the Chilopoda, are without eyes. At the end of the terminal joint of the antenna of Diplopods are several two-jointed processes that are undoubtedly tactile in function, and may also be used as organs of smell. In *Sphærotherium*, of the same group, a stridulating apparatus occurs. This argues the presence of auditory organs.

The eggs of the animals are laid in the ground, usually in nests. In the case of *Lithobius* they are laid singly. Sometimes the eggs and newly hatched young are guarded by the mother, as was observed with *Geophilus ferrugineus* by Fabre and others, and with *Scolopocryptops* by Wood. *Scolopendra* is said to be ovoviviparous. The eggs undergo total segmentation, and during development show similarities to the eggs of *Peripatus* and to those of Hexapoda. Very much yet remains to be learned in regard to the early stages of growth. The Diplopod young escapes from the egg with few body segments and only three pairs of legs, a fact that has been regarded as proving their affinities with the Hexapoda, and as showing them to be the antecedents of the Chilopoda. The larva undergoes a

series of moultings, more segments and more legs being added with each moult until the adult condition is reached. Among the Chilopoda there are two distinct divisions to be noted. In one, the *Epimorpha*, the young hatch from the egg with the adult number of segments and legs, while in the other, the *Anormorpha*, the young have at first only seven pairs of completely developed legs and three pairs of leg buds. With successive moultings new segments and new legs are added until the adult number of fifteen is reached.

The distribution of the Myriapoda is worldwide, a fact that indicates an early origin. The Chilopoda are not, however, found earlier than the Tertiary period, unless the Protosygnatha of Scudder be admitted as a primitive Chilopod, which is extremely doubtful. On the other hand, the Archipolypoda, apparently the precursors of the Diplopods, are found as far back as Devonian times. Of the Protosygnatha, the only form, *Paleocampa anthrax*, found by Meek and Morthen in the carboniferous formation at Mason Creek, Illinois, has ten body segments and two rows of spreading fascicles of needle-like spines. These give it the appearance of a caterpillar, and as such it has been described. If it is at all related to the Myriapods, it is more likely to *Polyxenus* of the Diplopoda than to any of the Chilopoda. Concerning the relationships of the Archipolypoda there is less doubt. The *Euphorberidæ*, occurring in the same beds as *Paleocampa*, are peculiar from the large spines on the back and sides, and for certain openings occurring in each segment between the bases of the legs. The former occur in some of the Diplopoda, but the meaning of the latter is an unsolved problem. Chief among works on Myriapoda are Latzel's *Die Myriapoden der Oesterreichisch-Ungarischen Monarchie*, containing a full bibliography, and the embryological works of Metschnikoff, Sograff, and Heathcote. For American forms, see Bollman's *Myriapods of America* (1893). F. C. KENYON.

Myrsitica, or **Nutmeg**: the kernel of the seed of a tree about 30 feet in height, closely resembling the orange-tree; a native of the Banda islands and some neighboring islands. Its scientific name is *Myristica fragrans*. It does not flower until the eighth or ninth year, but after this time it bears flowers and fruit together constantly, and continues to do so for many years. In order to insure early fruitfulness a branch of the female tree is grafted into all the young plants when about two years old. Sometimes as much as three crops are gathered annually. Mace is the inside covering of the nutmeg. Upward of 1,500,000 lb. of nutmegs are imported into the U. S. yearly. Nutmeg is used in medicine as a nervous sedative, and mace is sometimes employed as its substitute. H. A. HARE.

Myrmeleon: See ANT-LION.

Myrmid'ones (in Gr. *Μυρμιδόνες*): the followers of Achilles in the campaign against Troy. They came originally from Ægina, and received their name from *μύρμηκες*, ants, because Zeus, at the request of Æacus during a plague, changed all the ants of the island into men, and thus peopled it. Peleus led them into Thessaly, where they settled.

Myrob'alan [viâ Fr. from Lat. *myrobalanum*, from Gr. *μυροβάλανος*; *μύρον*, unguent, fragrant juice + *βάλανος*, acorn]: a drug formerly much used in medicine as an astringent, and now used by tanners, dyers, and ink-makers for the tannic acid it contains. Myrobalans, sometimes called white galls, are the fruit of East Indian trees (*Terminalia bellirica* and *T. chebula*, of the order *Combretaceæ*), of a euphorbiaceous plant (*Phyllanthus emblica*), and of other trees of tropical regions.

My'ron (in Gr. *Μύρων*): a sculptor; b. at Eleuthera, in Attica, who flourished about 460 B.C. He was a pupil of Ageladas, as were Phidias and Polyclitus. He worked almost exclusively in bronze, in which he cast a great number of statues both of gods, men, and animals. Among his statues of gods his Hecate (in wood), two Apollos, a Dionysus, a group consisting of Zeus, Athene, and Heracles, and a group of Athene and Marsyas were celebrated. Several imitations of the last group are known—on Athenian coins, on an Attic vase now in Berlin, and on a marble relief now in Athens. An admirable copy in marble of the Marsyas of this group is now in the Lateran Museum in Rome. (See von Sybel, *Athene und Marsyas* (Marburg, 1879); Hirschfeld, *Athene und Marsyas* (Berlin, 1872).) Of his statues of mortals that of the runner *Ladas* and the *Discobolos* were most celebrated. The best account of Myron and his works is found in Collignon's, *Histoire de la Sculpture Grecque* (Paris, 1892). J. R. S. S.

Myrosin: See FERMENTATION.

Myrrh [readapted to Latin orthography: O. Eng. *myrra*, from Lat. *myrrha*; Gr. *myrrha*, from Arab. *myrr*, myrrh, liter., bitter; the general name of many resins, among them a still the *Commiphora myrrha* L., var. *myrrha* Andros. Myrrh is exported from the East Indies in the form of reddish-brown, brittle, resinous lumps, of a fragrant odor and bitter, aromatic taste. Its principal constituents are a gum and a resin. (See GUM RESINS.) Myrrh has been known from the earliest ages, being used as a constituent of incenses, perfumes, and salves. Taken internally, myrrh resembles other acrid resinous substances in tending to correct a feeble, relaxed condition of the mucous membranes, and in small doses promotes digestion and quickens the action of the heart. It is very little used as an internal medicine in the U. S. Locally, an emulsion of myrrh makes an agreeable mouth-wash for spongy gums and sore throat and dressing for indolent ulcers. EDWARD CURTIS.

Myrtaceæ [Mod. Lat., named from *Myrtus*, the typical genus: Lat. *myrtus*; Gr. *myrtos*, from Pers. *myrt*, myrtle. Cf. MYRRH]: an important natural family of dicotyledonous trees and shrubs, of tropical and warm temperate regions, with the entire leaves dotted with pellucid glands, containing an aromatic oil, no stipules, mostly numerous stamens, and an inferior compound ovary surmounted by a single style. Nine species, belonging to the genera *Calyptanthus*, *Eugenia*, and *Psidium* occur in the extreme Southern U. S. A peculiar portion of the family, embracing a majority of the species, is Australian, conspicuous among which is the genus *Eucalyptus*, *sp.* *sp.* Within the tropics the fleshy or berry-fruited genera prevail. The family is important for its useful products, such as GROVES and MYRTLE, GUAYAS and EUGENIA, CAMPHOR OIL, and BRAZIL NUTS, *sp.* *sp.* Besides the common myrtle, callistemon and several Australian shrubs and small trees are cultivated for ornament.

Myrtle [from O. Fr. *mirtul*, dimin. of *myrte* < Lat. *myrtus*, myrtle. See MYRTACEÆ]: popular name of trees and shrubs, mostly tropical and evergreen, belonging to the genus *Myrtus*. None are indigenous to North America. The common European myrtle, *Myrtus communis*, is a fine aromatic shrub whose berries yield a pleasant cordial. The leaves produce an aromatic oil, and water distilled with the flowers is the agreeable perfume known in France as *eau d'ange*. Several tropical species are cultivated. The name is popularly but incorrectly extended to other evergreen shrubs. For Dutch myrtle, see GALE.

Mys'ia (in Gr. *Μυσία*): a province of Asia Minor, bordering N. on the Hellespont and Propontis, W. on the Egean Sea, S. by Lydia, E. by Phrygia and Bithynia. It was subdivided into five territories—Lesser Mysia, Greater Mysia, Troas, Æolis, and Teuthrania. Among its mountains was Ida; among its rivers, the Scamander, Simois, and Granicus; among its cities Troy. J. R. S. S.

Mysore, *mi-sör'*: an independent state of India under British protectorate; between lat. 11° 35' and 15° N., and between lon. 74° 45' and 78° 45' E.; bounded on all sides by the territory of the Presidency of Madras. Area, 30,886 sq. miles. Pop. (1891) 4,943,604. It is an elevated table-land, rich in gold mines and salt, and producing, besides the common Indian grains, pepper, cardamoms, cinnamon, and coffee; water is often very scarce, and the country is infested with tigers and leopards. The reigning family is Hindu.

Mysore: the capital of the principality of Mysore; in lat. 12° 19' N. and lon. 76° 42' E.; at an elevation of 2,330 feet above the sea; 10 miles S. W. of Seringapatam, the former capital (see map of S. India, ref. 6-D). It is fortified, and contains the palace of the rajah and the residence of the British governor. Its splendid aqueduct has now fallen into ruins, and great trouble is often caused by lack of drinking-water. Carpets are manufactured here. Pop. (1891) 74,048.

Mysteries (in Gr. *Μυστήρια*): the secret worship of various gods, to which one might be admitted only after having passed certain purifying initiatory trials or degrees that varied in number in different Mysteries. In addition to what was universally known about any god, there were also certain secret facts and tenets of such a character that they might be divulged to the initiated alone. The character of these tenets varied according to the god honored in the Mysteries, but they can only be guessed at, inasmuch as everything connected with the Mysteries was kept secret. A clue to the general character of Mysteries is given by Plato (*Rep.* 2,378), who tells us that whatever is vicious, im-

moral, or disgraceful in the stories about the gods ought either to be buried in silence or else be told only in Mysteries, from which the mob must be excluded by making the sacrifice of a huge and unprocureable victim the condition of initiation. The Mysteries had their origin in the worship of the powers of nature, as seen in the contrasts of spring and winter, seed-time and harvest, the budding of new life from the rotting of the seed. Life springing from death in nature were contrasts in which the devout saw a bit of the history of the human soul. The myth of Persephone embodied the principle of life succeeding death, so that Mysteries were naturally held in honor of Demeter and her daughter. Just as new life sprang from the death of the seed, so new life must also spring from the death of the human body, and hence the doctrines of the immortality of the soul and of retribution after death were added at an early time to the doctrines taught in the Mysteries. Mysteries were held in honor of Demeter and Persephone at Eleusis, of the Cabiri in Samothrace, of Zeus in Crete, and at many places in honor of Dionysus, Cybele, Hecate, Aphrodite, Mithras, Orpheus, Isis, Zagreus and Sabazius. Specialized information will be found under ELEUSINIAN MYSTERIES. See also Stengel, *Griechische Kultusalterthümer* (Munich, 1890); Stengel, *Studien über die Eleusis und die Kores* (Leipzig, 1872); Füssen, *Der Mythos und die Kores, die Eleusinischen Mythen* (Stuttgart, 1874); Hagenmacher, *Die Eleusinischen Mythen* (Basel, 1880); Nebe, *Die mysteriösen Eleusis* (Leipzig, Halle, 1886); Roberts, *The Mysteries of Eleusis* (London, 1892); Gardner's article *Eleusis and the Mysteries* in his *New Chapters in Greek History* (London, 1892).

J. R. S. STERILE.

Mysteries: See MIRACLES-PLAYS.

Mysticism [from Gr. *μυστικός*, secret, mystic, deriv. of *μύστης*, one initiated, deriv. of *μύειν*, close (the lips or eyes); cf. *μυστήριον*, secret rite, mystery]: a term covering different notions (1) in ceremonial worship, (2) in religion, and (3) in philosophy.

(1) In worship, mysticism denotes the performance of certain rites or mysteries symbolizing and, at the same time, tending to establish certain ineffable relations between God (or the gods) and man. It is common to nearly all forms of worship save the most spiritual, is closely connected with theurgy and MAGIC (*q. v.*), and frequently produces enthusiasm or ECSTASY (*q. v.*) in the worshiper. In Greece, this mysticism, which is later than Homer, was confined, for the most part, to the worship of the gods of the earth and the underworld (*ἑσπερίοι θεοί*). Consult Landelius, *Die Mysterien*; Lebeck, *Ägyptische Mysterien*; Schmidt, *Die Götter und Heroen der Griechen*, pp. 425, seq.; Harv., *Recent Lectures for 1888*, lect. x.; Roberts in Smith, *Religion of the Semites*, lect. x.; Lenormant, *Chaldaean Magic* (London, 1877).

(2) Religious mysticism grows out of the enthusiastic or ecstatic element in ceremonial worship, and occurs in many religions. It is an attempt to enter into direct communion or union with the divine through (a) some abnormal psychical condition or (b) some faculty of the mind other than reason. It therefore assumes many different forms.

(a) The requisite abnormal condition may be produced by various causes, by drugs (homa-juice, hashish, wine, etc.), self-hypnotism, asceticism, mental alienation, hysteria, obsession, (f) etc. To such causes as these we must attribute the frenzy of the Corybantes and Bacchantes, the "inspiration" of the PYTHIA (*q. v.*) and oracle-givers generally, the dreams of the SEERS (*q. v.*), the performances of magicians, dervishes, and yogis, very many of the phenomena of mediæval Christian and Moslem mysticism and modern Spiritualism, etc. Upon all these light is being thrown by psychiatry and psychological research. Consult Cicero, *De Divinatione*; Myers, *Human Consciousness*; William Barrett, *Jesus Christ and the Mystics*; Myer, *Psychical Research*; G. S. Gifford, *La Philosophie et les Philosophes de l'Asie Centrale*, chap. iv.; Fitzgibbon, *The Mystical Element in Religion*; Prutz, *Die deutsche Mystik*, vol. i., pp. 13-141.

(b) The faculties, other than the reason, by which men have sought to come into possession of the divine are (a) feeling, (b) the supernatural sense. (a) Some persons, like Max Müller (*Philosophy of Language*, p. 37), hold that we actually feel the Infinite with our bodily senses; but generally the theopathic sense is held to be a kind of emotion, *volupté*, or passive love (*Mimesis*), im-

leads to QUIETISM (*q. v.*), belongs almost exclusively to Christianity and to monasticism. It seems to have originated in the allegorical interpretation of the Song of Solomon, begun by the Jewish doctors, and continued among Christians from the days of Origen onward. Indeed, Origen may be called the founder of this species of mysticism (see Bigg, *The Christian Platonists of Alexandria*, p. 188, *seq.*), which appears in every age of the Church after him, assuming sometimes revolting forms, sometimes, when combined with the higher mysticism, forms of great purity and beauty, as, e. g., in Bernard of Clairvaux's eighty-six sermons on the Song of Solomon. It forms a large element in the mysticism not only of Bernard, but also of all the greater mystics—e. g. Francis of Assisi, Hugo and Richard of St. Victor, Joachim of Floris, Eckhart, Suso, Thomas Aquinas, Bonaventura, Dante, de Gerson, Catherine of Siena, Thomas a Kempis, Angelus Silesius, Molinos, Fénelon, Madame Guyon, etc. Consult the works of these, also of Preger and Görres, *ut sup.*) The forms of mysticism thus far named may all be regarded as more or less material, morbid, and false. We now approach the spiritual, healthy, and true form, that which has its origin in the supernatural sense. (B) It is difficult to define this sense otherwise than by saying that it is the faculty which relates us to the spiritual world, as our bodily senses relate us to the material world, and enables us to recognize God as the Father of Spirits. It has been called by many other names, e. g. inspiration (Job xxxii. 8), Word of God, Word (first by Heraclitus), faith (first by Parmenides), synderesis (*συνείρεσις*, first by Jerome, in commenting on Ezekiel i.), spiritual sense, theory (Aristotle, *Metaph.*, xi., 7), practical reason (Kant), wisdom (Tennyson, *In Memoriam*, cxiv.; cf. xcv.), etc. It is, as it were, the convergence and apex (*apex mentis*, Bonaventura) of all the faculties of the soul, including perception, will, love, or, in Paul's language, faith, hope, love. When strongly marked, it makes the prophet or the religious genius, and all such are necessarily mystics—Zoroaster, Moses and the Hebrew *nebi'im*, Jesus (supremely), Mohammed (slightly—the Buddha not at all), Heraclitus, Æschylus, Socrates (with his *dæmon*), the Christian apostles, several of the Neo-Platonists, Christian and heathen, Augustine, the great mystics of the Middle Age (see under *a*), Luther, and many more. Indeed all persons for whom religion is a matter of personal experience, something more than an ethical code, an historical belief, or a system of observances, are mystics. Mysticism of this kind is the very essence of religion, the spring of all healthy, rational, human energy. Consult the *Gāthas* of Zoroaster, in *Sacred Books of the East*, vol. xxxi.; the Bible, the Fathers of the Church; Lane-Poole, *The Speeches and Table-talk of Mohammed*; the works named under (*a*); Spicker, *Die Ursachen des Verfalls der Philosophie in alter und neuer Zeit*; Brother Azarias, *The Culture of the Spiritual Sense, in Phases of Thought and Criticism*; Vaughan, *Hours with the Mystics*; Rosmini, *Autopsologia Soprannaturale* and *Teosofia*; Gioberti, *Teorica del Soprannaturale*.

(3) Philosophic mysticism seeks either (*a*) to grasp the divine by means of the reason (dialectic), or else (*b*) to draw out in terms of the reason the data of the faculty by which it is grasped. The former is pantheistic or panlogistic, the latter theistic. (*a*) Pantheistic mysticism, proceeding by abstraction, reaches at last the universal predicate, Being, which it then assumes to be the real ground of the universe, God, and, reversing the process of abstraction, tries to deduce the universe from him. It involves a complete confusion of the ideal with the real, of human thinking with the process of existence, and always finds its goal in darkness, self-annihilation, *nirvana*. Since abstract Being is equal to naught, and as *ex nihilo nihil fit*, no other logical result is possible. Of this sort is all Brahmanic, Buddhistic, Neo-Platonic, Moslem, Jewish, and much Christian mysticism. It finds its classical expression in the philosophy of Hegel, which is rightly called Panlogism. In the western world, this kind of mysticism seems to owe its origin to Parmenides, who identified being and thinking (*τὸ γὰρ αὐτὸ νοεῖν ἐστίν τε καὶ εἶναι*), and placed being in a transcendental world. He was followed by Plato, whose whole doctrine of ideas is a species of intellectual mysticism, from which even Aristotle is not altogether free. (See *Metaph.*, *ut sup.*) The germs sown by these thinkers developed, under the influence of Oriental religions (Mazdeism, Judaism, etc.), into the mysticism which we find in Philonism and Neo-Pythagoreanism, and, partly under the influence of Christianity, into Neo-Platonism and the Gnosti-

cism of Clement and Origen, the former of whom has some claim to be considered the originator of Neo-Platonism. (See Bigg, *Christian Platonists of Alexandria*, p. 64.) A later union of Christianity with Neo-Platonism gave birth to the works erroneously attributed to Dionysius Areopagita, the convert of Paul. These works were written by a Neo-Platonic Christian about A. D. 400, and became known to the Latin Church through the translation of Scotus Erigena in the ninth century. They completed the union of Hellenism with Christianity, and furnished the type of mediæval theology and piety. From that time pure pantheistic mysticism ceased, until it was revived in the systems of Bruno, Spinoza, and Hegel. (Consult Brahmanic *Upanishads* and Buddhistic *Suttas*, in *Sacred Books of the East*; Mohini, translation of *Bhagavad-Gita*; Max Müller, *History of Sanskrit Literature*, chap. ii.; Dieterici, *Philosophie der Araber*, vol. i., pp. 164, *seq.*; Syed Ameer-Ali, *Life and Teachings of Mohammed*, chap. xix.; the *Cabbala*; the fragments of Parmenides, in *Journal of Spec. Phil.*, vol. iv.; the *Republic* and *Timæus* of Plato; Aristotle, *Metaph.*, book xi., in *Jour. of Spec. Phil.*, vol. xxii.; the works of Clement of Alexandria, Origen, Plotinus, Porphyry, Iamblichus, Proclus, Dionysius Areopagita; Westcott, *Religious Thought of the West*, pp. 142, 194, *seq.*; Bruno's philosophic works; Spinoza, *Ethica*; Hegel, *Logik*, *Naturphilosophie*, *Philosophie des Geistes*. Cf. Frothingham, *Stephen Bar Sudaili, the Syrian Mystic, and the Book of Hierotheos* (Leyden, 1886); *Der Neoplatonismus*, in Harnack, *D. G.*, i., 719, *seq.*) (b) Theistic philosophic mysticism is almost peculiar to Christianity, and dates from (the pseudo-) Dionysius (see above) and Augustine. It was in part due to the same cause as monasticism, and is closely connected with it. That cause was the secularization of the Church, which forced the more profoundly religious and reflective spirits to withdraw from the practical world and seek satisfaction in speculation. The monks were a church within the Church. The speculations of Dionysius and Augustine, continued through Maximus Confessor, Joannes Damascenus, Scotus Erigena, and others, finally celebrated a glorious resurrection in Bernard of Clairvaux. Bernard is the perfect type of the theistic mystic—God-intoxicated, yet keenly alive to the personality of God; practical in the best sense, yet living above the world. In him catholic piety ("Mysticism is catholic piety, in so far as this is not obedience to the Church," Harnack, *Dogmengesch.*, iii., 375) reached its highest expression, imparting a freedom which makes him interpret the records of revelation and the dogmas of the Church in terms of his own supernatural consciousness, and a power which enables him to dictate even to the head of the Church (see his *De Consideratione*); but he had no followers, except, perhaps, Dante—who knew so well the exceptional character of his mysticism as to place him in heaven, far above all other mystics, and make him his own last guide—and Savonarola. The mysticism of those who usually count as his successors, Richard and Hugo of St. Victor, Albertus Magnus, Thomas Aquinas, and Bonaventura, is, in reality, different, inasmuch as it subordinates the personal consciousness to the letter of Scripture and dogma. Their mysticism is co-ordinated with SCHOLASTICISM (*q. v.*), which in its earlier shapes rests upon Platonism and Neo-Platonism (pseudo-Dionysius), in its later upon Aristotelianism. It constantly tends, therefore, to abstract formalism and pantheism in thought, and slavery, not sonship, in practice. Its highest aim is the "superluculent darkness" of Dionysius. Indeed it was hard for mysticism to maintain itself on the height to which it rose in Bernard. Being composed of three elements, intelligence, love, will, it required that these should be completely and harmoniously blended in the "spark of synderesis" which unites man to God. And this can happen but rarely. Intellect in excess leads to pantheism. Neo-Platonism, and panlogism; love in excess, to QUIETISM (*q. v.*) and morbid sentimental pietism; will in excess, to antinomianism and contempt for morality. All these excesses are to be met with in the mysticism of the Middle Ages. German mysticism, in hysterical and theopathic forms, began in the twelfth century, and was professed mostly by nuns. (See Preger, bk. i.) The higher orthodox mysticism was inculcated by Albertus Magnus (see Bach, *Des Alb. Mag. Verhältniss zu der Erkenntnisslehre der Griechen, Lateiner, Araber und Juden*, pp. 182–212), who was followed by David of Augsburg, Berthold of Regensburg, and Dietrich of Freiburg; but the founder of what is known specifically as "Deutsche Mystik" was Meister Eckhart (see ECKHART, MEISTER), whose system, as

might be expected, was a compound of theopathy and theosophy (*q. v.*). It is, to a large extent, a return to Neoplatonism, but contains a dialectic element due to Aristotle, and a love element (*Amor*) due to Bernard and the German temperament. It comes, in its results, very close to Buddhism (see Neumann, *Die deutsche Romantik als buddhistischer und christlicher Lebens- und Gemüthsleben, Sätze und ein Traktat Meister Eckharts*, 1891), and is distinctly pantheistic; also in principle, though not in intention, anti-catholic. It endeavors, by a dialectic process, to penetrate the nature of God, One and Three, and through a process of love to bring the individual soul into union with him; but the dialectic reaches only an abstraction, and the love, being pathological, is destitute of moral force. The immediate knowledge of God which Eckhart claimed for the individual soul through its spark of synderesis (*Fünckchen*) formed the fundamental principle of the Protestant Reformation; and this was recognized by Luther, whose fondness for Tauler and the "Deutsche Theologie" is well known. There is a sense in which it may be said that the Reformation grew out of mysticism. The speculative mysticism originating with Eckhart may be called High German mysticism. Of somewhat later date is the Low German practical mysticism, whose founder was Johannes Ruysbroek. His pupil, Geert de Groot, was the founder of the society known as the Brothers of Common Life, whose most famous members were Thomas a Kempis, author of the *Imitation of Christ*, and Nicholas of Kues, one of the greatest of speculative mystics. (See Kettlewell, *Thomas a Kempis and the Brothers of Common Life*.) Contemporary with the later German mystics were de Gerson in France, and Catherine of Siena, and Savonarola (burned 1498) in Italy. After the Reformation there were two classes of mystics, one protestant, resting on the Gospel, the other, catholic, resting upon dogma. To the former belonged Luther, Casper Schwenckfeld, Sebastian Franck, Valentine Weigel, and Jacob Böhme; to the latter, Philip Neri, Sta. Theresa, Loyola, Francis of Sales, John of the Cross, Paracelsus, Campanella, and Giordano Bruno, in the last three of whom the modern scientific element predominated. Since the date of Bruno's death (1600), though there have been many noble Christian mystics—Angelus Silesius, Poirer, Malebranche, Madame Guyon, Fénelon, Cardinal Gerdil, Jacobi, Schleiermacher, Klopstock, Novalis, Gioberti, Thomas Taylor, Jones Very, etc.—there has hardly been any new movement except that initiated by SWEDENBORG (*q. v.*). Orthodox mysticism found a wonderful example and systematizer in Rosmini (1797-1855), who may be called the last of the Christian mystics. A return to purely intellectual mysticism, divorced from religion, was made by Spinoza from Judaism, by Giordano Bruno from Catholicism, by Hegel from Protestantism. Along with the last ought perhaps to be named Schelling, Krause, and Baader. Consult the works of the mystics above named, especially Bonaventura's *Itinerarium Mentis in Deum*, translated in *Jour. of Spec. Phil.*, vol. xxi.; also Thomas a Vallgornera, *Mystica Theologia Divi Thomæ*, 2 vols.; Pfeiffer, *Die deutschen Mystiker des XIV. Jahrhunderts*; E. Janssens, *Schles. Intellektuelle Lebens- und Gemüthsleben, von Eckhart bis de Groot*; Schell, *Die deutsche Mystik*; F. Allington, Paris, 1878; Stöckl, *Philosophie des Mittelalters*; Erdmann's and Ueberweg's histories of philosophy (the latter contains an excellent bibliography); Haller, *Deutsche Mystik*; Müller, *Kristenmythologie*; Schell, *Heiliges Leben*; *Christian Church*, and the literature there cited; Störck, *Bernard of Clairvaux*. — Thomas Davidson.

Mytho: See **LOGOS** CHINA *q. v.*

Mythology (Gr. *mythos*, word, story, tale; *logos*, discourse, reason): the science dealing with that body of poetic and quasi-scientific tradition which gathers about the religious belief of a race; or, the body of myths themselves. The notion of mythology should be sharply distinguished from the notion of religion; and the myth, though it must be connected with religion, should be distinguished from the cult or round of ceremonies employed in actual worship. We distinguish between the worship of a god and the story of a god. Nor, again, should we confound the myth with the creed or religious philosophy of a primitive race, although the myth may often embody the result of such speculation. A race which has reasoned out no creed, no rude system of religious belief, may nevertheless have myths, as it may have a cult. The cult is a matter of daily habit, a round of ceremonies to insure certain benefits or

avert certain evils; the creed is primitive thought; but a myth is the offspring of observation and unconscious fancy. Primarily, it attributes will and passion to the objects and processes of nature; yet this statement, correct so far as it goes, does not give a complete definition of the myth, but leaves out of account certain other factors with which we shall presently reckon.

History of the Science.—Myths have been found in every part of the world, and the study of them upon a historical and philological basis has resulted in the science of comparative mythology; but while this is a modern affair, attempts to explain the myths are as old as history. Even while they were current articles of faith, the rationalist began to oppose the believer. Criticism of this type fell into two classes. On the one hand, myths were explained by men like Anaxagoras and Heraclitus as allegory, as symbolical of some fact or truth. On the other hand, Euhemerus (about 316 B. C.) declared that a myth was nothing more than a fact covered with parasitic growth of supernatural fancies—that, e. g. Demeter was simply a woman who had introduced the art of baking bread. This interpretation of myths was a favorite among the early Christian writers, and finds a modern champion in Herbert Spencer (*Principles of Sociology*), who regards the myth as corrupted tradition of a dead and deified ancestor, complicated by the confusion of metaphorical statement. The opposite line of theory, which treats the myth as allegory and symbol, reached its ultimate absurdity in Bacon's *Wisdom of the Ancients*, where sundry classical myths are interpreted as bearing within them the most subtle lessons of morality and statecraft.

To treat myths as symbol and allegory, or as distorted fact, was the general drift of criticism down to modern times, when the rise of two great sciences, comparative philology and anthropology, developed two corresponding theories of the myth. The enormous gains made for our knowledge of the past by the comparison of related languages led certain scholars, notably Prof. Max Müller, to base the study of myths upon the study of words, particularly the names of gods and heroes. As the scholar had followed a group of related words to a supposed primitive Aryan word, so he resolved a group of related myths into a primitive Aryan myth. Although this method was foreshadowed by Jacob Grimm, it could be realized only by a student of Oriental languages; and Max Müller must be reckoned as founder of the science. His particular school came to regard the bulk of Aryan myths as sun-myths, while German advocates of the same general theory preferred the storm-cloud; but all of them were agreed in regard to the primitive Aryan myth, and in regard to the philological method of research. As to the origin of a myth, they taught that the literal words in which man spoke of natural processes were abstracted from these processes, were conformed with other words, and so came to represent divinities; hence the myth of a god and a deed, from the original statement about a natural object and a process (*Disease of Language*). "Mythology," says Müller, "is only a dialect, an ancient form of language."

To study words, then, seemed and seems to these critics the proper key of mythology. On the other hand, anthropologists regard a myth as no chance of speech, but as inevitable product of the human mind in certain stages of culture, and explain it by analysis of the physical and social environment. Edward B. Tylor has given an admirable summary of this doctrine in the chapters on mythology and on animism in his *Primitive Culture*; while Andrew Lang has brought the myth into closer relations to customs and folk-lore generally.

Philosophy.—While we are concerned with the myth that instinct of primitive man to see will and passion behind the processes of nature, just as will and passion are behind human deeds, it is necessary to note certain restrictions upon this doctrine. First, we must admit with Mannhardt the influence "of poetic and literary production as an essential factor in the formation of mythology." From this consideration, again, we derive an-

Schwartz called attention to the distinction between the origin and the development of a myth, and showed that a rude and brutal race will make a rude and brutal myth. Prof. E. H. Meyer places, therefore, "a pandemonium before the pantheon"—first demons, a horde of petty gods of the dead, mere ancestor-worship; then gods and ten of gods. Thirdly, we must allow extensive distribution

and borrowing of myths from race to race, a fact which spoils many a pretty theory of the older comparative mythologists. Fourthly, we admit as a factor in early myths not merely unbridled fancy, but unbridled curiosity as well, the rude scientific instinct which seeks to account for a strange fact or even a strange name. (See Tylor, *Early History of Mankind*, chap. xi.) We can, however, allow little weight to Scherer's claim for "entertainment" as the main factor in myth-making. Fear had more to do with the early myths than any phase of pleasure. Finally, we must admit that the world within, the realm of dreams and visions, had almost as great an influence on the making of myths as the world without. The nightly visitant, combined with ancestor-worship, could give rise to a demonic myth; and the feigned wanderings of the dreamer himself, not to speak of the connection easily made between mysterious beasts, such as the snake that glided suddenly from the neighborhood of a sleeping man, and the independent spirit, could also produce a plenty of such rude myths as we still meet in folk-lore—e. g. the common story of the soul leaving its body in shape of snake or mouse. Nevertheless, while the tendency of modern criticism to divest myths of their old majestic character, to bid us look if we would study origins, not at the stately figures of Olympus, but at the "cruel, puerile, and obscene" stories of the primitive savage, has both critical sanity and historic truth, the process can easily go too far. It goes too far when it concedes to primitive man an interest in the world within and denies him an interest in the world without. The sense of a vague personality in storm and fire he surely knew. The beauty of sunset, of sparkling ocean, was of little interest to him; but the thunderbolt ("it thunders," we still say), the whirlwind, whatever natural process came with overwhelming terror into his life, must have had personality for him, a cult of fear and sacrifice, and a myth.

It seems best to divide myths into those of the savage and those of semi-civilized races, the lower and the higher mythology, remembering that traces of the former will always be found in the latter. In savage myths little distinction is made between subjective and objective impressions; hence the strange medley of man, beast, and inorganic nature, all thrown together on one plane of mythic fancy. In the developed myth subjective impressions count for little; there is system, with a certain air of probability, and the ordering touch of literary instinct. Indeed, many a so-called myth is simply a bit of primitive science, a desire to give rational answers to curiosity.

Savage Myths.—Along with the fantastic, monstrous, and brutal stories of the savage we find distinct traces of element-myths. Evidence is at hand that even rudest tribes have doubted the stars were fire, and have regarded them as personal agents. Certain Africans were sure that the wind was a man, or at the least a bird. What we do not find, however, in this stage of culture is any system of myths, any cosmogony, that goes beyond an individual story. What has passed for such a system often turns out to be a missionary's account of creation translated into terms of savage thought; while the genuine myth goes no further than a makeshift, like the tortoise which holds the world upon its back—a myth found in North America as well as in India—or like the countless tales of sun and moon, eclipse, tempest, and earthquake. Moreover, the myth embodied primitive history, and supported that claim for divinity with which a race regarded its founder. Hence the heromym, the story of the great head of the race, as culmination of the system of ancestor-worship; hence, too, the allied myth of the culture-hero, the being who brought the race its arts of life, its primitive civilization. It is not only a Cadmus who plays this part; our native myth is full of such characters. (Brinton, *American Hero-myths*, Philadelphia, 1882.) Finally, among the lower myths, though not necessarily savage, are the tales of serviceable household spirits, familiar demons, and all other survivals from the days of ancestor-worship.

Higher Myths.—Here, to use Meyer's phrase, we have the pantheon developed out of the pandemonium. Dignity succeeds silliness; system takes the place of confusion; and such brutal or absurd elements as tradition has preserved are veiled, or belittled, or even explained away. Stories of the gods reveal only by implication the elements with which these had been identified—Zeus for the sky, or Apollo for the sun. Such myths belong distinctly to the realm of

poetry, sacred, to be sure, but none the less poetry. They tend more and more to the personal, the romantic, the literary. They combine with heroic legend to form the great epics, and stand in the forefront of every national poetry. Ethical conceptions cross and sometimes control the old traditions of wayward and inexplicable power in the divinity in question. Compare, for example, a Vedic hymn with a Vedic myth. At worst, the old brutalities are transformed into romance, just as love and war are used to disguise brutality and lust. Cycles of myths are told of one god or hero. In the old Persian religion we note a distinct superiority of the ethical and philosophical over the mythical; in Hellenic myths, again, poetical rather than ethical considerations have conquered. The elements of these different myths have been mingled and confused to a degree that makes the "interpretation" of them so supremely difficult, or so supremely easy. Besides the perplexing question of borrowing and distribution, we are everywhere confronted by the difficulty of sundering the myth-maker from the poet pure and simple. If we once drop the clew of religion, the test of belief by definite worshippers in the god in question, and belief to a reasonable extent in the myth itself, we are not only lost in the maze of poetry, and must accept the *Faerie Queene* or even Burns's *John Barleycorn* as a part of mythology, but we have no criterion for separating the myth from the heroic legend. Though the cord which bound the myth to some sort of religious worship may have been both long and loose, there must have been such a cord, or we are not dealing with a myth.

BIBLIOGRAPHY.—Of the countless works on mythology, general and special, we note: K. O. Müller, *Prolegomena zu einer wissenschaftlichen Mythologie* (1825), the first really scientific treatise on the subject; Max Müller, *Orford Essays* (1856); A. Kuhn, *Die Herabkunft des Feuers*, etc. (1859); M. Bréal, *Mélanges de Mythologie et de Linguistique* (Paris, 1877), especially essay on *Hercule et Cacus*, originally published 1863; Tylor, *Primitive Culture*, chapters on *Mythology* and *Animism*, probably the best modern treatment of the subject; Andrew Lang, article *Mythology* in the *Encyclopædia Britannica*, *Custom and Myth*, and *Myth, Ritual, and Religion*; E. H. Meyer, *Indogermanische Mythen* (2 vols., 1883-87); H. Spencer, *Principles of Sociology*. These represent each a definite school; for general summaries regarding the science may be noted: O. Pfeiderer, *Religionsphilosophie auf geschichtlicher Grundlage* (Berlin, 1878); Otto Gruppe, *Die Griechischen Culte und Mythen in ihren Beziehungen zu den Orientalischen Religionen* (vol. i., Leipzig, 1887); and Chantepie de la Saussaye, *Lehrbuch der Religionsgeschichte* (2 vols., Freiburg, 1887-89).

FRANCIS B. GUMMERE.

Mytilæne (in Gr. *Μυτιλήνη*): the most important city of Lesbos, situated on the eastern side of the island (see map of Greece, ref. 15-M). It was celebrated in antiquity as a seat of literature and art, being the birthplace of the poets Alcaeus and Sappho, the historians Hellanicus, Chares, and Theophrastus, the statesman Pittacus, the philosopher Cratippus, the rhetoricians Lesbonax, Polemo, and Diophanes. The city played an important rôle in every period of Greek history. It is still the chief city of Lesbos. See Conze, *Reise auf der Insel Lesbos* (Hanover, 1865); Archontopoulos, *Λέσβος* (Canea, 1866); Koldewey, *Die antiken Baureste der Insel Lesbos* (Berlin, 1890); Cichorius, *Rom und Mytilene* (Leipzig, 1888). The name is also applied to the island. See LESBOS.

J. R. S. STERRETT.

Mytil'idae: See MUSSEL.

Myxomyce'tes and **Mycetozo'a**: See SLIME-MOULDS.

Myzos'toma [Mod. Lat., from Gr. *μύζω*, suck + *στόμα*, mouth]: name of a genus of peculiar parasitic animals of uncertain affinities. Myzostoma has a disk-like body, about a sixth of an inch in length, around the margin of which are a number of warts or longer processes, while on the under surface there are five pairs of hooked feet, and in front a tubular protrusible proboscis. About seventy species are known, all marine, and all living upon crinoids. By some they are regarded as having affinities with the parasitic mites, while others, with more reason, place them among the worms (Chaetopoda). The species are described by von Graff in part xxvii. of the zoölogy of the Challenger expedition. The best account of the structure is by Nansen (Bergen, 1887).

J. S. KINGSLEY.

N



: the fourteenth letter of the English alphabet.

Form.—Its form is derived through the Roman alphabet from the Greek Ν, Ν, or Μ, corresponding to the Phœnician or Canaanitic מ, מ.

NOTE.—The English name *car* represents the Latin name *car*, which was a substitution for the Greek name *car*, after the manner of *aur*, *ch*, *er*, *es*, instead of *au*, *la*, *to*, *le*, *rho*, *sigma*. The Greek name *car* represents the Phoenician *car*, fish, probably suggested by the form of the letter, possibly also by the proximity in the alphabetical series of *mēm*, water, provided the arrangement itself is not due to the signification of the names rather than the sounds of the letters.

Sound.—Its sound is a dental or alveolar nasal. The passage of air through the mouth is checked by pressing the forward rim of the tongue against the roots of the upper teeth or against the teeth themselves (in English the former), and voiced breath passes out through the nasal cavity opened by depressing the soft palate. The sound of *n* is differentiated from that of the other nasals, *m*, *ng*, solely by the different shape and size of the oral resonance-chamber. In the case of *m*, this is formed by closure of the lips, in that of *ng* by contact of the body or back of the tongue with the palate. The sound of *n* is to that of *d* as *m* is to *b* or *ng* is to *g*. It may serve as a vowel, as in *arden*, *forgotten*, *even*, where the preceding unaccented vowel has been silenced. The letter is silent after *m* in the same syllable, as in *hymn*, *autumn*, *solemn*, also after *l* in *kiln*. After an accented vowel before a guttural it has generally the sound of the guttural (palatal) nasal *ny*, as in *longer*, *anger*, *uncle*, *empress*, *camper*, *ask*, *thank*, *anxious*; but when coupled with *g* in the same syllable it unites with it to express the guttural nasal, and *g* has no separate sound; thus *song*, *singer*, *tongue*, *wing*, with which contrast *long-er*, *fin-ger*.

Source.—The sound has in general been faithfully preserved as representative of Teutonic and Indo-European *n* in the native Teutonic element, and of Latin *n* in the Romance element: cf. *night*; Goth. *nabhts*; Lat. *nox*; Skr. *adakti*; *cham*; Goth. *kinnans*; Gr. *γένος*; *reign*. M. Eng. *reign* from Lat. *regnum*. Teuton. *n* is lost in O. Eng. before *s* and *þ*; cf. Eng. *gnost*. O. Eng. *þas*; Germ. *gnaves*; Eng. *gnath*; Germ. *salen*. Eng. *finger*; Germ. *ander*; Eng. *month*; Germ. *maim*.

Value as Symbol.—N = (in chemistry) nitrogen; also, noon, north, Norse; as a medieval numeral, a symbol for 90. Na = Sodium (*Natrium*). See ABBREVIATIONS.

Best. 100. Winner.

Nablus', Nabulus, or Napolose: town of Palestine; the ancient Shechem or Sychem, capital of Samaria, probably the same as the Sychar of the New Testament (see map of Palestine, ref. 8-D). The city, which had fallen into decay, was rebuilt by Vespasian and called *Nesapolis*, whence the name Nablus is derived. It is 32 miles N. of Jerusalem, on the watershed of a narrow valley, not more than 600 feet wide, between Gerizim and Elbal. This was Abraham's first camping-ground in the country. Here Joseph was buried, and here Joshua delivered his last address to the Israelites. It was one of the cities of refuge. Its situation is marvelously beautiful. There is no greener or more fertile spot in Palestine. It carries on a lucrative trade in cotton and oil, and manufactures coarse cloth and soap, sending large quantities of the latter to Egypt and the East. Among its 9,000 inhabitants are a few Jews, Samaritans, and Christians, but the majority are Mussulmans. At the eastern end of the valley, 1½ miles distant, is Jacob's well.

E. A. GROSVENOR.

Nabob [from Hind. *nawāb*, from Arab. *nawāb*, plural of *nāib*, vicegerent, governor]: under the Moguls in India, a viceroy or governor of a province. The title afterward came to indicate merely high rank without office. In process of time many of the nabobs became virtually independent monarchs. It was the mutual jealousy of the nabobs that made India the comparatively easy prize of British adventurers.

Nabonassar's year. Era of: an era employed in the Chaldean and Assyrian Greek chronology. By Berosus it was reckoned from the accession of King Nabonassar to the Babylonian throne, which took place Feb. 26, 547 B.C., as shown by astronomical records.

Sachees: See SACS AND ISIRIANS.

Nachtigal, naakhti-gaál, GUSTAV: physician and explorer; b. at Liebstadt, Prussian Saxony, Feb. 25, 1834; studied medicine at Berlin, and practiced for some time at Cologne; entered the service of the Bey of Tunis in 1863, and went in 1869 to Kuka to convey presents from the King of Prussia to Sheikh Omar el Bettan. On Feb. 18, 1869 he started from Tripoli, and reached on Mar. 27 Murzuk, where he stopped till Apr. 18, 1870, exploring the country of the Tibbus in the meantime, and arrived at Kuka July 6. He returned by Wady and Darfur, and reached Cairo in Nov. 1874, having explored the countries belonging to Baghirmi. The results of his explorations he communicated in 1874 in Petermann's *Mittheilungen* and the London *Geographical Magazine*. In 1879 he published *Sahara and the Soudan. Results of Six Years' Wanderings in Africa*, and in 1882 he was appointed German consul at Tunis. In 1884 he was sent to the west coast of Africa charged with effecting the annexation to Germany of the Cameroons, Lüderitzland, and other territory. D. on shipboard on his return to Germany, Apr. 19, 1885. Revised by M. W. HARRINGTON.

Nacogdoches, năk-ō-dō'chez: city; capital of Nacogdoches co., Tex. (for location of county, see map of Texas, re 3-J); on the Houston, E. and W. Tex. Railway; 53 miles N. E. of Crockett. It is in an agricultural and cotton-growing region, contains 8 churches, 5 secret-society lodges, a college, a national bank with capital of \$50,000, a private bank, and 3 weekly newspapers, and has several manufacturing and over 100 business concerns. Pop. (1880) 333; (1890) 1,138; (1894) with suburbs, 2,500.

EDITOR OF "STAR-NEWS,"

Nadal, EHRMAN SYME; author; b. at Lewisburg, W. Va., Feb. 13, 1843; graduated at Yale in 1864; was secretary of legation at London in 1870-71, and again from 1877-84; has lectured, engaged in journalism, and written for the magazines. Among his books are *Impressions of London Social Life* (London, 1875); *Essays on History and Philosophy* (1882); and *Zweibach, or Notes of a Professor in Italy* (1887).

H. A. B.

Nadaud, năă'dō', GUSTAVE : song-writer ; b. at Roubaix, France, Feb. 20, 1820. After completing his studies at the Collège Rollin at Paris (1834-38), he found employment in a business-house at Roubaix. In 1840 he removed with his parents to Paris, and embarked in business as a cloth-merchant. The success of some songs which he had composed, set to music, and sung for the entertainment of friends led him in 1849 to give up his business for song-writing, and in that year he published a small collection which was greatly enlarged in successive editions (1852-62-70, etc.). At first his songs celebrated conventional subjects, but afterward entered the field of political satire or became the vehicle of a gay and easy-going conception of life. D. Apr. 28, 1893. His works comprise also the words and music of several parlor operettas, collected in two volumes: *Opérettes* (7th ed. 1867) and *Œuvres complètes* (1879) ; a novel, *Le Fils de l'artiste* (1851) ; a *Manuel de la chanson* (1886) ; *Myrtilles* (1888) ; *Amour, mariage, mariage* (1889).

$$\lambda_1, \dots, \lambda_n \in \mathbb{N} \cup \{0\}.$$

Na'dir Shah, or Kuli Khan, Shah of Persia, born at Kelat, in the province of Khorassan, Persia, in 1688; became while still a young man the leader of a gang of robbers, by whose aid he captured and held several towns and fortified places in Khorassan: espoused the cause of Tamasp, the legitimate ruler of Persia, against the Afghan invaders; was appointed commander-in-chief of Tamasp in 1727; defeated the Afghans repeatedly, and succeeded finally in driving them entirely out of the country in 1730. Tamasp now made him the governor of the provinces of Khorassan, Mazanderan, Seistan, and Kerman, and he assumed

the name of Tamasp Kuli (Tamasp's slave), to which the shah added the title of khan. In 1731 he fought against the Turks and defeated them, and when in 1732, during his absence on a campaign against the Afghans, Tamasp was defeated by the Turks and concluded a dishonorable peace with them, ceding several provinces, Kuli Khan deposed him, and raised his son, Abbas III., a child, to the throne. The war with the Turks was renewed and carried on with great success, and when Abbas III. died in 1736 Kuli Khan was crowned Shah of Persia under the name of Nadir Shah. His reign was very brilliant in military undertakings, especially his expedition into Hindustan. He defeated the Great Mogul, captured Delhi, and carried away to Persia an enormous booty. He restored to Persia her old boundaries from the time of the Sassanides, but in course of time he became greedy, suspicious, and a merciless tyrant; whole cities were put to the sword. He was assassinated June 20, 1747. His *Life* was written in Persian by Mirza Mohammed Mahadi Khan, and translated into French by Sir William Jones (1770). See H. Maynard, *Nadir Shah* (1885).

Nævius, GNÆUS: author; b. in Campania about 264 B. C.; served in the first Punic war, and became famous as a writer of comedies and tragedies. He belonged to the plebeian party, attacked the nobility with great virulence, was driven into exile, and died in Utica, Africa, about 199 B. C. A few short fragments of his epic poem (in Saturnians) on the Punic war, and of his dramas, are still extant, and were collected by Klusmann (Jena, 1843). See also the fragments of the *Bellum Pœnicum* in L. Müller's edition of Ennius, pp. 157-170 (St. Petersburg, 1884), and for the dramatic fragments L. Müller's *Liv. Andronici et Cn. Nævi fabularum reliquæ* (Berlin, 1885), or O. Ribbeck, *Scenica Róm. Poesis Frag.* (Leipzig, 1871). M. WARREN.

Nævus [Lat.], or **Birthmark**: a discolored spot (also called *mother's mark* and *port-wine stain*) on the skin of a human being, usually characterized by the presence of numerous enlarged blood-vessels (more especially venous), and popularly believed to be the result of some ungratified longing on the part of the mother during gestation. Some nævi disappear spontaneously; others remain unchanged; still others grow rapidly, and sometimes inflame and slough. They may be treated by cold and pressure, by vaccination of the spot, by cautery, by excision, by ligation, or by other obliterative methods. Small nævi have been treated successfully by electrolysis. Revised by WILLIAM PEPPER.

Nagasaki, naä-gaä-saa'kêe: a city and important seaport in the S. W. of Japan, on the island of Kiushiu, for a long time the only Japanese port of entry for foreign vessels; situated along the eastern shore of one of the finest landlocked harbors in the world (see map of Japan, ref. 7-A). After Japan was closed to foreign intercourse in 1637, when the Spaniards and Portuguese were finally expelled, the Dutch and the Chinese were still allowed to carry on trade under severe restrictions, the small, flat, artificial island of Deshima, at the head of the harbor, being set apart for the Dutch factory; only one European ship arrived yearly from Batavia. The present foreign settlement has a water frontage of 700-800 yards; foreign population (exclusive of Asiatics), 332. Across the bay is a handsomely equipped imperial dockyard. Most of the foreign trade of Nagasaki has been transferred to Kobe, but the mines of Takashima still make it an important coaling station. The town is noted for its tortoise-shell bric-à-brac, and for its Imari and Arita porcelain. The most important articles of export, next to coal, are dried fish, rice and other grains, camphor; of import, sugar, raw cotton, rails and machinery, kerosene oil. The total entries for 1892 amounted to 733 vessels, aggregating 897,274 tons. Pop. 31,380. J. M. DIXON.

Nagel, naa'gel, ALBRECHT EDUARD, M. D.: ophthalmologist; b. at Dantzic, Germany, June 14, 1833; was educated in his native city, but studied medicine at Königsberg and Berlin; began practice at Dantzic in 1856; became privat docent at Tübingen in 1864; extraordinary professor in 1867; ordinary professor of ophthalmology in 1874. His principal works are *Das Sehen mit zwei Augen* (Leipzig, 1861); *Refraktions- und Accommodations-Anomalien des Auges* (Tübingen, 1866); *Behandlung der Amaurosen und Amblyopien mit Strichlein* (1871); *Die Anomalien der Refraction und Accommodation des Auges* (1880); *Die Vorbildung zum medicinischen Studium* (1890). He has also written much for scientific periodicals; since 1870 has edited and contributed to the *Jahresbericht über die Leistungen und Fortschritte im Gebiete der Ophthalmologie*; and since

1880 has edited the *Mittheilungen aus der ophthalmiatischen Klinik in Tübingen*.

Nägelsbach, nä'gels-bääkh, KARL FRIEDRICH: classical scholar; b. near Nuremberg, Mar. 28, 1806; became professor in the University of Erlangen in 1842; d. Apr. 21, 1859. He is famous as the author of the *Lateinische Stilistik für Deutsche* (1846; 8th ed. by Iwan Müller, 1890). Other works are *Die homerische Theologie in ihrem Zusammenhang dargestellt* (1861; 2d ed. by G. Autenrieth); *Die nachhomerische Theologie des griechischen Volksglaubens bis auf Alexander* (1857); *Æschylus's Agamemnon*, with introduction, translation, and commentary, ed. by Fr. List, 1863. Cf. L. Doederlein, *Oeffentliche Reden* (1860), pp. 239 ff. A. G.

Nagoya, naang'ô-yää: city of central Japan; situated close to the bay of Owari, on the main route and railway between the two capitals (see map of Japan, ref. 6-D). It was formerly the seat of the powerful daimios of Owari, who were closely allied to the Tokugawa ruling house, and whose magnificent castle, now used as a military station, still remains intact. Nagoya is the capital of the prefecture of Aichi. The town and district are celebrated for the manufacture of fans, cloisonné ware, porcelain of the "egg-shell," "frosted," and other delicate varieties, and silks. The people are devoted Buddhists, and the local temples are fine. Pop. (1892) 179,174. J. M. DIXON.

Nagpur, or **Nagpore**: town of British India; capital of the province of Berar or Nagpur; situated in lat. 21° 9' N., lon. 79° 11' E., 430 miles E. N. E. of Bombay, with which it is connected by railway (see map of S. India, ref. 2-E). It is 7 miles in circumference and consists mostly of mud huts. The ground on which it stands is swampy and unhealthy. Its manufactures of cotton cloths, coarse and fine chintzes, woollens, silks, and brocades are important. In 1740 it became the seat of an independent Mahratta prince; in 1853 it was incorporated with the British dominions. Pop. (1891) 117,014.

Naharro, BARTOLOMÉ DE TORRES: poet; b. toward the end of the fifteenth century at Torres, near Badajoz, Spain. After being a captive in Algiers, he visited Rome (after 1513) for the purpose of obtaining the favor of Pope Leo X. Obligated to leave Rome, owing to a satire on the vices of the papal court, he lived for a time at Naples, under the protection of Fabricio Colonna. He is said to have died in poverty. His works were first published by himself at Naples (1517) under the title *Propaladia*, and dedicated to Ferrante d'Avalos, husband of the famous Vittoria Colonna. They consist of satires, epistles, ballads, and particularly eight plays, called by the author *Comedias*. These latter were the first attempt in Spanish to adopt something of the form and manner of the classical and the Italian drama. Though fluent and amusing, they are often extremely coarse and never remarkably interesting. The openness of the attacks on the clergy in them led the Inquisition to prohibit them, and the later editions were expurgated. The first Spanish edition appeared at Seville in 1520, and was followed by many others, both there and elsewhere. Four of the comedies are printed in Böhl von Faber's *Teatro Español* (Hamburg, 1832). In spite of his roughness, Naharro was much admired and imitated in Spain during the sixteenth century. A. R. MARSH.

Nahr-el-Asi: See ORONTES.

Nahr-el-Mukatta: See KISHON.

Nahuatl Antiquities: See CENTRAL AMERICAN ANTIQUITIES.

Na'hum [= Heb. *Nahûm*, liter., consolation]: one of the twelve minor prophets. He is called an Elkoshite, but no place called Elkosh is now known. Jerome identified it with a town of Galilee; Ewald and others with *Alkush*, on the east bank of the Tigris, about 2 miles N. of Mosul, where "Nahum's tomb" is still shown, but Layard pronounces the structure to be comparatively modern; and there is no notice of Nahum in connection with this place earlier than the sixteenth century. Nahum prophesies after Sennacherib's invasion (700 B. C.) and before the destruction of Nineveh (625 B. C., Rawlinson, or 606, Oppert and Lenormant). His Hebrew is of the most classical style.

Na'iades: the Lamarckian name for the fresh-water mussels forming the family of the UNIONIDÆ (q. v.).

Naiads [from Lat. *Naïades* = Gr. *Naiðdes*, Naiads]: the nymphs of fountains, streams, and lakes, as distinguished from the Oceanids and the Nereids. Their special appella-

tions vary according to circumstances, *Cremata*, *Potamocheilus*, *Lunulatus*, etc. See NYMPHS.

Nails [O. Eng. *naegel*; O. H. Germ. *naegel*; Mod. Germ. *naegel*, nail; in both senses; Gr. *ὄνυξ*, claw, hoof, nail; Lat. *unguis*; Sanskr. *anghra*]; the plates of horny epidermis which in man grow upon the dorsal aspect of the distal phalanges of fingers and toes. They are the homologues of the hoofs and claws of the lower animals. They consist each of a free extremity, of which both sides are exposed; of a body, having one side exposed; and of a matrix or root, of which both sides are concealed in the skin. At the base of the nail appears a crescent-shaped patch of lighter color than the rest, called lunula or albedo. As the result of sickness small spots of whitish color are formed at the root of the nail, and by observing their progress in the growth toward the tip it may often be estimated how long before the observation an illness occurred. After febriles and some nervous diseases the nails cease to grow temporarily.

Nails: slender pins or pieces of metal, usually tapering and having a head, used for fastening pieces of wood or metal together, or, when driven into any material, for hanging articles on. Nails are classified by the U. S. Patent-office as cut, wrought, horseshoe, shoe, barbed, composition, button, carpet, coffin, sheathing, galvanized, harness, leather-work, picture, siding, slating, trunk, upholstery, weather-tiling, and screw-nails. Of these, the cut, wrought, and horseshoe nails are by far the most important. In the beginning of the nineteenth century nails were ordinarily manufactured by hand forging, usually by women and children, the degradation of the nail-makers forming one of the saddest phases of English industrial life. The application of machinery to the fabrication of all the more important varieties of nails originated and developed chiefly in the U. S. This was a natural result of the universal use of wood for buildings, fences, etc. The first cut nails are said to have been made in New England late in the eighteenth century by cutting the blanks from a piece of sheet metal and heading them with a hand-hammer while held in a vise. In 1810 a machine invented in the U. S. cut nails at the rate of 100 per minute. The rough surface of a cut nail where no clinching is required adds about 20 per cent. to the holding power. For uses requiring clinching a tapering hand-forged nail, termed the "German wrought," was used until about 1860, when manufacturers began to anneal common cut nails, giving them a bending quality; and these soon practically drove the others from the market. The importance attached to nail manufacture in the U. S. may be inferred from the fact that previous to 1874 upward of 300 patents were issued for improvements in making cut and forged nails, of which twenty-three were granted before the beginning of the nineteenth century. These embraced the germinal ideas of the present machinery for cutting nails, while an earlier English patent, that of William Finch, of Staffordshire, comprised the use of tilt-hammers, the rapid and forcible striking of which enabled several nails to be made from the rod with one heat, whereas by hand the rod required to be reheated previous to the forging of each nail.

In the manufacture of cut nails the iron or steel, as the case may be, is first rolled into plates having a thickness corresponding to that of the nail to be made, measured from one flat side to the other, and a width somewhat greater than the length of the finished nail. When the nails are to be annealed for clinching, the length of the plate is transverse to the grain of the iron, in order that the grain may be lengthwise of the finished nail to insure greater flexibility in clinching. The plate is then placed in a feeding device, which moves it forward to dies or cutters, which cut a tapering blank from the end of the plate. This blank is then gripped by holding-jaws, which clamp it firmly while a punch or header abuts against the widest end of the blank and upsets a sufficient portion of the metal to form the head. In order to secure the tapering form of the blank without waste of material, the plate is turned laterally, so that its end is at a slight angle to the cutting devices or dies, first in one direction and then in the other, the head of each alternate nail being formed at that lateral edge of the plate opposite that at which the head of the previous nail was made. In some cases the same result has been secured by giving the lateral movement to the cutting dies while the plate is made to travel in a straight line. In one machine the plate is made of a width sufficient to permit blanks for a number of nails to be cut simultaneously from

its end. In this apparatus rotating cutting dies, instead of vibrating or reciprocating ones, are used to sever the blanks from the plate, and the nails by this machine are made with chisel-shaped points.

In the manufacture of horseshoe nails, the nail-rod, heated at one end for about a foot in length, has its free or outer end steadied by the hand of an attendant, but is gripped near its inner end by an intermittent feeding-device which feeds it inward to the hammering mechanism. This latter comprises a fixed anvil, the face of which corresponds to the contour of one of the flat sides of the nail, and which has at one edge a fixed die arranged vertically at right angles to its face, and corresponding in its form to one of the curved lateral edges of the nail. At the opposite side of the anvil is a moving die having a face the same shape as that of the anvil, but attached to one end of a rocking lever, the opposite arm of which is connected by a universal joint, a rod, and strap with an eccentric on a rock-shaft provided transversely above the parts just noticed. On this shaft, immediately over the anvil, is a disk upon the periphery of which is arranged a roller, which serves the purposes of a striker. As the nail-rod is fed inward, with its heated extremity upon the anvil, the rotation of the striker impinges longitudinally upon the heated end of the rod, striking a "drawing" blow, which of course elongates the metal. As soon as the striker, carried away by the continued rotation of the disk, has been brought out of contact with the metal, the moving die moves inward, compressing the flattened part to bring its lateral surfaces to the shape required in the edges of the nail. This done, the striker strikes again, to be followed by another action of the dies, until after sixteen blows of the striker the nail is complete so far as the hammering is concerned; but the process of shaping does not end here. The "point" of the nail at this stage is an eighth of an inch wide, and is rough and jagged. The nail is, moreover, three-fourths of an inch longer than when finished. To complete the work, a little device, termed a "poker," bends the point or tip sideways until one edge intercepts (at a proper place along the length) an imaginary line drawn axially through the nail. This done, a cutter at the opposite side traverses a path corresponding to the curvature just given by the bending to the edge just previously referred to, and cuts off the surplus metal from the tip. A slight retrograde motion of the rod permits a suitable cutting device to sever the finished nail therefrom.

The wire nail consists essentially of a cylindrical piece of wire of suitable length, with one end properly sharpened and the other upset to form a head. A good wire nail has great holding-power. A succession of new machines and mechanical operations tends constantly to increase the output and improve the quality of this variety of nails. In the production of cut nails steel has, in a measure, taken the place of iron. This is due to the cheapening of a suitable quality of steel, and to its greater strength and toughness. Notwithstanding the long period during which the machine-manufacture of cut nails has been carried on, improvements and changes in machinery are constantly made.

Of the minor varieties of nails may be mentioned garden nails, made of cast iron and frequently toughened by annealing; screw-nails, made with flat shanks, to which a spiral twist, from a half to a full turn, is given; and barbed nails, notched or provided with notches or with spurs to increase their hold on the wood. Shoe-nails are headless tapering nails cut, the smaller sizes, from sheet zinc, the larger from iron. Ornamental nails, such as are used for pictures, coffins, etc., are made with wrought shanks and porcelain or stamped sheet-metal heads, the latter attached by being screwed upon the shanks or by soldering with soft metal.

JAMES A. WHITNEY.

Nain [= Gr. *Naly* = Heb. *Nā'in*, lit., pasture]; a poor little village in Galilee, 6 miles S. E. of Nazareth, mentioned only in the New Testament (Luke vii.) as the place where our Lord raised the widow's son from the dead (see map of Palestine, ref. 6-D). It was then a walled town, with a cemetery some ten minutes' walk to the E. It is beautifully situated, and now contains a few mud and stone houses occupied by Moslems.

Nain: mission station of the Moravian Brothers, on the east coast of Labrador, in lat. 56° 30' N.; politically a part of Newfoundland. The climate is severe: the mean temperature for summer is 48° F.; for winter, -7° F.; for the year, 25° F. Pop. about 300. See also NAIN, NAIN, and NAIN.

Nairne, Lady CAROLINA OLIPHANT, Baroness: poet; b. at Gask, Perthshire, Scotland, July 16, 1766; was called in her youth the Flower of Strathearn, from her great beauty; married in 1806 Capt. W. Murray Nairne, afterward Lord Nairne; belonged to a prominent Jacobite family; wrote *The Laird o' Cockpen*, *The Land o' the Leal*, and other popular Scotch ballads, the authorship of which was kept secret until shortly before her death, which occurred at Gask, Oct. 27, 1845. See her *Memoir and Complete Lyrical Compositions*, by Charles Rogers (1869).

Nairnshire: county of Scotland; bordering on the Moray Firth, Elginshire, and Inverness-shire. Area, 169 sq. miles. The surface generally ascends from a fertile and well-wooded tract near the coast, until at Carn Glas, on the southern boundary, it attains 2,162 feet. Most of the ground is covered with forest, and less than a fifth of the entire area is under cultivation, more attention being paid to stock than crops. Pop. (1891) 10,019. Capital, Nairn, at the mouth of the river Nairn, with a good harbor, protected by a breakwater. Pop. (1891) 4,651, chiefly engaged in herring-fishing. Near by is the village of Cawdor, with the castle of the same name, in which, according to tradition, Macbeth murdered Duncan; the present building, however, is not older than the fifteenth century.

Najae, ÉMILE, Comte de: dramatic writer; b. at Lorient, Morbihan, France, Dec. 14, 1828. After studying law he obtained a post in the ministry of the Interior, but later gave this up for a purely literary career. For a whole generation he has produced, alone and in collaboration with others, a stream of comedies, farces, operettas, etc. Among these may be mentioned *La poule et ses poussins* (1861); *Les oiseaux en cage* (1863); *La dernière poupée* (1875); *Théâtre des gens du monde* (1872); *Madame est servie* (1874); with Scribe, *La fille de trente ans* (1859); with Sardou, the comic opera *Les noces de Fernande* (music by Delfès, 1878); and the comedy *Divorçons* (1880). A. R. M.

Nakhimov, naak-hee' mov, AKIM NIKOLAEVICH: satirical poet; b. in 1782, on his father's estate in the government of Kharkov, Russia; was educated in Moscow, and at the University of Kharkov; but during the latter part of his life remained most of the time at his home in the country. In his leisure moments he wrote poems, of which the best known is his *Satirical Elegy* (1809), called forth by a new law on the education of officials. D. in 1815. The seventh edition of his complete works appeared in 1852, in the collection of Smirdin. A. C. C.

Nakhichevan': town of European Russia; on the Don, 30 miles from its mouth; founded in 1780 by an Armenian colony (see map of Russia, ref. 10-E). It is the seat of the Armenian Patriarch of Russia; has some manufactures of cotton and silk, and an extensive trade. Pop. (1889) 17,347.

Nakoo: See GAVIAL.

Namaland, Great, or Namaqualand: the southern part of the German possessions in Southwest Africa; bounded N. by Damaraland, E. by the Kalihari Desert and British Bechuanaland, S. by Cape Colony, and W. by the Atlantic. It is the chief home of the remnant of the uncivilized portion of the Nama or Hottentot people, and forms the southern extremity of the semi-arid lands of Southwest Africa. The characteristic features are sandy, undulating plains, hills, and mountains dividing the coast lands from the depression of the Kalihari, bitter salt springs, dry river-beds, and a few long, narrow, verdant valleys, where the missionary and chief native settlements are found. The region is less valuable in its prospects of mining and agricultural development than the German possessions adjoining it on the north. C. C. ADAMS.

Namangan: a town and fortress of Ferghana, Russian Turkestan; on the upper Syr-Daria; lat. 41° N., lon. 71° 40' E.; 50 miles N. E. of Khokan. It is the chief commercial city of the upper valley of the river, and transacts a large business in sheep, wool, hides, yarn, and fruit. Rafts are extensively used to convey the merchandise down the river. Pop. (1888) 31,074. M. W. H.

Namaquas: See HOTTENTOTS.

Namatia'nus, RUTILIUS CLAUDIUS: a Latin poet of the fifth century, who wrote in elegiac verse an account of his return from Rome to Gaul (*de reditu suo*) in two books (of which nearly the whole of the second is lost), interesting for the description of places and the personal allusions, and very correct in form. The writer was a Stoic, and despised

both the Christians and the Jews. See edition of L. Muel-ler (Leipzig, 1870) and Baehrens, *Poet. Lat. Minores*, vol. v., pp. 4-30 (Leipzig, 1883). M. WARREN.

Namaycush, or Mackinaw Trout: one of the largest of the fresh-water *Salmonidæ*. Its scientific name is *Salvelinus* or *Cristivomer namaycush*. It inhabits the upper lakes of the St. Lawrence basin and the lakes westward to British Columbia and Alaska. It is caught with the spear mostly. Specimens of 120 lb. weight are reported, but it does not often exceed 50. The flesh is good, but not of first quality. It is also called longe, togue, and Great Lake trout.

Namdin: city of Tonquin, Indo-China; 50 miles S. E. of Hanoi, 3 miles from the Song-koi or Red river, and 20 miles from the coast; lat. 20° 25' N., lon. 106° 8' E. It is the residence of a French political agent, a center for the Annamite French consular service, and contains magazines of military stores. It is a center of a rich portion of the Song-koi delta, and has an active commerce in rice, cotton, silk, indigo, salt, and wood-carvings. The exports go chiefly to the southern provinces of China. Pop. 50,000.

Name [O. Eng. *nama*; O. H. Germ. *namo* (> Mod. Germ. *name*); Goth. *namō*; cf. Sanskr. *nāman-*; Gr. *ὄνομα*; Lat. *nomen*, *name*]: the word or words by which a person, place, or thing, or a family or class of persons or things is designated. Among savages, with whom general social relations and history are in an undeveloped condition, a single appellation derived from some association is enough for the name of a person. He who kills a wolf under striking circumstances is called Wolf, and the man who dreams of an eagle is named Eagle. Among certain tribes in North America the animal-spirit peculiar to each Indian is the first creature which appears to him in a dream after fasting and seclusion, and this, his *totem*, gives him a name. The first distinction recognized is that of proper and common names, or that of the individual as distinguished from the family and tribe. As there is something reserved and sacred often attached to the former, there was often a mystery associated with it; and, as Schoolcraft observes, "An Indian will tell his specific name with great reluctance, but his generic or family name he will declare with pride."

Scripture Names.—The early Hebrews gave an infant a name as soon as it was born, from some striking accident relative to it. It thus became commemorative of the history of the family. When Eve bore her first son she said, "I have gotten a man from the Lord," whence he was called Cain, meaning "gotten" or acquired. Noah signifies "comfort" (Gen. v. 29). The vigor and intelligence shown in our Scripture names were remarkable. They greatly influenced Hebrew literature, and are the finest of antiquity. Those of the women were derived from character and circumstance: e. g. Adah or Ada, "ornament"; Leah, "weary"; Deborah, "a bee." The names of the patriarchs generally had a mystical meaning. Elijah and Joel are composed of two names of God; Josaphat and Saphatias indicate the judgment of God; Johanan or John of Hanania, his mercy; Nathaniel, Elnathan, Jonathan, and Nathania, all mean "the gift of God," as *Devadatta* was Sanskrit, and as *Theodore*, Greek.

Arabia and Turkey.—Among the Arabs and Turks names are few and simple. As Mohammed said, "Give your sons the names of prophets," the result has been an interminable repetition of Mohammed, Mahmud, Hamet, or Achmet; of Ibrahim (Abraham), Moussa (Moses), Suleiman (Solomon), Dauoud (David), and Aïssa (Jesus). Then come the names of their heroes, such as Osman, Ali, Omar. In a third category are the names beginning with Abd, a "servant," as Abd-el-Kader, "servant of the All-Powerful," Abd-Allah, "servant of God." To these follow names ending in *din*, "religion," as Salah-ed-Din (Saladin), "restorer of religion." Some names consist of these elements composed, as Hamet-el-Abd, "Mohammed the servant," and others are merely adjectives, as Saïd, "happy or fortunate," Hassan, "handsome," Hussein, "powerful," Reshid, "just judge," Mustapha, "elected of God." To indicate men more accurately, surnames are often added—e. g. El Kebir, "the great"; words of relationship—e. g. Abu or Bu, "father," Abu-Nebas, "the father of the race." Among the feminine names are Lulu, a "pearl," Zarifa, "beauty." Girls are also called after the wives or female relatives of the Prophet. Men sometimes take as surnames appellations relating to their country, birthplace, origin, family, sect, trade, or occupation.

Greece.—The Greeks in the time of Aristotle gave a child its name on the seventh day after birth. It was afterward

given on the tenth day. It was derived from some quality, such as piety, a great event, a striking personal quality, a happy presage; from some virtue or physical advantage, from friendship, or by chance. The grandson took his name from his grandfather or the nephew from his uncle, and to prevent confusion another name, such as the father's, was added, or else one derived from the calling of the bearer, from his birthplace, or a nickname. The father's name was, with a slight change, also given to one child, e.g. Chryseis, "daughter of Chryses." In later times names of people were taken from the gods, e.g. Apollodorus, "gift of Apollo." Though denied by many writers, it is evident that something like a generic name was applied to many families: e.g. the Heraclidæ, the Cecropidæ, the Atridæ, the Alceonidæ. Many of the Greek names were very beautiful—e.g. Aphrodite, "foam of the sea"; Artemis (m.), "perfect," Artemisia (f.), "perfect"; Diana, "bright as day"; Diomedes, "dear to Jupiter"; Zenobia (f.), "life," from Zeno, the lord of life; Spiridon, "breath of the gods"; Isidore (m.), Isidora (f.), "gift of Isis"; Heliodorus, "gift of the sun"; Zeno, "life" (the lord of); Zoë, "life"; Amaranth, "unfading flower."

Rome.—The Romans, like ourselves, had a family name, called the *nomen gentilitium*, generally ending in *ius, eius, or aius*. This, derived from the gens, "clan or tribe," was the *nomen* or name proper. As the clan was divided into families, there was also the hereditary *cognomen*, while the *prænomen* distinguished the individual. Sometimes, by way of further distinction, a second cognomen, called the *agnomen*, was borne. This was often an honorable title derived from some great exploit. The *prænomena* or "Christian names," so to speak, were not more than thirty in number, whence the constant repetition of Marcus, Decimus, Florus, Gaius, etc. Romans often took their names from their order of birth, as Primus, Secundus, Tertius ("first," "second," "third"), and cognomens were derived from the months in which they were born or from some personal peculiarity; from being a twin or a posthumous child; from a city, river, or country. The daughter's name was the feminine form of that of the father—e.g. Julia from Julius, Octavia from Octavius. To distinguish the individual, she also received another name grown hereditary in the family, as Julia Agrippina; but the surname was often fanciful, as *Felicula*, "little cat" or "puss." Nicknames were common. After marriage a Roman lady bore the name of her husband in feminine form, whence it was usual to say at marriage, "Where you are Gaius, I will be Gaia." Many Roman names were from Etruscan or other old Italian sources; some were from the most trifling or undignified personal peculiarities or occupations. With the Northern invaders came chiefs proud of their own ancient Gothic names and families; that of Theodoric gloriied in the recollection of Amal, whence Amalaric, Amalafride, Amalaberg. With Christianity came names from the Bible, but the old heathen family appellations "died hard." St. John Chrysostom in the fourth century complained of this obstinacy, as did St. Gregory in the sixth century. Such were the names Wolf, and those founded on Ans or As, indicative of a god; e.g. Anselm, Esmond, Oscar or Elf, Hildebrand, "war-sword," Bertha, "the bright goddess" (Albert, Bertram), Gertrudis, etc. All of these were sources of pride, owing to age and associations.

English Names. The entire history of Indo-European names is that of a growth from a condition like that of the Arab and Indian to the one now prevalent among us. Those of the Anglo-Saxons were imposed, says Sharon Turner, as with us, in their infancy, by their parents. They were frequently compound words, rather expressive of caprice than of appropriate meaning. The following are specimens: Æthelwulf, "the noble wolf"; Æthel or Ethel, Adel, and Adeline, meaning "noble"; Bertwulf or Bertolf, "illustrious wolf"; Eadwulf, "the prosperous wolf"; Æthelwyn, "noble joy"; Eadric, "happy and rich"; Ælfred, an "elf (i.e. shrewd) in council"; Sigoric, "victorious and rich"; Æthelred, "noble in speech" (German, *Rede*); Eadmund or Edmund, "prosperous patron"; Eadwin, "prosperous in battle"; Dunstan, "mountain-stone"; Ethelbald, "noble and bold"; Eadward, "prosperous guardian"; Ethelstan, "noble rock" (or stone); Ethelbert, "noble and illustrious." These names partially remain to-day. Many Anglo-Saxon names were wild and strange; e.g. Beanhelm, "helmet of the nobles"; Eardwulf, "wolf of the earth or province"; Werburg, "hedge of the city"; Sigfred, "peace of victory"; Beornhæst, "the soaring bee"; Beag-

"bracelet stone"; Wulfheah (wolf-high), "tall wolf"; Beornoth, "noble's oath"; Wine, "the dear one," which often forms a part of many names; Sæfreth, "freedom of the sea"; Ceolmund, "protecting ship." Female names were not less fanciful. Thus Dudda, meaning the "family stem," was a father who had three daughters—Deorwyn, "dear to man" or "dear love," Deorswythe, "very dear," and Golde, "golden." A father, Æthelwyn ("noble joy"), had four sons—Æthelwold, "noble governor," Alfwold, "ruling elf," Athelsin, "always noble," and Æthelwyn. It is not settled whether the Anglo-Saxons always used surnames. Many certainly had appellations added to their original names. Thus there was Wulfsc se blaca, or "the pole," and Thurceles hwitan, or "the white." These were, however, among the Saxons, as for many centuries later in England, derived from many causes, as from the place of residence—e.g. Ælfrie at Bertune; or from the father, as Elfgare Ælfan suna, "Elfgare, son of Ælfan," or, more shortly, Wulfrig Madding, Badenoth Beotting. Office, trade, or possession often bestowed a name, as Leofwine ealdorman ("alderman"), Sweigen scyldwirtha ("the shield-bearer"), Ægelifrig munuc ("monk"). In the course of time, though very rarely among the Anglo-Saxons, these became family names, and as such still exist. Among women's names are Ethelswytha, "very noble"; Seletthytha, "a good threatener" (Anglo-Saxon ladies appear to have excelled as scolds); Editha, "the blessed gift"; Elfhilda, "elf of battle"; Beage, "bracelet"; Ethelfritha, "noble and powerful"; Adeleva, "noble wife"; Heaburga, "high tower" (a tall lady); Adelfleda, "noble pregnancy"; Elfgiva, "elf favor"; Edgiva, "happy gift"; Ethelgiva, "noble gift"; Wynfreda, Winifrede, "peace of man"; Ethelhilda, "noble war-goddess"; Elfhrythe, "threatening as an elf." Saxon is the stock on which the English and American names of the present day are formed. Next to these come the Norman, but it must be remembered that both were in a great degree founded on a common Teutonic origin. Though the Anglo-Saxons very rarely employed a regular system of family nomenclature similar to our own, they attempted to show relationship by the use of similar personal names. Thus in one family we find Wigmund, Wig-helm, Wig-laf, Wih- (or Wig-) stan, and the nineteen descendants of Alfred had their names beginning with *Ead* ("prosperous"). The termination *-ing*, as in Brening, Dering, Whiting, means a descendant, or "born of." Surnames were not common before the eleventh century, though they were used, hereditarily, occasionally both by lords and common men. Among the oldest of these family names were the names Liniet (Linney), Grimkelson, Dubbe, Tuk (or Tuckey), Pincebek, and Gamelson. The ingress of the Normans introduced the use of Scripture names. During three centuries after the Conquest people of rank began to assume first some surname of place or characteristic, and then one of family. The younger branches of a family often laid aside the father's name and took one from the place where they lived, and thus (in Cheshire) in three descents as many surnames are found in the same family. Several brothers often assume different surnames. Hence it is difficult to trace the pedigree of any family beyond the thirteenth century. The roll of Battle Abbey, containing the names of those who fought at the Conquest, gives the cream of the Norman aristocracy, so that a biographer of Chaucer declared that all names to be found in it ennobled their descendants. (For different versions of this roll, see Lower, *Patronymica Britannica*.) The Normans introduced the title *de* or "of" or "from," as indicating the names of their estates; e.g. Le Sire de Vitry, Paennel du Monstier-Hubert. The mingling of Norman with English names soon formed a sad chaos, many callings, places, and nicknames being translated into French and thence Anglicized, while the confusion was worse confounded by the Latinization of others. *At*, meaning the same as *de*, or indicating residence, enters into many English names; e.g. Athill, Atwood. In Norman names many old Norse words became French. Thus *ey* or *ø*, "island," became *eu* (Cantaleu); *flot*, a river, *fleur* (e.g. Harlfleur); *bo* or *by*, an "island," *bauf* (Painbauf); *garth* became *gard* (Epe-gard), etc.

Celtic names were originally formed on the same principles as the Saxon, the affix *Mac*, denoting "son," being usually assumed in Scotland, as was *O'* ("grandson") among the Irish, and *Ap* with the Welsh. The head of a

The entire clan usually bore the chief's name. Among Celtic names are Angus, "firm"; Fingal, "strongest of the strong"; Brian, "chief"; Fergus, "strong arm or man"; Arthur, "a bear"; Griffith, "a dragon"; Hugh, "mighty, indomitable"; Murdoch, "great chief"; Owen (John), "a lamb"; Dugald, "black-haired"; Rowena, "the white-necked" (?); Brenna, Brenda, "raven-haired"; Cordelia, "token of the flowing"; Morgiana, "lady of the sea."

There are in Great Britain nearly 50,000 surnames, derived from every conceivable source, such as animals, offices, saints, traders' signs, virtues, and even from oaths and salutations, such as Bigot, from "by God"; Pardoe, from "par Dieu"; Godsall, from "God's soul"; Olyfader, from "Holy Father"; and Belcher, from "*belchère*." The commonest name is Smith; the next in order Jones, Taylor, Williams, Brown, Davies, Thomas, Robinson. Of the second class as to number are Baker, Clark, Cooper, Davis, Edwards, Evans, Green, Hall, Harris, Harrison, and others, in apparently the same proportion as in America.

In Wales there are districts in which family surnames are not yet known, and there are places all over Great Britain in which nicknames or sobriquets like those of the Middle Ages are in general use. It has been frequently asserted that French names introduced at the Conquest may be known by such prefixes as *de, du, des, de la, saint*, or by the suffixes *font, ers, faut, beau, age, mont, ard, aux-bois, ly, eux, el, val, court, lay, fort, ot, champ, and ville*; but this is far from being the case, since very soon after the Conquest these terms came into such general use as to make distinctions almost impossible. The Norman term *fitz* is commonly believed to signify illegitimate descent, but this was by no means invariably the case, the word itself meaning simply *fits*, or "son."

In many European countries the husband adds his wife's name to his own, and in Spain, if the mother is of better family than the father, the children take her family appellation. In inheriting Scotch estates it is a very common condition that a certain name shall be taken with the property.

Ancient Egypt.—Among the ancient Egyptians the king ordinarily had two names—one a prænomen or solar title, assumed at coronation (as Men-Cheper-Râ, the prænomen of Thotmes III., or Cheper-Ka-Râ, that of Usertasen I. of the twelfth dynasty), and a family name. In writing these were included in ovals or cartouches. Individuals had often two names, but the Egyptians generally used only one. Egyptian proper names, however, present great variety of structure, some being apparently very simple and not always possessed of particular significance, while others present more or less complete sentences. The latter usually have a divine name as a component part, and are capable of a more or less exact translation.

China and Korea.—The Chinese have at least two names: one a "sing" or family name, which is invariably placed first in both speech and writing, and a "ming" or personal or given name, corresponding to the Christian name of Western nations. There were originally only 100 family names, but now there are 438, of which thirty are dissyllabic, as Sze-ma, Ow-yang, etc. The others are all monosyllabic. The little book called *Peh-Kia-Sing*, or Hundred Family Names, which contains lists of these characters, is the most popular book in China, and as it covers nearly every sound in the language it affords to the unlearned a convenient list of phonetics for correspondence and account-keeping. These names are usually the names of common objects such as *Lung*, "dragon"; *Lang*, "wolf"; *Ma*, "hemp"; *Li* (pronounced lee), "a plum"; *Lin*, "forest"; *Liu*, "willow"; *Ts'ün*, "inch"; *Hwang*, "yellow"; *Luy*, "thunder"; *Wang*, "prince." The surnames Li, Wang, and Chang are as common in China as Smith, Brown, and Jones are among English-speaking peoples. Persons having the same surname can not intermarry.

The *ming*, or given name, is usually in two syllables, and invariably follows the sing or surname, as Li Hung-chang (the famous viceroy and grand secretary), Tsêng Kwo-fan. It is therefore improper to speak of Mr. Ch'ang or of Mr. Hung-chang; Mr. Li and Mr. Tsêng are correct. The surname never varies, but the *ming* may. At birth a boy receives a "milk-name"; when he goes to school he receives a "book-name"; when he marries he takes a "great name"; when he takes his degree or enters upon office he assumes an "official name"; while in the ancestral temple he is known by his posthumous name. When a woman marries she assumes her husband's surname, and retains her own

surname as her given name. All Buddhist monks are surnamed Shih (the first syllable of Shih-kia- or Sakya-muni); hence no one ever asks a Buddhist his sing or surname. The dissyllabic names which are often seen over the doors of Chinese business houses are simply the "style" adopted by the individual or firm doing business there, and not the names of individuals.

Emperors are never known or spoken of by their own names. On the accession to the throne a *nien-hao*, or year-name, is chosen, and this designates not the ruler, but his reign-period. K'ang-hi is thus not the name of the second emperor of the Manchu dynasty, but merely the style of his reign. The eighth emperor of the present dynasty was named Mien Tsai, and his reign-period Tung-Chi. The present reign-period, which began with 1875, is called Kwang-sü, or "Glorious Succession." In history emperors are known by their posthumous or temple names.

Korean usage is the same as that of China.

Japan.—Japanese surnames are of two kinds: (1) the *Kabane*, or clan name (e. g. Minamoto, Fujiwara, etc.), and (2) the *uji*, or family name, originally names of localities, e. g. Takahashi, "High-bridge"; Yamamoto, "Mountain-foot"; Matsumura, "Pine-tree-village"; Nagasaki, "Long-point." Given (or "Christian") names are also of two kinds: (1) common name, usually ending in -tarō for the eldest son, -jirō for the second, -saburō for the third, and so on; (2) the true name, which until recent times was used only on solemn occasions. As in China, the family name invariably precedes the given name, e. g. Nagasaki Gentarō. As in China, the mikados are known in history by their posthumous or temple names. The personal name of the present emperor is *Mutsu-hito*, "Benevolent Man," and his reign-period is *Mei-Chi*, "Enlightened Rule." Women are generally named after some flower or other natural object, preceded by O, "honorable," as O Hana, "Flower"; O Take, "Bamboo"; O Kiku, "Chrysanthemum"; O Haru, "Spring."

PLACE-NAMES.—The study of the names of places is hardly less important than that of persons. From the earliest times men have retained the names of towns, hills, or rivers given by earlier races, so that it often happens, as in the case of the Picts, that all that is known of their language and origin is embraced in these terms. Again, in migrating to other lands the old place-names have always been transferred to new localities, in illustration of which the reader may consult *India in Greece, or Truth in Mythology*, by Edward Pococke (1852), a work in which the author has endeavored to prove that Aryan-Indian names were taken to the West. In like manner the Celt, the Saxon, the Pict, Romans, and Normans left their language in such words as *tam, tav, or chwyd*, meaning "river or water," whence the Thames, Tavy, and Clyde (Celt.); in *burg*, "a hill," and *brig*, "bridge" (Saxon); in *Penwal*, "the head of the wall" (Pictish); in *castrum*, "a camp," whence *-caster* (Roman). In *The Norman People* (London, 1874) it is shown that 124 common English names of places are also to be found in Scandinavia, and in such a way that they evidently originated there. See Steenstrup, *History of the Normans*, especially part iii.

Among the many books on the subject of names the reader may refer with advantage to *The History of Christian Names*, by Miss Yonge; also, *English Surnames*, by Beardsley (2d ed. 1875); and *Names and their Meaning*, by Leopold Wagner (1892). For (East) Indian names, see *Journal of the Royal Asiatic Society* (Jan., 1889, p. 159).

Revised by R. LILLEY.

Names, Law of: For centuries the common law has assumed, if it has not required, the full legal name of a natural person to consist of a Christian or given name and of a surname or patronymic. A middle name or initial is generally deemed no part of the legal name, and hence unimportant. According to the older authorities a total mistake in the Christian name was fatal to all legal instruments, whether pleadings, grants, or obligations; "and the reason is, because it is repugnant to the rules of the Christian religion that there should be a Christian without a name of baptism, or that such person should have two Christian names, since our Church allows no rebaptizing. The mistake of the surname does not vitiate, because there is no repugnancy that a person should have different surnames." (Bacon's *Abridgment*; title, *Misnomer and Addition*, B.) The first of the above rules is no longer law. It is now well settled, both in Britain and in the U. S., that a person can change any part or the whole of his name with-

out penalty or punishment of any kind, unless the change is resorted to for the purpose of defrauding another. If he enters into a contract in a particular name, he may be sued in that name, whatever his true name may be. So if he makes or receives a grant in an assumed name, his identity may be established by extrinsic evidence; and his marriage under an assumed name is valid. If negotiable paper is made payable to a person by a mistaken name, he may indorse it in such name, and thereby pass title and bind himself as indorser. "All that the law looks at is the identity of the individual, and when that is clearly established the act will be binding upon him and others." (*Phillips vs. John Smith*, 2 Harv. & R. ports.; N. Y. Common Pleas 566.) Upon marriage the legal surname of the wife becomes that of her husband; yet she may continue to employ her maiden name in business transactions without subjecting herself to moral or legal censure. (*Bell vs. San Printing Co.*, 42 N. Y. Superior Court Reports 567.) The legal right to name a child is in the father. His promise to give the child a particular name has been held a valuable consideration for a note of the promisor. (*Wofford vs. Powers*, 85 Ind. 294.)

An act of Parliament changing a person's name is permissive and not compulsory; he may retain his original name. In many of the U. S. the constitutions forbid local or special laws changing the names of persons, and provision is made for the alteration of names by a judicial proceeding. (*Stimson's American Statute Law*, §§ 335, 432.) Statutes have been enacted authorizing the use of a deceased person's name by his successors in business, upon their acquiring the right to use it from his personal representatives, and filing and publishing the required certificate. (See N. Y. Laws of 1880, ch. 561, and Laws of 1881, ch. 389.) English common law does not secure to an individual such a right of property in his name or in the name of his real estate as to enable him to prevent the assumption of such name by another, unless the name thus assumed has become a TRADE-MARK (*q. v.*) or business name, and is employed to deceive the public or to defraud the person who made it valuable. See McAdam on *Individual, Corporate, and Firm Names* (New York, 1894). F. M. BURDICK.

Namur, Fr. pron. nām'mūr': province of Belgium, on the French frontier; intersected by the Meuse. Area, 1,414 sq. miles. It consists of large, densely wooded hills, offshoots of the Ardennes, and rich in coal, iron, copper, lead, sulphur, alum, marble, and slate; and beautiful and exceedingly fertile valleys, yielding fine pastures and large crops of wheat, oats, hops, and flax. Besides agriculture and mining, a large manufacturing business is carried on, especially in paper, hardware, and cutlery. Pop. (1891) 336,543, mostly French-speaking Walloons.

Namur: capital of the province of Namur, Belgium; at the confluence of the Sambre and the Meuse; 35 miles by rail S. E. of Brussels (see map of Holland and Belgium, ref. 11 F.). It has an elegant cathedral and many good educational institutions, large breweries, and celebrated manufactures of cutlery and leather. It was formerly a very strong fortress; was taken by Louis XIV. in 1692, and retaken by William III. in 1695. Joseph II. demolished the fortifications, and, although they were restored in 1817 during the union with the Netherlands, they were demolished again in 1866, with the exception of the citadel. Pop. (1891) 30,674.

Nanaimo, nā-ni-mō: port and town of Vancouver island, British Columbia; situated on the east coast, 60 miles N. N. W. of Victoria. It is a station on the railway from Victoria to Menzies Bay; and has a good harbor, although closed by ice in winter. Excellent coal is obtained in the immediate neighborhood and at Departure Bay, 3 miles north. Pop. about 3,000. M. W. H.

Nanaimos: SEE SALESIAN INDIANS.

Nanak: SEE SIKHS.

Nana Sahib, nā-nā-sahib: title of Daboo Peshwa (or Panth): a leader of the Sepoy mutiny; b. about 1820; was adopted by Bajee Rao, Peshwa of Poona, and became his heir, but was not regarded as such by the British Government, which refused to continue the pension paid to his adopted father. Though embittered by this the Nana continued outwardly friendly to the British and won their confidence, but on the outbreak of the mutiny turned traitor and placing himself at the head of a body of rebels attacked Cawnpore. The British surrendered on condition that they should be

sent down the Ganges to a place of safety. They were suddenly embarked when they were fired upon from the shore and almost all the men on board were killed. The women and children were taken to Cawnpore, and on the day before the arrival of Havelock to their aid were butchered by order of the Nana and their bodies thrown into a well. Notwithstanding the repeated efforts of the British to capture the author of the crime, he never fell into their hands though several times defeated by them in battle. Of his subsequent career nothing is known. F. M. COLBY.

Nancy, nān'see': capital of the department of Meurthe-et-Moselle, France; on the left bank of the Meurthe; 220 miles by rail E. of Paris (see map of France, ref. 3-H). It is beautifully situated at the foot of a range of wooded and vine-clad hills. Besides its suburbs, it consists of the old and the new town, the latter with many broad and straight streets lined with magnificent houses, and many public squares adorned with fountains and gardens. It owes much of its beauty to Stanislaus Leczinsky, ex-King of Poland, who resided here from 1735 to 1766, and whose statue is in the Place Royale. It is the seat of a bishopric, and has a university, a celebrated school of medicine and pharmacy, a lyceum, a library of 40,000 volumes, several scientific societies, and many other excellent educational institutions, and large museums and collections both for scientific and artistic purposes. It is an important center for research in the field of hypnotism. It has manufactures of cotton and woolen goods, hosiery, hats, and brass, and its embroideries in all kinds of stuffs are celebrated. It was the capital of the former duchy of Lorraine, and in its immediate vicinity was fought the battle between Charles the Bold of Burgundy and René II. of Lorraine, in which the former was defeated and killed Jan. 5, 1477. At the death of Stanislaus, who held the country after the Peace of Vienna in 1735, Nancy was incorporated with France (1766). It has grown much in importance since the German annexation of Alsace-Lorraine. Pop. (1891) 87,110. Revised by S. A. TORRANCE.

Nan'du, or **American Ostrich**: the South American ostrich, or Rheu. See RHENDEL.

Nan'ek: founder of the important modern sect of the Sikhs of the Punjab; b. at Talwandy, near Lahore, in 1469; son of Kalu of the Kshatriya caste; showed an early tendency to mysticism; associated with the fakirs; studied the religious books both of the Brahmans and of the Mohammedans; distributed his property to the poor; visited Mecca and Medina, and wandered through India in quest of a "vision of truth," which he ultimately attained, and thenceforth propagated a new religion with great success, being presented to the Emperor Baber in 1527. Nanek taught the unity of God, insisted upon faith in God and love to man, rejected monasticism, and instituted a very simple form of worship, which has since been considerably overlaid by the innovations of his successors. The object of Nanek was a reconciliation of Buddhism with Mohammedanism, and he embodied his doctrine in a book entitled *Adi Granth*, now the Bible of the Sikhs. D. at Kirtipur, on the banks of the Ravi river, in 1539. His tomb has been swept away by the river, but the locality is still a place of pilgrimage.

Nankeen' [named from *Nanking* in China, the original place of manufacture]: a durable cotton cloth of a buff-yellow color. It is made in Asia from a variety of cotton whose fiber is of this color (the *Gossypium herbaceum*). Artificially colored nankeens are made from ordinary cotton, and have nearly superseded the real article.

Nanking, or (less correctly) **Nankin** (literally, southern capital): the name by which *Kiang-ning-foo*, capital of the province of Kiang-su, is popularly known in China and among foreigners. It is situated on the south bank of the Yang-tse, 194 geographical miles W. of Shanghai, and 44 above the river-port of Chin-kiang; lat. 32° 2' N., lon. 118° 49' E. (see map of China, ref. 5-K). Its walls, which are 30 feet thick at the base and 70 feet high in some places, have a circuit of about 20 miles. The inclosed area, however, contains many open spaces and much waste ground. The inhabited part lies toward the west side, and is 3 miles from the river. The site is very unhealthy for Europeans, and even for natives of other parts of the empire. It is the seat of the viceroy or governor-general of the group of provinces known as Kiang-nan, and was formerly a city of much magnificence and importance. It was one of the chief literary centers, and was noted (as it still is to some extent) for its manufactures of satin, crape, nankeen, paper, porcelain, and

artificial flowers. It is now the seat of an arsenal conducted, under foreign superintendence, on the most advanced scientific principles.

The present city dates from the year 1368, when Chû-yuen-chang, a temple servant, at the head of a native army overturned the Mongol dynasty, whose capital was at Peking (the northern capital), and founded the Ming dynasty, which was in turn superseded in 1643 by the Manchus. He made it his capital (hence the name southern capital). Here outside the south gate stood the famous Porcelain Tower, or pagoda, which the third emperor of the Ming dynasty erected in honor of his mother in 1413, two years after the removal of the capital to Peking. It was 261 feet high, octagonal in ground plan, and consisted of nine stories, each provided with a gallery and a projecting roof, from the corners of which bells were suspended. Its outer walls were encased with white porcelain tiles. On Mar. 19, 1859, the city was taken by the Tai-pings, and was held by them until July 19, 1864, when it was captured by Gen. Gordon, and the rebellion came to an end. During their occupancy the palaces and other public buildings erected in the early days of the Ming dynasty, including the Porcelain Tower, were completely destroyed. The arsenal now stands on the site of this tower, and was partly built with its bricks.

At Nanking, Aug. 29, 1842, Great Britain concluded the treaty which opened five ports to foreign residence and trade. In the treaty concluded by the French in 1858 Nanking is mentioned as a treaty-port, but it has never been opened. Population probably less than 250,000. R. LILLEY.

Nan'sen, FRIDJOF, Ph. D.: Arctic explorer; b. near Christiania, Norway, Oct. 10, 1861; entered the University of Christiania 1880; left in 1882 for an expedition in a sealing-ship to Arctic latitudes; was appointed on his return in 1882 curator in the Natural History Museum at Bergen; started May, 1888, on his celebrated journey to Greenland, in which he crossed the continent, returning May, 1889; became curator of the Museum of Comparative Anatomy at the University of Christiania; is the author of *The First Crossing of Greenland*, *Eskimo Life*, and numerous scientific papers. The Norwegian Storting having voted 200,000 kroner for a new expedition to the north pole under Nansen's direction, he set out from Christiania June 24, 1893, in a specially constructed vessel of 170 tons, the *Fram* (Forward), manned with a dozen men and equipped with provisions and fuel for five years. His plan was to utilize the current which he believed sweeps from Bering Strait and the vicinity of the New Siberian Islands (*q. v.*) across the pole toward Greenland. By Sept. 22 he was shut in by the ice and began his northward drift. On Mar. 14, 1895, when in lat. 83° 59', he with Lieut. Johansen left the ship and proceeded toward the pole with dog-sledges. On Apr. 8, when in lat. 86° 14' N. and lon. 95° E. (2° 50' nearer the pole than any previous explorer), they discovered that the ice-pack on which they were traveling was slowly drifting southward, and determined to make for Franz Josef Land, which they reached Aug. 26; spent the winter there (lat. 81° 13' N.), living on bear and walrus, and in the spring of 1896 set out to reach Spitzbergen over the ice. On the way they fell in with members of the Jackson-Harmsworth expedition, and in August returned to Norway in their supply vessel, the *Windward*. On Aug. 21 the *Fram* also arrived safe and sound at HAMMERFEST (*q. v.*), and reported that, continuing to drift with the ice, she reached lat. 85° 57' on Nov. 15, 1895, and found open water in lat. 83° 14' N. and lon. 14° E. No land had been sighted N. of 82°. In Feb., 1897, Nansen began a lecturing tour in Great Britain, and had many honors heaped upon him. See *Fridtjof Nansen* (1896) and his *Farthest North* (1897). R. LILLEY.

Nantes (Fr. pron. nanât; anc. *Condivin'cum*, or *Namne'tes*): city of France; capital of the department of Loire-Inférieure; situated on the right bank of the Loire, 35 miles from its mouth, at the influx of the Erdre and the Sèvre-Nantaise; 248 miles by rail S. W. of Paris (see map of France, ref. 5-C). The quays, boulevards, and promenades along the Erdre are elegant, and the city is regular and handsome. The most remarkable architectural monuments are the cathedral, built in the fifteenth century, with its towers hardly rising above the roof, containing the splendid monuments of Queen Anne, of Francis II., the last Duke of Bretagne, and his wife, Margaret of Foix; the castle, begun in 938, in which Henry IV. signed the EDICT OF NANTES (*q. v.*) Apr. 13, 1598, and in which many of the French kings resided temporarily; the bourse, a modern building, and one

of the finest of its kind in France; and the post-office, built in 1884. The city has a lyceum, a school of navigation, several commercial and industrial schools, a library of 50,000 volumes, a botanical garden, a museum of antiquities, and an art-gallery. The principal branch of the industry of Nantes is ship-building and the production of all articles necessary to the outfit of a vessel—anchors, cables, cordage, sailcloth, biscuits, preserved meat, etc. The city itself possessed in 1889 330 ships, of 54,500 tons burden; the total shipping for the year amounted to 296,000 tons; the value of imports was \$10,000,000 and of exports \$2,750,000. Sugar-refining and the manufacture of linen and cotton fabrics, calicoes, flannels, musical, mathematical, and optical instruments, chemicals, leather, brandy, etc., are also extensively carried on. The harbor, formed by an arm of the Loire, can accommodate 200 vessels, and a ship-canal constructed in 1891 between Nantes and St.-Nazaire has made it possible for large vessels, which were formerly compelled to load and unload at the mouth of the river, to reach the harbor. Pop. (1891) 122,750.

Nanticoke: borough; Luzerne co., Pa. (for location of county, see map of Pennsylvania, ref. 3-H); on the Susquehanna river, and the Cent. of N. J., the Penn., and the Del. Lack. and W. railways; 8 miles S. W. of Wilkesbarre, the county-seat. It contains a planing-mill, drill-factory, several coal mines, and 2 daily and 2 weekly newspapers. West Nanticoke is in Plymouth township, on the opposite side of the river, and has large coal-mining interests. Pop. of Nanticoke (1880) 3,884; (1890) 10,044. EDITOR OF "NEWS."

Nanticokes: See ALGONQUIAN INDIANS.

Nantucket: town; capital of Nantucket co., Mass. (for location, see map of Massachusetts, ref. 6-J); on Nantucket island, and the Nantucket Railroad; 28 miles S. of the Cape Cod peninsula. It is a noted summer resort; has steamboat connection with New Bedford (53 miles N. W. by water), Wood's Hole, and Martha's Vineyard; and contains a national bank with capital of \$100,000, a savings-bank with deposits of over \$453,000, 2 libraries (Admiral Sir Isaac Coffin's Lancasterian School, founded 1827, and the Athenæum, founded 1836) containing over 10,000 volumes, and 2 weekly newspapers. The town formerly had large whale-fishery interests, but is now principally engaged in the cod-fishery and the coasting trade. Pop. (1880) 3,727; (1890) 3,268; (1895) 3,016. EDITOR OF "INQUIRER AND MIRROR."

Nantucket Island: an island in the Atlantic Ocean; about 30 miles S. of Barnstable co., Mass. With the small islands of Tuckanuck, Musket, and the Gravel islands it forms the county of Nantucket, which has an area of about 60 sq. miles. Nantucket island is of a triangular shape, about 15 miles long, and from 3 to 4 miles wide. The soil is sandy. Pop. (1890) 3,268; (1895) 3,016.

Napa, naa'pa: city; capital of Napa co., Cal. (for location of county, see map of California, ref. 6-C); at the head of tide-water on the Napa river, and on the S. Pac. Railroad; 46 miles N. E. of San Francisco, 65 miles S. W. of Sacramento. It is in an agricultural, horticultural, and wine-growing region, in a valley noted for its beautiful scenery and equable climate. It contains 4 public and 2 private schools, Oak Mound School (non-sectarian, opened 1872), Napa College (Methodist Episcopal, opened 1886), 2 libraries (free public, founded 1885, and Napa College) containing over 9,000 volumes, 2 State banks with combined capital of \$500,000, a private bank, and 3 daily and 3 weekly newspapers. The State asylum for the insane, completed in 1875 at a cost of over \$1,000,000, is located here. The manufactures include cream of tartar, wine, planing-mill products, tanned leather, and gloves. Pop. (1880) 3,731; (1890) 4,395. EDITOR OF "REGISTER."

Napata: the capital of the Ethiopian kingdom which grew to power between 900 and 700 B. C. It was located at the present Gebel Barkal (18° 30' N. lat.), somewhat below the fourth cataract of the Nile. The region was conquered by the Egyptians of the twelfth dynasty and was long governed as a province. During the Hyksos period its history is unknown, but under the eighteenth dynasty it was again conquered, and a temple to Amon-Ra was erected at Napata by Amenophis III. Intimate relations with Egypt continued through the Ramesside period. Somewhat later Napata became the capital of an "orthodox" priestly Egyptian kingdom, possibly founded by the successors of HER-HOR (*q. v.*) when the Libyans gained the rule in Egypt under the twenty-second dynasty (about 930 B. C.). Subsequently the

relative strength of Egypt and the kingdom of Napta gradually changed, and 200 years later Phoenicia made a warlike incursion into Egypt, capturing the whole country and establishing the Egyptian dynasty. After the Greek period the history of Napta is not clear, its name occurring largely in a geographical tract written by a Greek geographer of the 1st century B. C. It continued however, down to the Roman times, with a change of the capital to Memphis. (C. R. OLLIVER.)

Naperville: (city, Du Page co., Ill. for location, see map of Illinois, ref. 2-6); on the Du Page river, and the Chi. and Quincy R. R.; 9 miles E. of Aurora, 30 miles W. S. W. of Chicago. It is the seat of Northwestern College, for both sexes (Evangelical Association, opened in 1861), which in 1890-91 had 21 professors and instructors and 280 students. The principal industries are agriculture, stone-quarrying, and manufacturing. There are a national bank with capital of \$50,000, two private banks, and a weekly and a monthly postoffice. Pop. (1880) 2,973, (1890) 2,216.

Naphtali [*=* Heb. *Naphthal*, lit., my wrestling; the sixth son of Jacob, by Bilah, the handmaid of Rachel. The tribe of Naphtali numbered 53,400 fighting men before Sinai, and 45,400 at the entrance into the promised country. It was settled in Northern Galilee from the foot of Anti-Lebanon to Lake Genesareth; Kedesh was its principal town.

Naphtha [*=* Lat. *=* Gr. *náphtha*, from Arab. *nafth*] a name applied to certain natural and artificial volatile fluids with little or no color.

In Persia the word was used to designate the most volatile forms of liquid bitumen that are intermediate between petroleum and natural gas. As the use of the word extended into Europe, where the substances to which it was first applied were unknown, it was used to designate petroleum. Hence we have "the naphthatest Arabian" and Rangoon naphtha, the latter of which was nearly maltha in consistence. When wood was distilled for the production of pyroligneous acid, the volatile liquid that first passed over, and from which by refining methylic alcohol is obtained, was called wood-naphtha. When coal-tar was distilled, the volatile liquid that first passed over, from which benzole and its homologues are derived, was called coal-tar naphtha. Still later, when American petroleum was distilled, the volatile liquid that first passed over, that was not suitable for illuminating oil, was called naphtha, and later petroleum-naphtha. This crude naphtha was later redistilled and the distillate subdivided into A, B, and C naphthas, having different specific gravities, and used for different purposes. At the present time the word has very little use without some qualifying phrase to give it definition. See BITUMEN, PETROLEUM, METHYL ALCOHOL, and HYDROCARBONS. S. F. PECKHAM.

Naphtha Gas: See PETROLEUM.

Naphthalene [*naphtha* + *alcohol* + suffix *-ene*]: a hydrocarbon found among the products of the destructive distillation of bituminous coal. (See GAS-LIGHTING and HYDROCARBONS.) It occurs in Rangoon petroleum and the tar of shale oil. It is formed by passing the vapors of several other hydrocarbons through a red-hot tube, as toluene (C_7H_8), xylene (C_8H_{10}), cumene (C_9H_{12}), or mixtures of ethylene (C_2H_4) with benzene (C_6H_6), cinnamene (C_8H_8), anthracene ($C_{14}H_{10}$), or chrysene ($C_{18}H_{12}$). Alcohol and ether vapor, and even ethylene and vapors of acetic acid, petroleum, essential oils, etc., yield some naphthalene when passed through red-hot tubes. Soot and lampblack contain naphthalene.

Preparation.—Naphthalene is found in the tar formed from coal in the manufacture of gas and coke. It is found in that fraction of the tar that boils between 180° and 250° C. (350° and 480° F.), that is principally in the so-called "carbolic oil." From this it is separated by filtering and pressing between hollow plates heated by steam (hot-pressing). The product obtained in this way is treated with caustic soda for the purpose of extracting phenols; then it is washed with dilute sulphuric acid at about 100° C. (212° F.). During this stage a small quantity of finely ground black oxide of manganese is added to the vessel for the purpose of removing the color. The purified hydrocarbon is washed several times with hot water, then with dilute alkali, again with hot water, and then sublimed or distilled.

Properties.—Naphthalene appears in brilliant white, scaly crystals, very friable, strongly and unpleasantly odor-

The hydrocarbon is soluble in alcohol, ether, and benzene, leucoline oil, which can be separated by boiling it with strong sulphuric acid and precipitating the resulting brown solution with ammonia. In medicine naphthalene has been employed for antiseptic and disinfectant purposes both internally and externally. Its specific gravity is 1.152. It melts at 79.5° C. (175° F.) and boils at 218° C. (425° F.). It sublimes at low temperatures and evaporates in the air. It is insoluble in cold, and almost insoluble in boiling water, but dissolves readily in alcohol, ether, fatty and essential oils, and most oils (naphthas) obtained by destructive distillation, in acetic and oxalic acids. The composition of naphthalene is represented by the formula $C_{10}H_8$ (see HYDROCARBONS), and, so far as its chemical nature is concerned, it is regarded as related to benzene, C_6H_6 . A very ingenious suggestion as to the relation between these hydrocarbons was first made by Erkenmeyer, and afterward shown by Gräbe to be in accordance with a large number of facts. It has long been used as a satisfactory working hypothesis, and much of our knowledge of this hydrocarbon and its derivatives is due to attempts made to test the hypothesis.

Naphthalene is a stable substance, as is clearly shown by its formation under the influence of high heat. It undergoes change under the influence of active reagents, and yields a great variety of derivatives, many of which have come into use on a large scale, especially in the manufacture of colors.—**Oxidizing agents**, as, for example, nitric acid, *potassium permanganate*, etc. (see MANAGERIAL CHEMISTRY) convert it into PHTHALIC ACID (*q. v.*), or into α -naphthoquinone.—**Chlorine** forms addition products and substitution products.—**Nitric acid** forms several nitro-products, viz., one mono-nitronaphthalene, $C_{10}H_7NO_2$; two dinitro-products, $C_{10}H_6(NO_2)_2$; three trinitro-products, $C_{10}H_4(NO_2)_3$; and two tetranitro-products, $C_{10}H_2(NO_2)_4$. **Sulphuric acid** yields sulphonic acids, as follows: two mono-naphthalene sulphonic acids, $C_{10}H_7SO_3H$; four disulphonic acids, $C_{10}H_6(SO_3H)_2$; two trisulphonic acids, $C_{10}H_5(SO_3H)_3$; one tetrasulphonic acid, $C_{10}H_4(SO_3H)_4$.—Among the most important derivatives of naphthalene are the **sulphonic acids**: the *nitro-naphthalenes*; α and β -*naphthol*, $C_{10}H_7NH_2$, and α - and β -*naphthol*, $C_{10}H_7OH$, which bear to naphthalene the same relation that carbolic acid or phenol bears to benzene; *naphthionic acid*, $C_{10}H_6NH_2SO_3H$, or the sulphonic acid of naphthylamine. The naphthols and naphthionic acid are used in the preparation of azo-dyes.

Some years since Roussin prepared a substance which he supposed to be artificial alizarin, the most important coloring-matter of madder. Alizarin was at that time supposed to be a derivative of naphthalene, as both yield phthalic acid. Roussin's product was not alizarin, and has not proved to possess any value as a dye. It is called naphthazurin, and is $C_{10}H_6O_4$ (see CHEMISTRY).

Naphthalene Colors.—Many of the derivatives of naphthalene exhibit beautiful and intense colors, but a few only have been found available as dyes. (1) Martius yellow, Manchester yellow, *jaune d'or*, is the ammonium calcium or sodium salt of dinitro-naphthol. It imparts to wool and silk, without the aid of a mordant, yellow hues from lemon-yellow to golden-yellow, which are gradually volatilized by steaming. Picric acid imparts similar tints, but it is volatilized by steam. Martius yellow is not only used for dyeing yellow, but also to modify the hue of aniline red. (2) Naphthol yellow S, acid yellow S, is the calcium, sodium, or ammonium salt of dinitro- α -naphthol-sulphonic acid. It is prepared by treating α -naphthol with sulphuric acid and afterward with nitric acid. The acid and its salts dye like Martius yellow. Unlike the latter, they are not volatile in the process of steaming. (3) Magdala red, naphthalene red, naphthylamine red, roseonaphthalene, is made, according to O. N. Witt, by melting together hydrochlorate of naphthylene-diamine, α -naphthylamine, and amidazonaphthalene. It has the composition $C_{20}H_{12}N_4Cl$, and belongs to the class of dyes known as safronines. The product appears in commerce as a dark-brown, somewhat crystalline powder, which is the chloride of the base. In tinctorial power it equals aniline red, while it surpasses it in being a very fast color. It can be readily distinguished from aniline red by the following reaction: On pouring a few drops of its concentrated solution into a cylindrical vessel filled with alcohol, a liquid is formed perfectly transparent, with light rose-color by transmitted light, but exhibiting in reflected light a strong and peculiar fluorescence, giving an appearance of opacity, as if a precipitate were formed. (See CHEMISTRY.)

clouds of fiery-red color. (4) Naphthylamine violets and blues are produced by the same reactions employed in converting aniline red into violets and blues (see ANILINE COLORS); i. e. replacing in magdala red one, two, or three atoms of hydrogen by methyl, ethyl, phenyl, etc. They may also be produced by treating naphthylamine with mercuric nitrate (*Wilder*); by substituting the radical naphthyl ($C_{10}H_7$) for hydrogen in aniline and toluidine (*J. Wolff*); from rosaniline and mono-bromonaphthalene, and from rosaniline and naphthylamine (*M. Ballö*). Blumer-Zweifel (*Dingl. polyt. J.*, cxvii., 66) produces naphthylamine violet directly on the fiber by printing linen or cotton stuffs with a solution containing in a liter of suitable thickening material 30 grammes of naphthylamine hydrochloride and 15 grammes of cupric chloride solution of $15^\circ B$. For dyeing the thickening material is omitted, and the cupric chloride is reduced by a fourth. By increasing or diminishing the quantity of naphthylamine salt the color may be made darker or lighter. The printed or dyed stuffs are left for two or three days in the oxidizing chamber at a temperature of $77^\circ F$. ($25^\circ C$), and the colors fixed by washing with soap-water. Alkaline baths render the color reddish, acid baths make it bluish. A. Kiemayer (*Dingl. polyt. J.*, cxvii., 67) has given a similar process, using chlorate of potassium instead of cupric chloride. (5) Chloronaphthalic or chlor-oxynaphthalic acid ($C_{10}H_5ClO_3$). When naphthalene is heated with chlorate of potassium and hydrochloric acid, a mixture of chloro-naphthalene and bichloro-naphthalene is obtained. By heating these with nitric acid a mixture of phthalic acid and chloride of chlor-oxynaphthyl is produced. The latter compound, on being heated with an alkali, is converted into the new acid. In a free state the chlor-oxynaphthalic acid is yellow; it forms beautifully colored salts with baryta, zinc, and copper. It dyes wool scarlet without a mordant, but scarcely produces any change on cotton mordanted with alumina or iron. This acid almost rivals turmeric and litmus in its sensibility to alkalis. Paper stained with a very dilute alcoholic solution assumes a red color in ammoniacal vapors.

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Revised by IRA REMSEN.

Naphthol and Naphthylamine: See NAPHTHALENE.

Nap'ier, Sir CHARLES, K. C. B.: admiral; son of Capt. Charles Napier, R. N.; b. at Merchiston Hall, Stirlingshire, Scotland, Mar. 6, 1786; entered the navy at the age of thirteen; was made commander in 1807; distinguished himself in the West Indies; served as a volunteer in the British army in Portugal; became commander of the Thames (32 guns) in 1811, and inflicted great damage upon the French in the Mediterranean; was engaged in the British naval operations in the Potomac and against Baltimore in 1814; settled in Paris after the peace, and lost his money in a steamboat speculation; was placed on naval duty on the coast of Portugal in 1829; accepted from Dom Pedro in 1833 the command of the squadron of the young queen; inflicted upon the fleet of Dom Miguel a decisive defeat off Cape St. Vincent July 5, for which he was made Viscount St. Vincent in the Portuguese nobility and admiral-in-chief of the Portuguese navy. In 1836 he resumed service in the British navy; was engaged as commodore on the coast of Syria in 1840, when he stormed Sidon with a land force, captured Acre, blockaded Alexandria, and concluded a convention with Mehemet Ali, for which services he was knighted. He sat in Parliament 1842-46; commanded the Channel fleet 1846-48; made vice-admiral May, 1853; commander of the Baltic fleet in the war with Russia 1854, and captured Bomarsund, but his refusal to attack Cronstadt provoked unfavorable comment, and he thereafter held no active command. He was made admiral of the blue 1858, and sat in Parliament for Southwark from 1855 till his death, which occurred at Merchiston Hall, Hampshire, England, Nov. 6, 1860. He wrote *An Account of the War in Portugal* (1836) and *The War in Syria* (1842), and furnished materials for a *History of the Baltic Campaign* (1857).

See his *Life and Correspondence*, by Maj.-Gen. E. Napier, 1862.

Revised by B. B. HOLMES.

Napier, Sir CHARLES JAMES, G. C. B.: soldier; b. at Westminster, London, Aug. 10, 1782; received a commission in the army when twelve years of age; fought in the Irish rebellion; was wounded and left for dead in the battle of Corunna (Jan. 16, 1809); engaged in literary work in England; returned to the Peninsula as a volunteer and obtained a regular command in 1811; engaged in expeditions against the coast of the U. S. 1813; governor and military resident of Cephalonia 1822-30; conquered Sind in a series of battles, and showed great ability as governor of the conquered province 1842-47; resided in England 1847-49, when he was again sent to India as commander-in-chief, but found the Sikhs already beaten, and returned to England the next year. D. near Portsmouth, Aug. 29, 1853. He was of an imperious disposition, and often quarreled with those of greater authority; but he was loved by his soldiers and was the object of much hero-worship. He is the author of *Lights and Shadows of Military Life* (1840); *Indian Misgovernment and Lord Dalhousie* (1853).

Napier, JOHN, Laird of Merchiston: mathematician; b. at Merchiston Castle, near Edinburgh, Scotland, in 1550; studied at the University of St. Andrews; spent several years in travels in France, Spain, and Italy, and on his return entered upon a life of studious leisure. He first became known as an author by his *Plain Discovery of the Whole Revelation of St. John* (1593), giving in the dedication some wholesome advice to King James upon the reform of his "house, family, and court." About this time he was engaged in researches into the construction of warlike machines, and a letter to Anthony Bacon, dated in 1596, describes his invention of a mirror to set fire to ships by reflecting the rays of the sun, and of an instrument for scattering shot over a wide area; but these inventions seem never to have been tested or even perfected. In 1614 he published his great discovery of logarithms in a work entitled *Mirifici Logarithmorum Canonis Descriptio*, which, according to Kepler, he had indicated as early as 1594 in a letter to Tycho Brahe. In 1617 he published *Rabdologie, seu Numerationis per Virgulas Libri duo*, describing the invention known as NAPIER'S BONES (*q. v.*). He died at Merchiston, Apr. 4, 1617. His son Robert published, 1619, a posthumous work, *Mirifici Logarithmorum Canonis Constructio*, explaining the method of constructing tables of logarithms. Archibald, his eldest son, was created Lord Napier in 1627, and was ancestor of several of the Napiers of military and naval celebrity in modern times. Biographies of Napier were published by the Earl of Buchan (1787) and by Mark Napier (1834).

Napier, MACVEY: lawyer and author; b. in Stirlingshire, Scotland, Apr. 12, 1776; studied law; became writer to the signet 1799; published in 1817 an essay on the *Philosophical Writings of Lord Bacon*; edited the *Supplement to the Encyclopædia Britannica* (6 vols., Edinburgh, 1815-24); was appointed Professor of Conveyancing in the University of Edinburgh 1825; edited *The Edinburgh Review* for seventeen years (1829-46); superintended the seventh edition of the *Encyclopædia Britannica* (1830-42). D. at Edinburgh, Feb. 11, 1847. A posthumous work by Prof. Napier, *Lord Bacon and Sir Walter Raleigh*, appeared in 1853.

Napier, Sir WILLIAM FRANCIS PATRICK, K. C. B.: soldier and author; b. at Castletown, Kildare, Ireland, Dec. 17, 1785; brother of Sir Charles James and Col. George, and cousin of Admiral Sir Charles Napier, who together constituted a remarkable assemblage of military, naval, and literary talent, all being descendants of the Laird of Merchiston, the inventor of logarithms. Sir William entered the army in 1800; became captain 1804; served at the siege of Copenhagen 1807; in 1808 accompanied Sir John Moore to Portugal, and was actively engaged in the Peninsular campaign 1810-14; became major 1811, and lieutenant-colonel 1813, and wrote a *History of the War in the Peninsula and in the South of France from 1807 to 1814* (6 vols., 1828-40), admitted to be one of the most remarkable military histories of modern times. This history called forth a large number of replies and criticisms from officers alluded to in the text and the later editions contain replies printed under the title *Justificatory Pieces*. Napier was made colonel in 1830, major-general 1841, lieutenant-governor of Guernsey 1842, knighted 1848, and made lieutenant-general 1851. He devoted his later years to the illustration of his brother's exploits in the East, publishing *The Conquest of Scinde* (1845),

Administration of Sicily (1851), and *The Life of Sir Charles Napier* (1857); *Louis* issued in 1855 *English Battles and Sieges in the Peninsula*, consisting of passages from his larger history, revised and sometimes rewritten. D. at Seaside House, Chatham, Feb. 12, 1860.

Napierian Logarithms: See LOGARITHMS.

Napier of Magdala. ROBERT CORNELIUS NAPIER, BARRISTER-AT-LAW, in Ceylon, Dec. 6, 1810; son of Major C. F. Napier, of the Royal Artillery; was educated at the Military College at Addiscombe, and entered the Royal Engineers as second lieutenant in 1826; served throughout the Sikh campaign of 1845-46, as chief engineer in the battles of Moodkee and Ferozeshah (severely wounded), and as brigade major of engineers at the battle of Soobraon; served in the Punjab campaign of 1848-49; was chief engineer and wounded during the siege of Multan 1849; commanding engineer of the right wing at the battle of Gujerat and pursuit of the Sikh army; actively engaged throughout the Indian mutiny campaigns; chief of staff to Outram in 1857, and distinguished in the actions leading to the first relief of Lucknow and subsequent operations; brigadier and chief engineer at siege and capture of Lucknow; commanded a brigade at the capture of Gwalior, reducing the fort of Powrie Aug., 1858; commanded a division in the China expeditionary force, and was distinguished throughout the campaign resulting in the surrender of Peking, and promoted to be major-general; appointed lieutenant-general in 1867, and commanded the Abyssinian expedition resulting in the capture of Magdala and the release of the British prisoners. On Napier's return to England, in July, 1868, he was raised to the peerage under the title of Baron of Magdala, and received an annual pension of £2,000. (See ABYSSINIA and MAGDALA.) He was also nominated a G. C. B., having previously been made C. B. and K. C. B. for his services during the Indian mutiny. He was governor and commander-in-chief of India 1870-76; governor of Gibraltar 1876-82. D. in London, Jan. 14, 1890.

Napier's Bones or Rods: a set of tablets of bone, horn, ivory, or other material, invented by the mathematician Napier for facilitating multiplication and division. They are of no practical use, and are only interesting as a mathematical curiosity.

Naples [= Fr., from Ital. *Nà-poli* < Lat. *Nep̄opolis* = Gr. *Nēd̄ropolis*, *liter.*, New Town; *néos*, new + *pólis*, city]; city of Italy; capital of the province of Campania, and formerly of the kingdom of the Two Sicilies; on the Bay of Naples; in lat. 40° 50' N., lon. 14° 16' E.; 161 miles by rail S. E. of Rome (see map of Italy, ref. 7-F). It is magnificently situated, rising like an amphitheater from the shore, and has an almost perfect climate. The city is dominated on the W. by the Castle of St. Elmo, once of immense strength, which crowns the hill of St. Ermo or St. Ermo; on the seaside are the fortresses of Castel Nuovo, often compared to the Tower of London, and adorned with a triumphal arch in honor of Alfonso of Aragon (1442); the Castel dell' Ovo, with its medieval traditions about Vergil, but which was probably built by the Norman William I. (1150); also many battlements.

Marine Communication. *Steamers, etc.*—There is regular steam communication by water between Naples and all the principal Mediterranean ports, and railways connect it with Central and Northern Italy; the city itself is intersected by tramways and omnibus lines. It is divided into the Old, or eastern, and the New, or western, towns by the ridge extending from the palace of Capodimonte to the sea, thus dividing the city into a kind of double crescent. The modern streets are broad and well paved, while the older thoroughfares, lined by houses of great height, are, the Via Roma excepted, extremely narrow, and sometimes very steep and crooked, and the glimpses caught of them in driving through the wider avenues are strikingly picturesque. Among the principal streets are the Via Roma (formerly called the Toledo), a grand street intersecting the old town; the Chiaja, or Riviera di Chiaja, which, passing the charming gardens of the Villa Nazionale on the left and a row of fine buildings on the right, winds for several miles along the curving, undulating western shore of the bay, and is the fashionable promenade of the city; the Vittorio Emanuele, which skirts and crosses the higher portions of the town, commanding views of surpassing loveliness; the Corso Garibaldi, and the Via del Duomo. The lower part of the Via Roma formerly offered to the visitor the most animated pictures of Neapolitan habits, where the whole domestic life

of the poorer classes might be studied in the open air; but all this has greatly changed since the unification of Italy and the consequent reduction of the *lazzaroni*. The public squares, called *larghi*, are irregular, and, though flanked by showy edifices and decorated with fountains, are not generally attractive. In the Villa Nazionale stand the aquarium and exhibition-rooms of the famous Zoological Station, established here in 1870-75 by Dr. Anton Dohrn, of Jena.

Churches and Public Institutions.—The churches of Naples, some very quaint and curious in their construction, and have more archaeological interest than architectural merit. In the sacristy of the Cathedral of San Gennaro is the almost priceless treasury of the saint; here also are the *ampolle* or small phials said to contain the blood of St. Gennaro, which is believed to liquefy twice every year. Among other prominent churches are the Incoronata, founded by Joanna I., with damaged frescoes attributed to Giotto; Sta. Chiara, with fine frescoes and curious old monuments; San Domenico Maggiore, very rich; the Church of the Gerolomini, one of the finest in the city; San Francesco di Paola, which has a cupola of great size and boldness of execution. Of the six large theaters, San Carlo is the largest and most elegant. The National Museum, formerly known as the Museo Borbonico, is one of the most extensive and most interesting in the world; among its treasures are a great number of objects found in Pompeii and its neighborhood. The National or Farnese Library contains over 250,000 volumes, besides 8,000 manuscripts on parchment and paper, and 1,800 from Herculaneum on papyrus; the Brancacciana has over 100,000 volumes; and 150,000 volumes belong to the library of the university, which was founded in 1224, and is attended by 3,500 students. Outside of the Capuan gate is the cemetery of the non-Catholics, remarkable for the simplicity and elegance of the monuments. The old Campo Santo, the cemetery of the victims of the cholera, and the new Campo Santo, are on the road to the Poggio Reale. Among the many objects of interest in the immediate vicinity of Naples is the grotto of Posilipo, the work of Lucullus or of Agrippa. This is a gallery cut through the rocky promontory of Posilipo, about 1,850 feet long, 17 or 18 in width, and at the extremities above 50 feet in height, though much lower toward the center. Just over the east entrance is the reputed tomb of Vergil.

Industries, Trade, etc.—Naples has, on a small extent, manufactures of woolen, silk, and linen fabrics, leather, gloves, coral ornaments, tapestry, porcelain, chemicals, machinery, carriages, and macaroni, and is the site of a government ordnance-foundry. Its trade is large, however; some 3,700 ships of 1,700,000 tons burden enter the port annually. The principal exports are wine, olive oil, almonds, sulphur, hemp, and flax; the chief imports, grain, cottons, woolens, and earthenware. The fisheries also are important.

History.—Naples is said to have been founded as an offshoot of the still older town, *Parthenope* or *Palæopolis*, the site of which was probably Posilipo. Both towns were Greek colonies, and Greek continued to be spoken until the second century of the Christian era. The ancient city first appears in history as an ally of Rome against the Samnites. It continued faithful to the Romans in their wars with Hannibal, and eventually became the favorite resort of the Roman aristocracy, the ruins of whose splendid villas still meet the eye in every direction. After suffering much from the barbarians, it was besieged (537) by Belisarius, who, entering the town through an aqueduct, gave it up to his soldiers. Totila, who took it afterward, treated it more humanely. Later it became the capital of a dukedom, gradually extending over the neighboring towns and islands, and had fierce conflicts with that of Benevento. In 1037 the city fell into the hands of the Normans under Ruggiero, and was well governed by him and his successors as a part of their kingdom. The Swabian dynasty followed in 1194, but in 1268, at the instigation of the pope, Conradine, the last of his house, was taken prisoner and beheaded by Charles of Anjou, on whom the pope had bestowed the kingdom of Naples. Charles beautified the city and made it his capital. The weakness of Joanna I. and the assassination of her husband brought upon Naples the vengeance of his brother, Louis of Hungary, and for a century the greatest disorder and misery prevailed. In 1442 Alfonso of Aragon besieged the city and entered it through an aqueduct, as Belisarius had done before him. In 1495 Naples joyfully opened her gates to Charles VIII. of France, who, however, was soon forced to share his prize with Spain. Francis I. vainly endeavored to recover it from his rival,

Charles V. In the siege of 1528 both besieged and besiegers suffered cruelly from plague and famine. Under the government of the Spanish viceroys Naples presented a scene of disorder and squalor, while churches were multiplied and convents occupied the most beautiful and healthful positions in the city. Strong efforts were made by the best citizens and the purest ecclesiastics to introduce the Reformed religion, and a popular tumult in 1547 forced Charles V. to annul the order for the establishment of the Inquisition; but religious persecution under other forms and the most intolerable despotism finally brought about (1647) the famous insurrection of MASANIELLO (*q. v.*). Not long after a terrible plague appeared, during which 30,000 persons perished in six months. In 1701 the nobility attempted to overthrow the existing government and place an archduke of Austria at its head. During the wars of the French Revolution, Naples was several times taken, lost, and retaken by the French. In 1815 the Bourbons were once more restored; the citizens endeavored to obtain reforms, but were sternly repressed until 1860, when, on Sept. 7, Garibaldi entered the city, and the people, being called upon to decide their own destiny, voted for the annexation of Naples to the constitutional kingdom of Victor Emmanuel II. Since then marked changes for the better have taken place, and the material wealth of the city has increased. Its sanitary condition has been greatly improved by a system of drainage that carries the sewage to a distance, by the pure water-supply opened in 1885, and by the removal of unsanitary dwellings begun in 1889. Pop. (1882) 463,172; (1893) 532,500. Revised by S. A. TORRANCE.

Naples, Bay or Gulf of (anc. *Sinus Puteolanas*): a portion of the Mediterranean, on the southwest coast of Italy, running inland about 10 miles between Cape Miseno and Cape Campanella, 20 miles distant from each other. Its shores have a worldwide reputation for beauty of scenery and charm of climate.

Naples, Kingdom of: one of the old political divisions of Italy. See ITALY and SICILY.

Napo, naa'pō: a northern branch of the upper Amazon, in Ecuador; rising on the east slope of the Andes, S. E. of Quito, flowing S. E. by E., and joining the Amazon near lon. 72° 45' W.; length, by the principal windings, nearly 800 miles; navigable for small steamers about 500 miles. The upper portion is obstructed by rapids, which are passed by canoes as far as the village of Napo; thence a rough trail leads over the mountains, by way of Archidona and Papallacta to Quito, forming almost the only route from the Ecuadorian plateau to the Amazon. The river flows through a vast, forest-covered plain, which is thinly inhabited by a few Indian tribes; a dozen miserable villages on the banks are the only marks of civilization. The Napo region is rich in gold, but it is collected only in small quantities by hand-washing. Sarsaparilla, a little rubber, etc., are obtained along the banks. The principal tributaries are the Curaray, Aguarico, and Coca. Peru claims the lower Napo, and the entire northern shore is in territory claimed by Colombia. See ORTON, *The Andes and the Amazon* (1876); SIMSON, *Travels in the Wilds of Ecuador* (1886). H. H. S.

Napoleon: village; capital of Henry co., O. (for location of county, see map of Ohio, ref. 2-D); on the Maumee river, the Miami and Erie Canal, and the Wabash Railroad; 35 miles S. W. of Toledo. It is in an agricultural region, and contains two large flour-mills, elevators, several manufacturing, water-works, electric lights, 2 private banks, and 4 weekly newspapers. Pop. (1880) 3,032; (1890) 2,764; (1894) estimated, 3,300. EDITOR OF "DEMOCRATIC NORTHWEST."

Napoleon I.: soldier, statesman, and Emperor of the French. The place of his birth was Ajaccio, in the island of Corsica, but the date is uncertain. The one commonly accepted is Aug. 15, 1769, but the Corsican record shows that his mother bore a son Jan. 7, 1768, who was baptized by the name Napolione. If the earlier date is the true one, the motive for announcing the other was doubtless the fact that when, in Apr., 1779, he was admitted to the military school at Brienne he would have been excluded as more than ten years of age if Jan., 1768, had been given as the time of his birth. His father, Carlo Buonaparte, was descended from an Italian family of rank, which had migrated to Corsica in 1529. When he was eighteen, Carlo Buonaparte married Letitia Romolino, a Corsican young lady not fifteen years of age. The children of this marriage were thirteen in number, of whom eight grew to maturity, Napoleon being

the eldest or the second. The mother had beauty and sagacity, but neither position nor wealth. The father, though noble in rank, was poor and indolent. Two characteristics of Napoleon's childhood are specially worthy of note. He grew up in poverty, though among luxurious noblemen. The condition of the country was one of uninterrupted turbulence and violence. France had purchased the equivocal rights of Genoa to the island in 1768 and had attempted to enforce them by a vigorous and cruel system of suppression. The Bonaparte family took the French or unpopular side. Up to 1795 Napoleon's interests were in Corsica, where he doubtless intended to pass his life. In the course of five years at the military school at Brienne he mingled very little with his fellow pupils. One authority says his life was that of a "hermit"; it is certain that he was solitary and unhappy. In 1784 he went from Brienne to a military school in Paris, and a year later received the rank of lieutenant in a regiment at Valence. During the next few years his regiment was moved from place to place, and on account of ill-health he frequently had long vacations, which he passed in Corsica. During this period he showed no unusual talent, though he had skill in mathematics, and was fond of military history. His writings at this time gave no promise of an exceptional future, though they indicated that kind of fierce impatience which was characteristic of his later years. Thoroughly alive to the interests of Corsica, his youth was familiar with a country in a constant state of turbulent disorder. At this period his allegiance wavered from one side to the other. In 1792, having obtained a limited command, he made an unsuccessful attempt at a *coup d'état*, but when pursued he escaped to France, thus probably saving himself from being shot by court martial. A little later the whole family, pursued by the fury of the Corsicans, fled from the island and subjected themselves to the risk of landing in France in the very midst of the Revolution. Thus ended the Corsican period of his life. His education, if not exclusively military, had been chiefly military in the very worst sense of the term; for from infancy he had been constantly familiar with deeds of violence.

Soon after Bonaparte's return to France his character and ability revealed themselves. Rising rapidly in the service, he impressed all who came in contact with him with a sense of his irresistible force of will. When he was first appointed to a command, Augereau, a proud but heroic old soldier, ridiculed his insignificant figure and his youth (according to de Méneval he was only about 5 ft. 2 in. in height), but after an interview with the little general Augereau confessed that he had been frightened and overawed at the first glance. Gen. Vandamme, one of the most energetic and brutal of the revolutionary soldiers, said to Marshal d'Ornano: "I, who fear neither God nor devil, when I approach him, tremble like a child. He could make me dash through the eye of a needle into the fire." United with these characteristics was a remarkable power of work and concentration. Roederer, during the early part of Napoleon's French career, wrote of him: "What characterizes him above all other men is the force, flexibility, and constancy of his attention. He can work eighteen hours at a stretch, on one or on several subjects. I never saw him tired." Pelet wrote a little later: "Often he keeps the counselors of state from nine o'clock in the morning until five in the evening, with fifteen minutes' intermission, and seems no more fatigued at the close of the session than at the beginning." Such powers were not long in producing an effect. Immediately after his return from Corsica Napoleon allied himself with the younger Robespierre and the Terrorists. In 1793 he was given command of a battalion of artillery, and so distinguished himself in planning the expulsion of the British from Toulon that he was at once named general of brigade. In the summer of 1794 he saw little military service, but was active in his political plans, and, according to Marmont, "acquired an ascendancy over the representatives which it is impossible to describe." After the fall of Robespierre (July 28, 1794) Bonaparte was arrested and imprisoned, but was not sent to Paris, as the record quaintly says, "on the ground of the possible utility of the military and local knowledge of the said Bonaparte." Gen. Marmont says he "moved heaven and earth" to effect his escape from prison. He finally succeeded. In 1795 he showed a restless activity, though he seemed to act now on one side and now on the other. On Oct. 4 he received the command of the garrison, and on the following day showed himself master of the city by sweeping the streets with grapeshot and driving the Terrorists into seclusion. He thus practically

brought the Revolution to an end. In Mar., 1796, he married Josephine de Beauharnais, a widow whose first husband had perished on the guillotine. Josephine had sweetens of disposition, and the favor with which she was regarded in Parisian society was of advantage to her husband. The marriage register declares that Bonaparte was born in 1768 instead of 1769, and Josephine in 1767, instead of 1763, the true date of her birth. Bonaparte's European career was now to begin.

The First Italian Period.—The coalition which had been formed against France in 1793 was broken up by the revolt in Poland, and the consequent withdrawal of the Prussian troops from the west. France in 1794 recovered all she had lost, expelled the Austrians from Belgium and the Stadtholder from Holland, set up her boundary on the Rhine, and pushed her armies into Germany. This act of conquest led to the coalition of Russia, Austria, and Great Britain in 1795. The Austrian generals Wurmser and Clerfaut forced the French armies back out of Germany and drove them across the Rhine. Bonaparte saw that the most formidable enemy of France was Austria, and that the most vulnerable point of attack was the Austrian territory in Italy. He urged his views on the members of the Directory with so much cogency that an Italian campaign was determined upon, and he himself was placed in command. His personal characteristics showed themselves instantly. Though the ostensible purpose of the war was to free Italy from Austria, Bonaparte issued a proclamation to the soldiers in which he said: "Soldiers, you are naked and ill-fed; I will lead you into the most fruitful plains in the world. Rich granaries, great provinces will be in your power. There you will find honor and fame and wealth." This order was issued Mar. 27, 1796, eighteen days after his marriage. The course hinted at in the proclamation was carried out. The commander not only made the war support itself, but he levied enormous sums upon the provinces and cities, with which he filled the military chest and made his commanders rich. Marmont relates that Bonaparte at one time caused a large sum to pass through his hands, and that when he rendered a detailed account of the same the commander ridiculed him for not keeping it for himself. From the pope he extorted 15,000,000 francs. In this way he bound his officers and soldiers to him and overawed his enemies. His plan of campaign was essentially the same that he attempted nearly twenty years later at Waterloo. He separated the Austrian army from the Sardinian, and then defeated them both in turn. In less than a month he fought five important battles, and was in complete possession of the western part of Northern Italy. Turning to the E, he met greater difficulties, but he showed even greater ability and resources, and his success was not less marked. Wurmser had come to the rescue from N. of the Alps with a new army of 50,000 men, and Bonaparte came near being overwhelmed and ruined at Arcola. The Austrians were defeated at Rivoli Jan. 14, 1797, and a whole *corps d'armée* capitulated at Roverbella Jan. 16. These successes raised the reputation of Bonaparte above all the other French generals and made him from that time practically independent. He determined to strike at the heart of Austria from Mantua as a basis, but he was now to meet with a new enemy. The Austrian general, the Archduke Charles, who had succeeded Clerfaut in the campaign against Jourdan and Moreau in Southern Germany, had beaten the French at Würzburg and driven them back across the Rhine. He was now ordered to return to the defense of Austria against Bonaparte. No important successes were achieved by the French, and Mar. 31 Bonaparte proposed to the archduke an armistice of six days. The result was what are known as the Preliminaries of Leoben, which were the basis of the Treaty of Campo Formio, signed in Oct., 1797. The unscrupulous way in which Bonaparte had even now begun to deal was shown in the treatment of Venice. This republic, which had maintained its neutrality though overrun by the French army, was now ceded to Austria in return for Belgium and the Rhenish frontier, though France had no right to cede Venice, and Austria had no right to cede those portions of the left bank of the Rhine, over which she had no control. By the same treaty a Cisalpine republic was set up under the protection of France. On the whole, the treaty was decidedly favorable to Austria, for she gained the territory of Venice as far as the Adige in return for a number of straggling provinces over which she had at best only partial control. The most important result of the campaign was the great fact that it revealed

Bonaparte to the army, to France, and to the world. It was also of importance that he had given the republican Venice to imperial Austria; for by so doing he had thrown an apple of discord among the old powers of Europe.

The Egyptian Campaign.—The revolution of the 18th Fructidor (Sept. 4, 1797), led by Augereau, overthrew the republican constitution which had been definitely established in 1795, and substituted for it the government of the army. The elections had shown that the country favored a policy of peace, and consequently the element in favor of peace in the legislature was on the point of gaining control. Augereau, who was then one of Bonaparte's generals of division, surrounded the legislative body with a force of 12,000 men, and arrested the most obnoxious representatives. The elections in forty-eight of the departments were annulled, and a large number were proscribed and transported to die in the penal colony at Cayenne. Henceforth during the ascendancy of Bonaparte France was to be ruled by the sword. Soon after congratulating the armies on the fall of "the enemies of the soldier, and especially the army of Italy," Bonaparte left Italy for Paris. His speech on the occasion of his reception by the Directory indicates that he was at the time uncertain what course to pursue. The Directory probably saw the necessity of giving him employment, and he was made "general-in-chief of the army of England"; but the affairs of continental Europe did not offer him a favorable opportunity for direct action against England. He had no faith in the permanency of the present form of government, and while the Directory was demonstrating its weakness an opportunity offered itself for showing his powers in another field. For some months he had talked of an Eastern policy which should unite France with Russia in taking possession of Turkey, for the purpose of weakening Great Britain. It was this thought which now gave shape to his action. France had not yet abandoned all its claims in India. He decided to attack Egypt, and then swing around upon Turkey from the East after he had taken possession of Palestine. It is significant, however, that at this very time the flames of war were bursting out in all parts of Europe. In the early spring of 1798 the Swiss constitution was overthrown, the French seized a treasure of 40,000,000 francs at Bern, the treasury of the aged pope was plundered, and the pope himself was carried into captivity; but these excesses, although they led to the new coalition against France, did not change Bonaparte's determination. He was not only willing that in the condition of affairs then existing France should carry on the war without him, but he was willing to take with him to Africa the flower of the French army and the most promising of the generals. With Murat, Berthier, Desaix, Kléber, Lannes, and Marmont he set out in command of 30,000 men on May 19, 1798. Stopping to take Malta, which capitulated June 12, he was ready to begin the Egyptian campaign early in July. The Egyptians were easily beaten. At the battle of the Pyramids the Mamelukes lost 2,000, and the French only twenty or thirty. Bonaparte, however, was thrown immediately into the greatest embarrassment by the complete destruction of his fleet by Nelson only a week after his arrival in Cairo. His grand design was ruined by this misfortune. While France was at war with nearly all Europe its best generals and an excellent army were imprisoned in another continent. From July until the following February Bonaparte and his army remained in comparative inactivity near Cairo. Meanwhile the Turks were gathering a force in Syria. He determined to anticipate their attack by advancing against them with 12,000 men. He entered Syria, and took Jaffa Mar. 3 by assault. More than 2,000 prisoners were taken. Unwilling to feed or to guard them, he ordered them to be taken to the seashore and shot. The order was carried out, every precaution having been taken to prevent any from escaping. At St. Jean d'Acre the fortress was furnished with supplies by the British from the sea. After vain attempts for two months to reduce the city, he was obliged to retire. He wrote to the Directory that he abstained from entering the city on account of the plague which he had heard was ravaging it. He afterward declared that the "grain of sand" which obstructed his way at Acre "changed the destiny of the world." At Mt. Tabor, and later in the Bay of Aboukir, some advantages were gained, but nothing could relieve the general character of the disaster. There was now nothing to show for the loss to France of some 6,000 soldiers and several distinguished generals at a very critical period. On Aug. 22 Bonaparte transferred the command of the expedition to Kléber, and, taking with him all

the other generals of distinction, set sail in two frigates for France. After a tortuous voyage and many delays he landed at Fréjus Oct. 9, 1799. Kléber was soon murdered, and Egypt and Malta passed into the hands of the British.

The Coup d'Etat of the 18th Brumaire.—During Bonaparte's stay in Egypt France had been threatened with overwhelming disaster; but the affairs of the allies had been mismanaged, and the affairs of France, on the whole, had been conducted with ability and skill. The Duke of York, in command of the British forces in the Netherlands, had conducted an unsuccessful campaign, and the Archduke Charles had gone to his assistance without result. The attack of the Russians, under Suvaroff and Korsakoff, had been successfully repelled by Masséna near Zurich, and Italy, though threatened, had not been lost. It would be too much to hope that this favorable condition could long be continued unless the coalition could be broken or the power of France strengthened. The return of Bonaparte therefore was most opportune. He was everywhere met with universal acclaim. The finances were in disorder, and the forces of the Government were not united. Bonaparte saw at once that affairs were ripe for a change. He had no difficulty in bringing the members of the Directory to his way of thinking. They caused reports to be spread that the legislative bodies were in danger of attack in the city, and by this means induced them to adjourn to St.-Cloud. Here the task of overthrowing the Government was not difficult. On the 18th Brumaire (Nov. 9, 1799), just one month after Bonaparte landed in France, the *coup d'état* took place which swept away the constitution of the year III. and placed Bonaparte in power. The legislative halls were cleared by the soldiery, and Sieyès drew from his pocket a new constitution, that known in the republican calendar as the Constitution of the year VIII. When modified by Bonaparte the new instrument of government practically put all power into the hands of three consuls. Sieyès had, no doubt, in planning the constitution made, as he supposed, ample provisions for himself; but Bonaparte as First Consul would brook no rival. He afterward boasted that he had pacified Sieyès with an ample bribe at the expense of the state. Sieyès and Ducos resigned as consuls, and Bonaparte put two unimportant officials in their places.

The Second Italian Campaign.—During all this period war was going on, and the enemies were on the borders of the country. Scarcely had he been installed as Consul when he made overtures of peace to Great Britain and Austria. It is not singular that these were rejected, for, after the events of 1799, the allies must have been confident of ultimate success. The new Government therefore was obliged to renew the war against Great Britain, Russia, and Austria. The condition, however, was not so bad as it seemed; for Russia, attributing the defeat of Suvaroff to Austrian jealousy, refused further aid to the coalition, and Great Britain, after the failure of York in the Netherlands, was not in condition to take an active part. The only enemy of importance therefore was Austria; but at that very moment Austria was in possession of Southern Germany and of a large part of Northern Italy, with powerful armies in the field. Bonaparte availed himself of all the new enthusiasm to re-enforce the army and put it in order. His plan of action was soon determined upon. In Italy the Austrian general Melas was advancing toward the W. with an army of 120,000 men, while Masséna was trying to keep him at bay with an army of 40,000. North of the Alps Moreau was in command of about 130,000 men, as opposed to 120,000 under the command of the Austrian general Kray. The plan of campaign now entered upon is generally considered one of the most brilliant ever designed by Napoleon. He directed Moreau to advance to Schaffhausen, in the eastern part of Switzerland, to cut off Kray, and then to send a part of his army across the St. Gothard Pass to co-operate with the French army in Italy. Masséna was to fall back to Western Italy, and Napoleon himself was to advance across the middle Alps. Thus the Austrians would be caught either between Napoleon and Masséna, or between Napoleon and Moreau. Napoleon's part of the campaign was conducted with the greatest secrecy. Masséna (in the early spring of 1800) was driven to the W., and finally shut up in Genoa, where he distinguished himself by a defense that made his name memorable. Moreau, though not venturing to march on Schaffhausen, drove Kray back to the Danube at Ulm, and sent the promised contingent across the Alps. The success of Napoleon's movement depended upon its secrecy. Troops were collected in Southern France in such a way as to bewilder the enemy. Rapidly during the second week in

May they converged upon the Swiss frontier, and Napoleon placed himself at their head. A part of the troops advanced by Mont Cenis; but the main army, under Napoleon himself, crossed by the Great St. Bernard. So secretly had the movements been conducted, and so swift was the execution, that Napoleon reached Milan on June 2. The corps sent by Moreau across the St. Gothard, finding that the Austrians had advanced to the W., followed on and united with Napoleon immediately after his arrival in Milan. The approach of a French force by Mont Cenis had deceived Melas and thrown him off his guard. Meanwhile Napoleon, learning that Masséna had been obliged to surrender Genoa, feared that Melas would try to escape by the seaboard. He therefore determined to advance at any risk. Going through the Stradella Pass of the Apennines he came into the vicinity of the enemy in the great plain of Marengo. His army was inferior in numbers, and still more inferior in artillery and cavalry. The Austrian commander saw his advantage, and advanced to a furious attack on the morning of June 14. The battle raged with varying fortunes, but near the end of the day the Austrians were everywhere successful, and Melas retired from the field believing that the battle was won. At that moment, however, Desaix arrived with his division, and, heading a furious charge of the heavy cavalry, turned the tide, and changed the disaster into a complete victory. Desaix was killed in the hour of triumph, but the line of Melas's retreat was closed, and the Austrians had no choice but to make terms. Later in the year Moreau overwhelmed the Austrians at Hohenlinden, and was about to march upon Vienna when overtures of peace were made. The Peace of Lunéville (Feb., 1801) confirmed the provisions of Campo Formio in regard to the French frontier along the Rhine, but it was far more disastrous to Austrian interests in Italy. The power of Austria in the Italian peninsula was practically destroyed, and the ascendancy of France became complete. Napoleon then turned his attention toward Great Britain. He succeeded in establishing a firm alliance with Russia; but at the critical moment the death of the czar and the victory of Nelson at Copenhagen destroyed his prospects. Negotiations were opened for peace. After months of discussion the Treaty of Amiens was signed in Mar., 1802. Unfortunately the treaty left many important questions unsettled. Great Britain agreed to give back Malta to the Knights of St. John under the protectorate of a great European power, but the conditions were obscure, and contained the seeds of future discord. Great Britain consented to the French status N. of the Alps, but refused to acknowledge the republics in Italy, which were in fact the dependent vassals of France. These refusals and ambiguities made the peace hardly more than a truce. The war, however, had won for Napoleon the respect of Europe, and had confirmed his power over all opponents in France. The success of the war was crowned by an overwhelming majority of the senate and the people creating him First Consul for life.

Napoleonic Reforms during the Consulate.—The years 1802-03 were devoted very largely to that reorganization of the government in which Bonaparte showed his extraordinary power quite as much as he had done in the fields of war. It is true that the Revolution had left the government in chaos, and consequently he was not embarrassed by the resisting power of precedents; but even after every possible allowance is made it will have to be admitted that the years of the First Consulate were remarkable for the number, the far-reaching importance, and the permanence of the changes brought about. The revolution of the 18th Brumaire met with popular favor, and Bonaparte at once as First Consul took the whole system of administrative and executive government into his own hands. In this new position he showed a faculty for organization perhaps never before equaled. His power of calculation, his force of insight, his tireless industry, his stupendous capacity for mastering details, and, above all, his ability at any moment to co-ordinate all these resources and bring them into their place in accomplishing any object he had in view, form one of the most impressive facts in the history of the human race. In a few weeks he reorganized the financial system of the Government, and rapidly brought order out of the chaos of practical bankruptcy. By a wise combination of energy and clemency he altered the chronic rebellion of La Vendée into enthusiastic loyalty. Though in the East he had avowed the Mohammedan faith, he now stopped the persecution of the nonjuring priests, ordered a solemn funeral for Pius VI., threw open the church doors in all parts of France, re-

stored Sunday as a sacred day of rest, and removed the priests and bishops from the offices of administration. In less than a year he had secured the support in name of the clergy of the Church, and with this support he exterminated the most important of his opponents. Some of the reforms had to do not only with the principles of the Revolution, but with the very foundations of government. The old Bourbon method had been one which centralized all power in the thirty intendants, who were directly accountable to the king. The Revolution had swept away this method and set up a system which Burke characterized as "forty thousand republics." Napoleon reverted to the old method with an improvement. At the head of every department he placed an officer under whom there was a hierarchy of prefects, sub-prefects, and mayors, each dependent on the person above him, and thus all dependent on the First Consul. The powers of local self-government, though not effaced, were greatly curtailed and controlled. This system, as Napoleon himself said, placed the First Consul in every department of France. His next step was a reform of a similar nature in the courts of justice. The Revolution had swept away the cumbersome Bourbon system and substituted for it an elective judiciary which had resulted in some of the wildest excesses of discord and injustice. Napoleon restored the appointment of judges and made them independent of popular clamor. While strengthening the courts of initiative he provided courts of appeal, by means of which justice was made prompt as well as effective. He also resumed and pushed forward the work begun by the National Assembly of collecting and fusing the laws and usages of the nation into an organic code. This work, like that of Justinian, was intrusted to a body of eminent jurists. The *Code Civil* was published in 1804, but the *Code de Commerce*, the *Code Penal*, and the *Code d'Instruction Criminelle* occupied the commissioners till near the close of Napoleon's career. What is known as the *Code Napoleon*, which was made up of these four parts, at once took rank as one of the foremost legal productions of history; and its permanence in France has already more than justified the declaration of Napoleon himself that his code would outlive his victories. In his efforts to improve the system of education he was less fortunate. Under the Revolution the National Assembly had decreed that every commune should support a primary school, but from time immemorial the schools had been in the hands of the priests; and, as the revolutionary Government was in no condition to enforce its decrees, the weakening of the clergy had weakened the schools. Napoleon did not provide for supporting primary schools by taxation, and therefore his efforts in their behalf were only slightly successful. For the higher schools he did more; but his method abundantly shows that he had no adequate understanding of the elements of educational success. He endowed a few secondary schools, and some years later he concentrated the whole system for a nation of 30,000,000 of people in the single university at Paris which was made immediately dependent on the central Government. Another element of prodigious power in this work of centralization was the re-establishment in France of the ecclesiastical hierarchy. The National Assembly had swept away this great corporation by the confiscation of its lands and by requiring an elective clergy which should acknowledge supreme allegiance to the state. Under this régime the Church had assumed an attitude of active or sullen hostility to the Government. Napoleon now restored the Church in all the most essential of its powers and sealed its restoration by the Concordat which is the basis of all ecclesiastical law in France down to the present day. The Church, however, had been shorn of its endowments, and was made, therefore, strictly dependent on the Government. This action was an element of great power in consolidating and harmonizing the masses of the nation. It severed the Church from the Bourbons and attached it to Napoleon, who depended upon the peasantry for his army. A similar influence, though in another field, was the system of honorary rewards and dignities. He established the Legion of Honor, a national order of merit thrown open to pre-eminent success in every walk of life. It encouraged excellence in all ranks and callings, and was so successful that institutions of the same kind have been established by nearly all the governments in Europe. In Feb., 1800, a general law regulating the organization of local government was enacted, and at about the same date the financial system was concentrated in the newly established Bank of France. While these several reforms greatly tended to establish and consolidate the

dictatorship, they conserved harmony and good order, and for the most part retained a permanent place in French government even after the fall of Napoleon. They were not enacted, however, without opposition. The old Revolutionists strenuously opposed the Concordat, and the ardent republicans saw in the general movement a complete throw of the revolutionary system. In Dec., 1800, the explosion of a bomb aimed at the Consul's carriage called for decisive action. Napoleon acted with characteristic energy. A hundred and thirty conspicuous opponents were seized, and without trial sent to the penal colony at Cayenne. Moreau, the hero of Hohenlinden, was condemned to imprisonment for two years, but was allowed to escape to America. Pichegru, found strangled in his bed, was either murdered or permitted to commit suicide. Thus the republicans were outdone, and opposition was annihilated. The supremacy of Napoleon was crowned by the declaration that the Senate was henceforth to have constituent powers, thus doing away with the legislative body, and enabling the Senate to make any change in the constitution that might be called for by its master. An open road was thus constructed to an imperial monarchy far more concentrated than was the monarchy swept away by the Revolution.

Of foreign affairs Napoleon was less fortunate. It is now easy to see that he should have avoided vexing and alarming the states of Europe, but he chose the opposite course. He annexed Piedmont to France, made himself president of the Italian republic, and the remainder of Northern Italy a subject province. He reduced the Batavian republic to a dependency, and placed Switzerland under French control by the occupation of Bern. He made the lesser German states his dependencies by his interpretation of the Treaty of Lunéville, and he showed unwonted activity in all the ports and dockyards of France. A report of Sebastiani on the condition of Egypt seemed to take it for granted that the British were to be driven from the country by a new French occupation. The *Moniteur*, the organ of the state, was filled with boastful assertions of French power, and emissaries were dispatched to the British ports to observe and report on their condition and strength. This unwonted activity created general unrest throughout Europe, but it was especially irritating to Great Britain, where public opinion was beginning to oppose the peace policy of the Government. The dispute over the island of Malta was the occasion of the outbreak. Great Britain, in accordance with the Treaty of Amiens, had invited Russia, and a grand-master chosen by the pope, to assume the protectorate of the island, but both had declined. France had been at least lukewarm in suggesting expedients of settlement. Delay and the prodigious increase of French power had, as the British claimed, changed the situation. When the French envoy now referred to the condition at Malta, Lord Hawkesbury, the British foreign minister, hinted that Great Britain might have to take precautions, the state of the Continent had so greatly changed. Napoleon replied by a peremptory demand for the immediate evacuation of the island. While negotiations were pending the *Moniteur* published the report of Sebastiani, the French officer sent to examine the condition of Egypt, which, among other irritating statements, declared that "the country could be recaptured by 6,000 Frenchmen." This was immediately followed by a message of Napoleon to the legislative bodies, saying that Great Britain by herself was unable to cope with France. This was regarded as a direct challenge by all classes in Great Britain, and caused an instantaneous explosion of wrath. Public opinion in Great Britain was greatly aggravated by the absurd demand of Napoleon that the public prints which caricatured him should be suppressed. All attempts to negotiate were unsuccessful, for each refused to accept the terms of the other. Negotiations continued for some months, during which both sides carried on the most active preparations for war. Great Britain finally instructed her ambassador to propose that she should retain Malta for ten years; that the new Italian states should be recognized by her; that French troops should be withdrawn from Holland and Switzerland; and that, if these terms should not be acceded to in seven days, the British ambassador should demand his passports. The French refused the terms offered, whereupon Lord Whitworth demanded and received his passports on May 12, 1803. It is of importance to note that on May 2 of the same year Napoleon, notwithstanding the violent opposition of Talleyrand and of his brothers Lucien and Joseph, sold the territory of Louisiana to the U. S. for \$15,000,000.

frances. This transaction, of such immeasurable importance to the U. S., was proposed and pushed through by Napoleon purely for financial reasons. The money received was all devoted to the armament for the invasion of England. The flames of war at once sprang up and soon the whole European world was involved in the conflagration.

The Renewal of War.—Napoleon's first plan contemplated the invasion of England, and preparations were made on a stupendous scale. What he planned will always remain a monument of his comprehensive genius and of his extraordinary gifts in arranging even the minutest details. From the Scheldt to the Garonne along the banks of the rivers vessels were constructed for the purpose of converging at the right moment upon a single point with an army of 160,000 men. The number of vessels so prepared reached the vast number of 2,300, and these were manned by more than 15,000 seamen and 3,000 guns. Before the end of 1804 the shores around Boulogne were skirted with armed vessels ready to put to sea. Meanwhile four great military camps had been formed and the army put into condition for the descent. In Great Britain more than 200,000 men were put under arms, and made ready to repel the attack; but while these preparations were going on, evidences began to abound in France of plots against the life of the First Consul. These had their inspiration partly in the interest of the Bourbons, and partly in the disaffections of the republicans. It was discovered that meetings of the conspirators were frequently held in Paris and Strassburg. The report of a French spy declared that meetings of some of the *émigrés* had been held at the house of the Duc d'Enghien at Ettenheim, in Baden. Napoleon determined to terrify the Bourbon faction by a decisive act. Though Baden was a neutral state, he ordered a body of armed men to enter the territory, seize the duke, and bring him to Paris a close prisoner. The papers that were taken showed no evidence confirming the charges. He was then charged with having been an *émigré*, and with having been opposed in sympathy to the consular government. There could be no answer to such a charge. The duke was taken in the night before a military tribunal selected for the purpose, was given no opportunity for being heard in defense, and before morning was shot. In his last will Napoleon declared that he caused the duke to be "arrested, condemned, and shot because it was necessary for the security, the honor, and the interests of the French people." That the act would excite all the crowned heads of Europe to a new coalition against him does not seem to have entered Napoleon's mind. The event created a profound sensation. Signs of opposition began to show themselves in all parts of Europe. The friends of Napoleon soon saw that prudence required the consolidation of his authority in every possible way. The Tribune and the Senate proposed that he receive the name as well as the power of emperor. The proposal met with the general and enthusiastic favor of the people as well as of the legislative bodies, and the First Consul was crowned as emperor at Notre Dame, Dec. 2, 1804. A little later the emperor visited Italy to be crowned King of Lombardy, and in the course of a few months he made it evident to all of the European powers that he was henceforth to regard the smaller states of Italy and Germany simply as parts of his empire. He either made the political blunder of supposing that this course would not lead to a general coalition against him, or the miscalculation of believing that he could carry on successfully at the same time an invasion of England and a war against continental Europe.

The Austerlitz Campaign.—It was, no doubt, on account of the gathering clouds that on Jan. 2, 1805, Napoleon wrote to the King of Great Britain making overtures of peace. To this letter the Government of Great Britain, now again under the energetic guidance of Pitt, replied that that power could not enter upon any definite negotiations for peace without consulting her continental allies. This answer gave an unmistakable intimation of a new coalition. In the following April a treaty was signed between Great Britain and Russia, and a little later the league was joined by Austria. Prussia, induced by promise of Hanover, was kept neutral. Up to this time preparations for the menaced invasion of England had been unabated. Nelson, with his British fleet, manœvered so successfully that Villeneuve, with the combined fleets of France and Spain, did not venture to approach for the protection of the transports intended for invasion. In the presence of the British fleet an attempt to cross into England would have been madness. As soon, therefore, as the hostility of Austria was openly declared, Napoleon obscured the failure of his plan of invasion by

announcing that the operations of the "Army of England" were to be transferred to Germany. Early in September the camp at Boulogne was rapidly broken up, and the army was turned toward the Rhine. The Austrians, 80,000 strong, under Gen. Mack, about the same time advanced as far as Munich, with the intention of pushing on into France. Napoleon stationed himself at Strassburg, and ordered the larger part of his army around by the north through the neutral territory of Hanover. By a series of brilliant manœuvres he threw his troops between the Austrian army and Vienna. Mack, taken by surprise, was driven into Ulm and forced to capitulate with his army on Oct. 20. On Nov. 13 Napoleon entered Vienna, and established his headquarters in the imperial palace. His situation, however, was apparently by no means free from danger. The violation of Prussian territory had driven Prussia into the coalition, though too late for active service. The Austrian Archdukes Charles and John had collected a force of 90,000 men in Hungary, and a powerful Austro-Russian force was advancing from Moravia. Napoleon very naturally decided to deliver a decisive blow before these armies could be united, and for this purpose he crossed the Danube on Nov. 22 and marched upon Brünn. A series of masterly manœuvres, all executed with astonishing celerity and accuracy, brought the French into a favorable position at Austerlitz. In the battle that followed on Dec. 2 the Austro-Russian force was overwhelmingly defeated. The Emperors of Russia and Austria, compelled to witness the destruction of their splendid legions, saved themselves by flight. An armistice was immediately signed, and this was followed, Dec. 26, by the Peace of Presburg, by which Austria gave her Venetian territory to the kingdom of Italy, her Tyrolean territory to Bavaria, and her Suabian territory to Würtemberg and Baden.

Though Napoleon's Austrian campaign had everywhere been triumphantly successful, his project of invading Great Britain had been thwarted by the annihilation of his fleet at the battle of TRAFALGAR (*q. v.*). On the very day after the capitulation of Mack at Ulm, Lord Nelson, having hurried south as soon as Napoleon started for Austria, had met the combined French and Spanish fleets under Admiral Villeneuve, and of thirty-three line-of-battle ships twenty-four were either captured or sunk, in one of the most memorable naval battles in history. The emperor, therefore, abandoning all present thought of invading England, was able to turn his attention to the consolidation of his power on the Continent. The death of Pitt on Jan. 23, 1806, and the succession of Fox as Foreign Minister, gave temporary promise of peace; but even Fox would not consent to the demands of the emperor, and all hopes of an accommodation were thus brought to an end. For the consolidation of his power he now declared the throne of Naples vacant, and placed upon it his brother Joseph; he created his brother Louis King of Holland, and his brother Jerome King of Westphalia; he raised Bavaria and Würtemberg to the dignity of kingdoms; he consolidated the smaller German governments on the right bank of the Rhine into a confederation under the suzerainty of himself; he raised the subordinate members of his family by marriage to positions of dignity and influence; and the most successful of his generals he elevated to the highest nobility.

The Jena Campaign.—Peace was by no means established. In the summer of 1806 the Government of Prussia discovered that Napoleon was negotiating to restore Hanover to Great Britain, although he had promised that electorate to Prussia as the price of her neutrality. His violation of Prussian territory when advancing to the rear of Mack had given emphasis to Prussian distrust. The current of public opinion, greatly swollen by the letters of Queen Louise and the advocacy of Stein, had finally become irresistible. Prussia had joined in firm alliance with Russia; and the czar in August refused to ratify the treaty with France which had been signed by his representative in Paris. If Napoleon had sincerely desired peace it would have been easy to satisfy Prussia; but he decided to pursue another course, and to act as he had done in the case of Italy and Austria. The French had not yet evacuated Germany since the Austerlitz campaign. The Prussian army was mobilized, but before it could be brought into fighting condition Napoleon struck in upon the rear of his enemy, as he had done at Marengo and at Ulm. The battles of Jena and Auerstädt, Oct. 14, 1806, crushed the Prussian army and gave the conqueror Berlin as the capitulation at Ulm had given him Vienna. As Napoleon advanced toward the east the fortresses established by Frederick the Great capitulated one after another

almost without resistance. The French army was led on to the Vistula, where the terrible battle of Eylau, Feb. 8, 1807, left 12,000 Frenchmen and 15,000 Russians on the field. For the first time Napoleon had fought a great battle in which he was only partially victorious; but his weakened and shattered forces were recruited and maneuvered with characteristic skill, and on June 14, the anniversary of Marengo, at the battle of Friedland the cause of the allies suffered an overwhelming defeat. The Treaty of Tilsit, which was signed in July, 1807, deprived Prussia of nearly half her inhabitants and her territory, and reduced the army to 42,000 men. In this treaty Napoleon overreached his goal, for it was the severity of these terms that made the people of Prussia the most moderate foes of the conqueror from this time until the final downfall in 1815.

Napoleon now had time to complete the rewards of his most efficient supporters. He had already made Berthier the Prince of Neuchâtel, Bernadotte the Prince of Pontecorvo, and Talleyrand the Prince of Benevento; he now created four additional hereditary princes and thirty-one hereditary dukes. Of these new potentates, one (Berthier) received more than 1,250,000 francs a year, another (Davoust) more than 750,000 francs, nine others more than 250,000 francs each, and twenty-three others more than 100,000 francs each. Thus it was that loyalty was secured and power consolidated.

Though the invasion of England had been abandoned, Napoleon sought in the course of this campaign to strike an effective blow at British power and influence by another method. The right to prevent a neutral from trading with an enemy by means of a blockade is conceded by international law; but the blockade must be a real one. It was impossible for Napoleon to blockade British ports; but notwithstanding this fact, he did not hesitate to proclaim by what is known as the Berlin Decree of 1806 that the harbors of neutrals were closed against British ships under penalty of war with France, and the confiscation of ships and goods. It was a defiant manifesto, designed to create what he called a "continental system," and to leave Great Britain in commercial isolation. The effort was not successful; for while it exasperated Great Britain into retaliation, it failed to bind the continental nations together.

The Spanish Campaign. Having removed the states on the Rhine at his pleasure and placed members of his own family in power, he now turned his attention to Portugal and Spain with a similar purpose. Portugal defied the Berlin decree by keeping her ports open to British commerce; and Spain was embroiled with domestic difficulties which afforded an opportunity for interference. In Oct., 1807, two conventions at Fontainebleau provided for the partition of Portugal; for the giving of Brazil to Spain; for giving the King of Spain the title of emperor; and for providing a French army to resist any intervention of Great Britain. On Nov. 30, Marshal Junot arrived with an army in Portugal, and a little later a French force of 80,000 men took possession of a number of fortresses in Spain. The Spanish people, it is true, were indignant at the weakness of the king and the dissoluteness of the queen, but the heir-apparent, Ferdinand, was a favorite, and the popular movement was designed to overthrow the king and place the prince on the throne. While Napoleon was supposed to support this movement he was welcome; but he soon disclosed another purpose. His course was perhaps the most unfortunate one adopted by him in the whole of his career. Spain for fifteen years had been perfectly subservient to revolutionary France and to Napoleon, and he would not have been difficult by a moderate force to have turned into a permanent ally and placed Spain under permanent obligation. Napoleon, however, arranged for a meeting with King Charles IV. and his son Ferdinand, and at the end of a stormy interview extorted from both an abdication. The event was followed by an outburst of indignation in all parts of the country, and an uprising that has seldom had a parallel in history. Napoleon offered the throne to his brother Louis, who, seeing the difficulties, refused it. He then gave it to his brother Joseph. So general and fervid was the opposition that before the summer was over the emperor was obliged to invade the country in person with an army of 180,000 men. Junot was defeated by the British in Portugal, and Spain was everywhere open to communications with Great Britain. The result was not only a determined insurrection by a nation of 11,000,000 of people, but an insurrection everywhere supported by the power and resources of Great Britain. Napoleon may have believed that he could regenerate and improve the last government of Spain, but he committed

the blunder of misjudging human nature, and nothing can excuse the perfidy of invading the country with an armed force for the ostensible purpose of settling a domestic difficulty, and then demanding an abdication of the king and of the heir-apparent in order that he might impose his own government upon a confiding people. There could be only one result. The Peninsular war, led on the part of the British by Sir John Moore and Sir Arthur Wellesley, and on the part of the French by Napoleon himself and such marshals as Soult, Ney, Lannes, Masséna, and Bessières, continued to drain the resources of France until the last of the French were driven across the Pyrenees in 1814.

The Wagram Campaign.—As soon as the magnitude of the Spanish war revealed itself, unmistakable signs of difficulty appeared in the East. Napoleon led his army into Spain and advanced as far as Madrid, where he reinstated Joseph, who had been obliged to flee for his life; but no sooner had he begun the active work of the campaign against Sir John Moore than he was obliged to leave Spanish affairs in the hands of his marshals in order that he might devote himself to the rising discontents in Germany. By appointment he met the czar at Erfurt and completed the negotiations for an alliance that had been secretly begun at Tilsit. The most serious source of difficulty, however, was in Austria. That government had so far recovered from the Austerlitz disaster as to be able to put an army of nearly 400,000 men into the field. Affairs in Italy were in such condition that nearly all the Austrian troops could be used N. of the Alps. The course of Austria was inspired by the insurrection of Hofer in the Tyrol, the occupation of the French in Spain, the rising hatred of Napoleon in Germany, and especially by the policy of France now revealed of extending the power of Russia in the south. War was begun in Apr., 1809. Napoleon was compelled to fill the ranks of his army with conscripts from France and from the confederation of the Rhine. He entreated the czar to send a re-enforcement from Poland to the Galician frontier, but his request was only partially and tardily complied with. The Archduke Charles, now in supreme command of the Austrian forces, advanced with an army of 150,000 men across the Inn and the Isar. The French army was widely scattered, Davoust being at Ratisbon, Masséna at Ulm, and Oudinot at Augsburg. In the face of a powerful and enterprising enemy it would have seemed impossible to bring them together. The movements which now extricated the French from their positions constitute one of the most remarkable of Napoleon's military exploits. With an army greatly inferior in point of numbers and experience, Napoleon not only rescued his forces from a perilous position, but defeated the enemy in the decisive battles of Abensberg and Eckmühl, and drove him across the Danube. The French entered Vienna on May 13; but the army of the Archduke Charles was still far superior to that of Napoleon. The campaign that ensued was one of the most interesting in all the Napoleonic period. Impatient to crush the enemy by another Austerlitz, the conqueror crossed the Danube into the great plain of the Marchfeld, a little N. E. of Vienna. The archduke attacked with fury on May 21 and 22 at Aspern and Essling, and finally drove the French back to a precarious position on the island of Lobau. Here the superhuman energy and resources of Napoleon were shown as nowhere else in all his career. His army was huddled in upon an island, the bridges of which were either broken down or in command of a victorious foe; but instead of asking for terms or weakening his efforts, he kept up an attitude of the most vigorous and aggressive defiance. On the night of July 4, under cover of a false attack and a furious cannonade, he threw six bridges across the river, and marched 100,000 men to the left bank. In the course of the 5th the Archduke Charles, baffled and almost paralyzed, brought his forces into line for battle. The armies were the largest that had ever confronted each other in modern warfare. Napoleon had received re-enforcements until he now had 160,000 men and 600 cannon, while the army of the archduke consisted of about the same number of cannon and nearly as many men. In the battle of Wagram the French were victorious, but as the Austrians began their retreat the advance guard of the long-expected army of the Archduke John came in sight. Had he been a few hours earlier the end of the battle might have been like that of Waterloo. An armistice was agreed to at Znaim on July 11, and the Treaty of Schönbrunn was signed Oct. 14. By this act the humiliation of Austria was made nearly as complete as was that of Prussia by the Treaty of Tilsit. Napoleon had then

terms of the treaty, by raising the Polish question, set at naught the agreements that had been made with the czar at Tilsit and Erfurt. The great significance of the treaty was the fact that Russia was converted by it into an enemy, and the Russian war began to loom up as soon as the Austrian war was brought to a close. The alienation was soon converted into something like bitterness by the divorce of Josephine and the subsequent marriage of the emperor. The emperor's policy of an hereditary empire required that provision should be made for a succession to the imperial throne. To this end Napoleon had for some time contemplated a divorce. On his return to Paris after the treaty of Schönbrunn, he determined to carry out this policy without delay. He first asked the czar for the hand of his sister, but a little later withdrew the offer and contracted with the Emperor of Austria for the Archduchess Maria Louise. By this marriage, Austria, after being weakened and humiliated, was practically adopted as a dependent state.

The Russian Invasion.—The emperor now had leisure and opportunity for the further development of the plans he had adopted in 1806. With this end in view he entered upon a commercial policy which sought at once to insure the independence of continental Europe and the destruction of British supremacy. Perhaps the latter was the cause of the former; but whether his British policy was the parent or the child of his policy on the Continent, he found he could not secure continental independence without closing additional ports by means of additional annexations. He annexed Holland and cut it up into nine French provinces. He rounded out his interior frontier by annexing the kingdom of Westphalia with all the territory added from Prussia after Tilsit. He extended the northern maritime border so far as to include Oldenburg, which was then under the protectorate of Russia. These events, taking place in 1809, 1810, and 1811, convinced Russia that there was no possibility of peace except by crushing the power of Napoleon, or by an acknowledgment of a Napoleonic suzerainty over the whole of Western Europe. Great Britain had taken that position early in the century. The Austrian marriage, the birth of a Napoleonic heir (May 11, 1811), the looseness with which Napoleon had interpreted the obligations he had entered into with the czar at Tilsit, the seizing of the northern provinces—these were enough to complete the evidence, and so taken together were the cause of the war with Russia. Napoleon now had Austria and Germany under his control, and entered into the war with the assistance of their troops. Sweden, though now ruled by Bernadotte, formed an alliance with Russia. The great contest therefore brought together Great Britain, Sweden, and Russia on the one side, France, Austria, and the rest of Germany on the other. Great Britain at war with the U. S., and still in the thick of the contest on the Spanish Peninsula, could take no prominent part in the great struggle now about to begin. Napoleon, with the help of his allies, was able to begin the invasion with an army of more than 600,000 men.

The general plan of the campaign was like all the campaigns of Napoleon in its aggressive features, but it was fatally defective in its failing to take into account the condition of the invaded country, and the spirit of the invaded people. From the very first the czar refused to negotiate for peace so long as the French were upon Russian soil. Eylau and Friedland, not to speak of Kesseldorf and Kunersdorf, had abundantly shown that Russian soldiers were among the most formidable and persistent fighters of Europe. It is one of the most singular facts in the career of Napoleon that he did not perceive the elements of the situation, but regarded Russia as he had regarded Italy, Austria, and Germany. His recent experience in Spain should have taught him that the enemy would only have to fall back in order to lure him on to certain destruction, as Peter the Great had lured on the conquering armies of Charles XII. The failure of Napoleon's Russian campaign is often attributed to the unwonted severity of the winter, but if the winter had been no more severe than usual, the result must have been substantially the same. The number returning would have been somewhat greater, but the failure of the expedition would have been scarcely less.

Napoleon advanced across the Niemen on June 24, 1812. That he was so late in beginning the campaign, and that he did not leave Vilna until July 16, shows either that he had no adequate understanding of what was before him, or that much of his old energy was already gone. The forces of the enemy were divided into three armies, neither of which could be brought to a decisive engagement. Bad roads and huge

baggage-trains delayed the advance. The French pushed forward with the main line between the rivers Dvina and the Dnieper, evidently intending to strike at Moscow. Napoleon's method of making war support itself told rapidly upon Russian patience, and the clamors for a battle at length became irresistible. The czar, in answer to the demands for a vigorous resistance, placed Kutusoff in command of the entire Russian force, a fact that indicated a change of policy. The battle of Borodino, one of the most sanguinary of modern times, followed on Sept. 7, and left about 80,000 men on the field. The French were victorious; but they did not press their advantage, and relatively they were no stronger than before. On the 14th they entered Moscow, but were surprised to find it practically deserted. The next night fires broke out in all parts of the city. These, begun by the governor of Moscow before the evacuation, had probably been kept up by Russians, partly in the interests of patriotism and partly in the interests of plunder. Napoleon was obliged to evacuate the Kremlin almost immediately after occupying it. What was next to be done? Would the czar negotiate for peace? The pressure upon him by faint-hearted councilors was very great; but Stein, a representative of Germany, and Jackson, a representative of Great Britain, urged the opposite course with so much cogency that the czar stood firm. Napoleon hesitated six weeks before leaving Moscow. After blowing up the Kremlin he abandoned the old capital Oct. 20. Recruits for the Russian army were coming in from every quarter, while the force of Napoleon was constantly growing weaker. He turned southward in the hope of richer fields, but he could not bring the enemy to a decisive battle, and was obliged to return to the north. He reached Smolensk on Nov. 9. Winter came on with unusual severity to complete the work already far advanced. The sufferings of the retreat form one of the most melancholy pages of history. As in Egypt and in Spain, Napoleon left the defeated army in the hands of subordinates and returned to France. Passing through Poland and Germany in disguise he reached Paris in the early part of December. After unparalleled sufferings, a remnant of the army tottered into Vilna on the evening of the 6th of the same month. It is estimated that by battle, by disease, by starvation, and by frost, half a million men had perished.

The Leipzig Campaign.—The disasters of the Russian campaign seemed to precipitate the distrust and discontent that were now everywhere prevalent. Even in France the old fervor for the emperor was gone. The conscriptions had drained the country of able-bodied men, and the levies for the great Russian movement had met with so much opposition that young men were willing to maim themselves in order to be exempt from the service. Napoleon's departure for the war evoked no enthusiasm, and his return was met with ominous indifference. Still his genius was able to prevent any general uprising in France. In Germany the situation was far different. Though Prussia and Austria, as well as the confederation of the Rhine, had been drawn into the Russian expedition, they had fought without zeal, and were probably not dissatisfied with the result. The Prussian contingent in the north and the Austrian in the south had not shared the fate of the French. The signal for a general revolt was the course of Prussia. Field-Marshal York, commanding a Prussian wing of the invading army, and seeing that the tide had turned, abandoned the cause of the French, and put himself at the head of the opposition to Napoleon. The movement was contagious and soon amounted to a popular uprising throughout Prussia. It was now found how effectually the Napoleonic requirement that the army should be kept down to 42,000 men had been avoided. By terms of short service and rigorous drill nearly all the young men in the country had passed into and out of the army, and had received a good military training in the course of the six years that had elapsed since the Peace of Tilsit. In a few months the Prussian army amounted to some 250,000 men. In Austria the movement was slower, owing to the bond that had been established by the marriage and the birth of an heir; but Napoleon twice refused definite offers by Austria, looking toward the establishment of peace on a basis that would have secured French retention of a large part of the conquered territory. The result of these refusals was that Austria joined the new coalition with Prussia and Russia. The campaigns that followed in 1813 were intricate, and for a long time without decisive results. It was the general policy of the allies, inspired by Scharnhorst, the organizing military genius of

Prussia, to avoid general engagements, except when they could be fought with manifest advantage. The battles of Lützen, Bautzen, and Dresden gave Napoleon some advantage, but were not followed up with energy, and were by no means decisive. Blücher met and routed Ney at the Katzbach. Napoleon formed a grand design of holding Schwartzberg and the Austrians in check with the corps of Murat in the south, while he advanced rapidly upon his allies in the north, and, after defeating them, returning and crushing the Austrians; but the design could not be carried out because of the inherent weakness of the situation. At the decisive moment Bavaria threw off her allegiance to Napoleon and joined the allies, Westphalia repudiated Jerome, and the confederation of the Rhine showed such unmistakable signs of disloyalty as to threaten the emperor's communications with France. For these many reasons the plan had to be abandoned. Murat was unable to keep Schwartzberg in check, and Blücher, followed by Bernadotte, vigorously pressed back the forces from the north. The allies rapidly concentrated about Leipzig, and Napoleon was compelled either to fight a great battle or to withdraw. He decided to risk a general engagement. His force at Leipzig was about 160,000 men, while that of the allies, Austrians, Bavarians, Russians, Prussians, and Swedes exceeded 300,000. The allies began the attack on the morning of Oct. 16, and the battle continued until the 19th. The defeat was so disastrous to Napoleon that he was able to rescue only about 60,000 men from the wreck of his army. The garrisons on the Elbe, the Oder, and the Vistula were left unsupported and surrounded by enemies, so that the total loss to the French could hardly have been much less than 175,000.

The Invasion of France.—After the disastrous battle of Leipzig Napoleon slowly made his way back to the Rhine, while his flanks and rear were constantly harassed by the forces of Blücher and Schwartzberg. Austria attempted to negotiate for a permanent peace on the basis of the "natural boundaries," i. e. the Alps, the Pyrenees, and the Rhine; but Napoleon was unwilling to abandon Germany, and so lost the last chance of saving Holland, Belgium, Cologne, Mentz, and Mannheim. In the westward movement that followed, Blücher crossed the Rhine at Mannheim with about 80,000 men, and Schwartzberg at Basel with no less than 160,000. The defensive campaign now fought by Napoleon gave abundant evidence that his masterly strategic ability was in no way diminished. Wellington, who was one of the most discriminating of military critics, characterized it as "very brilliant, probably the ablest of all his performances." In a general way his policy may be described as a determination to prevent the two invading armies from uniting, and by keeping between the two, striking out to the right and left as there might be opportunity. The forces of the French probably did not exceed one-third the numbers of the allies. At La Rothière Napoleon was defeated, and his cause now seemed hopeless. Blücher pushed on with characteristic energy, Schwartzberg with characteristic caution. With almost unprecedented force and skill the mighty Frenchman threw his army upon the advancing forces of Prussia, and not far from Troyes defeated them three times in succession, between Feb. 10 and 14. He then turned upon the hosts of Schwartzberg, which were advancing along the Seine on the way to Paris, and defeated them at Nangis and Monttereau after a series of movements which showed extraordinary skill. An armistice followed in the closing days of February, but the enemies could not agree upon terms of peace. The allies had discovered that Napoleon was now supported with no enthusiasm by the French, and they therefore demanded that the boundaries should be established on the basis of the France of Louis XVI. The emperor scornfully refused to consider these terms, and the war accordingly was renewed. Blücher had recovered and united with the Austrian force on the Seine. Napoleon fought two disastrous battles at Craonne and Laon, in which he lost nearly a fourth of his army. He now adopted a course which could hardly have been the result of anything but desperation—he threw himself in the rear of the enemy and called for re-enforcements from the troops shut up in the fortresses along the Rhine. This movement left the way to Paris open for the allies. Having already discovered a formidable conspiracy in the city, led by Talleyrand, to repudiate Napoleon, they did not hesitate to march directly upon the capital. Marmont and Mouton were honorable but fruitless defense, and on Mar. 29 the united armies reached the heights of Montmartre. The capitula-

tion was signed on the evening of the same day. Meanwhile Napoleon, finding no forces to meet him in his eastward movement, and fearing that the allies were marching upon Paris, turned westward once more and reached a village near Fontainebleau before, on the evening of the 30th, he heard the terrible news that the capital was in the hands of the enemy. He sent an embassy at once to treat for peace, but the allies were in no haste. Strange scenes in Paris met the eyes of the envoys. A revolution was everywhere going on for the purpose of overthrowing Napoleon and reinstating the Bourbons. Talleyrand assured the allies that public opinion was ready for a complete repudiation of Napoleonic authority. The czar, smarting still under the remembrances of 1812, was in condition to dictate the policy; and answer was finally returned that the allies would not treat with Napoleon or with any one of his name. The emperor had gathered about him at Fontainebleau an army of 80,000 men, and now prepared to renew the attack; but the extent to which the poison of discontent and distrust had permeated all branches of the service, as well as of the Government, was now revealed. While Marmont himself was treating with the allies as an envoy of Napoleon, his corps, 20,000 strong, deserted the standard of the emperor and passed over to the enemy. Even worse than this, the Senate, which ever since 1804 had been his subservient tool, now proclaimed that Napoleon had forfeited his crown. The populace tore down the emperor's statue from the column of Austerlitz, and evidences of his name were rapidly effaced. Seeing that the contest could not longer be carried on without civil war, the emperor signed an unconditional abdication on Apr. 6, 1814. The evidences of defection on the part of the officers he had raised to power tormented him with the impression that he was forsaken and execrated by mankind. In a moment of anguish he swallowed poison, but the dose did not prove fatal. The allies decided to place the Comte de Provence on the throne as Louis XVIII., and to banish Napoleon to the island of Elba. Bidding a touching and memorable farewell to the soldiers of his guard at Fontainebleau, he was soon on his way to the little island in the Mediterranean. As he passed through the towns that had been made desolate by the commercial destruction of his continental system, he was denounced as a monster of crime, and the cause of all the sufferings of the French people. At Avignon the crowd attacked the carriages and wanted to throw him into the Rhône. He was obliged to disguise himself, and more than once his life seemed to be in extreme danger.

The Waterloo Campaign.—Scarcely had Napoleon landed on the island of his exile when new troubles broke out in France. Louis XVIII., and those he called about him, not only re-established many of the most offensive features of the old Bourbon government, but unsettled domestic affairs, played havoc with the positions of public men, and threw the titles of estates into dire confusion. These changes, so sudden and intolerable, were enough in themselves to suggest a new revolution. Meantime the old soldiers, who had been left in the garrisons or as prisoners in Germany, probably 300,000 in number, came streaming back into France with their enthusiasm for their chief unabated. The congress at Vienna, called to settle all disputed questions arising from the new conditions, added to the discontents. Meeting in September, the plenipotentiaries passed the whole of the winter without completing their work, but as the months passed on it became apparent that France would in the end be humiliated and the great powers would be greatly enriched. In all these facts Napoleon saw what he thought to be an opportunity to revive the old loyalty to himself. He formed the desperate resolution to abandon Elba and place himself at the head of the malcontents. Setting sail with about 1,100 soldiers on Feb. 25, 1815, he landed Mar. 1 near Cannes. He had not misjudged the feelings of the old soldiery, for he was at once, wherever he appeared, hailed with acclamations of joy. On Mar. 13, at Lyons, he issued an imperial decree dissolving the chambers established by Louis XVIII. and summoning an extraordinary meeting in the Field of May. On Mar. 19 the king left Paris; on the 20th the emperor arrived. Although the people generally maintained a sullen silence, the soldiers were enthusiastic. Many of the old commanders flocked to his side, and he soon had an army of more than 100,000 men; but, as so often before, he had not estimated the powers of his enemies aright. On Mar. 13 the news of his landing in France reached the representatives of the powers at Vienna. They at once forgot their differences and proclaimed

him "an enemy and disturber of the peace of the world." On the 25th the new coalition was signed, and the troops everywhere marching toward home, were ordered to halt and fall into line for the coming campaign. The allies put at once 700,000 men into the field, and the reserves at their disposal were probably twice as many more. Napoleon early in June commanded about 200,000. When the campaign began, on June 12, the emperor's force numbered 122,401. The allies consisted of Great Britain, Prussia, Russia, and Austria, besides the subordinate states of Germany, and it is evident that, whatever the result of the first great battle, the complete overthrow of the emperor could not now long be postponed. Napoleon advanced with characteristic rapidity. His plan was to strike in between his enemies, as he had so often successfully done before, and defeat them individually before they could unite. The army under Wellington, consisting of British, Hollanders, Belgians, and Germans, numbered 105,950 and was stationed at Brussels. The Prussian army of Blücher, numbering more than 116,000 well-disciplined troops, was approaching from the E. to join his British ally. Napoleon's purpose was to prevent their union and to defeat first the one and then the other. On June 16 the French and Prussians fought at Ligny, but the Prussians, though defeated, were able to withdraw from the field in good order. Napoleon now made the mistake of supposing that Blücher withdrew to the E. by way of Namur, while in fact he took the road N. leading to Wavre, a village about 8 miles E. of Waterloo. Marshal Grouchy, with a strong French force of about 33,000 men, was ordered to pursue Blücher and prevent his junction with Wellington. Grouchy naturally took the Namur road instead of that to Wavre. The mistake at Ligny led to another that was still more important. After the battle of Ligny, Napoleon's army, only about 15 or 18 miles from that of Wellington, if the old-time energy had been shown, could have overtaken Wellington by Genappe and Nivelles in time to fight the battle on the 17th. The night of the 16th Napoleon passed at Fleurus, a village about 3 miles S. of Ligny, though the left of his army, under Ney, was at Quatre Bras. The delays that now occurred have baffled many of the critics, but the most recent investigations have shown that Napoleon was so overcome with fatigue and illness on the evening of the 16th that he went to bed immediately after the battle, and did not allow himself to be disturbed till late on the morning of the 17th. He reached Ligny about noon, where he heard that Blücher had moved toward the N. Going to Quatre Bras early in the afternoon, he learned that Wellington had fallen back to the high ground S. of Waterloo. Furious rains retarded the movement of the army, but before dark the heads of the emperor's columns reached the hills in front of La Belle Alliance, less than 2 miles S. of Wellington's line. If, in the course of the night, the army had moved forward so as to begin the attack at daybreak, the result might have been different, but, notwithstanding the fact that Napoleon knew of Blücher's movement, the French army was so slow in coming into line that it was noon of the 18th before the battle began. The delay is not very satisfactorily explained by Napoleon's over-confidence in his own destiny and his underestimate of the power of his foes; and it can not properly be attributed to the rain, since the defeated army of Blücher was able to advance a much greater distance over inferior roads. It is evident that the Napoleon of Waterloo was not the Napoleon of Marengo or Austerlitz. When the attack began the French columns were thrown against the British squares with the fury of desperation. Attacks were repeated on the British right, on the left, and on the center. About four o'clock the imperial forces captured the important strategic point at La Haye Sainte. A gap was now opened in the British lines, and Napoleon followed up the advantage by an attack of the guard; but the head of the Prussian columns, under Bülow, had already reached the field, and at this moment Blücher's veterans came on as an irresistible re-enforcement. The Prussian force charged upon the French right with impetuosity. The French forces were thrown into some confusion, when Wellington ordered a general charge along the whole line. This movement not only decided the day, but drove the imperial army from the field. The pursuit was followed up with so much energy by the victors that the French army was shattered in pieces, and the fragments were sent flying in all directions toward the frontier. Napoleon himself hastened to Paris to make an appeal to the chambers, and, if possible, to repair the crushing disaster. His appeal fell on

insensible ears. There was nothing left for him but abdication.

Final Abdication, Banishment, and Death.—He proclaimed his son Napoleon II., but, notwithstanding this fact, the chambers set up a provisional government. The allies, under the impetuous counsels of Blücher, pressed on to Paris. Napoleon saw that he could do nothing to resist the current, and, accordingly, he decided to embark for America; but on reaching La Rochelle he found the harbor thoroughly guarded by British cruisers, and so changed his purpose. On July 15 he placed himself under the flag of Great Britain, and was received on board the *Bellerophon* with high honors. At the same time he wrote a letter to the prince regent declaring that he "committed himself to the protection of the laws of the most powerful, the most persevering, and the most generous of his foes"; but the coalition had learned a lesson at Elba. In a few days the British Government decided upon its course. The dignified protest of the emperor was disregarded, and early in August the great exile was on his way to the rocky island of St. Helena, in the Southern Atlantic, where, after six years of mental and physical distress, he died, May 5, 1821, after much suffering, from an ulcer in the stomach. In his last will he distributed his fortune with munificent forethought, and expressed his desire that his remains might "repose on the banks of the Seine amid the people whom he had loved so well." This wish was respected by the British Government, but the remains were not removed until 1840. In that year the "solitary tomb under the willow-tree was opened, the winding sheet was rolled back with pious care, and the features of the hero were exposed to the view of the spectators. So perfectly had the body been embalmed that the features were undecayed, the countenance serene, even a smile on the lips, and his dress the same, since immortalized in statuary, as when he stood on the fields of Austerlitz and Jena." The remains of the mighty dead reached Paris early in December, and on the 15th, followed by a procession of 600,000 people, were deposited in their final resting-place under the dome of the Church of the Invalides on the banks of the Seine.

General Estimate of his Career.—Taken all in all, Napoleon was by far the greatest of the modern masters in the art of war. In those military combinations which are known as strategy he has never had an equal, and he was so consummate a master of details that he could often predict to a day or an hour the time when a remote result would be accomplished. By a kind of inspiration or intuition he was able to detect the weakest point in the policy of the enemy, and he had unrivaled skill in throwing himself between the opposing forces and beating them in detached parts. The boldness and swiftness of his movements often stunned and almost paralyzed his foes. If he met with reverses, he was often able to conceal them by some achievement that seemed to cover everything with a blaze of glory. By means of his bulletins and reports he kept an impression of his invincible power in the minds and imaginations of the people, and it long seemed to many of the thoughtful minds of Europe that his imperial system would be permanently established. Stupendous as were his successes, a careful analysis of his career will show that his failures were still greater. It is not probable that at the beginning of his career he had any clearly defined policy in view. He was, in a very exceptional sense, a product of revolution, and yet he was so far from having sympathy with revolutionary ideas that he reinstated many of the most offensive features that the revolution had overthrown. When he came into the revolutionary current and sought to control it, he saw that the most effective way to wield all the forces of France was to unite them against the traditional foe of the nation. During the eighteenth century France had been almost constantly at war with Great Britain. The result had been humiliating to the French in the extreme. William III. and Marlborough had beaten the French on the Continent; and the statesmanship of Chatham had accomplished the stupendous result of driving the French out of America and out of India. A general hatred of the British was as dominant a factor in French life from 1775 to 1800 as was hatred of the Germans during the generation following 1870. Connected with this hatred was a natural desire to recover what had been lost. When Napoleon came upon the scene, France and Great Britain were at war. Napoleon found in this fact the greatest of opportunities. His Egyptian campaign was designed primarily as a blow at British power in the East, and its design, as well as its failure, was made all the more conspicuous

when he sent Sebastiani to explore the country with a view to a new attack. The refusal of Great Britain to give up Malta in consequence of these new revelations led, as we have seen, to a renewal of the war with the same purpose in view. The colossal preparations for the invasion of England followed; but Pitt succeeded in forming a continental coalition, and France was now obliged to fight not only Great Britain but Austria and Russia as well. As the French fleet had been unable to keep Nelson from guarding the Channel, Napoleon saw that the chances of a successful invasion were daily becoming less and less, and accordingly he changed his purpose and determined to strike the British allies instead of Great Britain herself. Ulm and Austerlitz concealed the defeat at Boulogne, as Marengo had concealed the defeat in Egypt. The war with Prussia, which began with Jena and ended with Friedland and Tilsit, humiliated the people of Frederick the Great, and by so doing prepared the way for the Nemesis of Leipzig and Waterloo; but even the tumults of this great war did not turn Napoleon for an instant from the line of his great purpose. The annihilation of the French navy at Trafalgar showed the great conqueror the utter futility of renewing the project of invasion; but the Berlin decree was aimed at the same result. By destroying commercial relations with continental markets he believed that Great Britain could be subdued; but in order to accomplish this purpose he must close all the ports of Europe. The Spanish Peninsula and the Russian Baltic ports were still open. The Spanish war was brought on by sending his brother to Madrid and Junot to Portugal for the purpose of completing the blockade in the Peninsula; and he brought on the Russian war, with all its horrors, by insisting upon a closing of the ports of Oldenburg. The failures of the Spanish and the Russian wars, among the most stupendous in history, were but the crowning failure of his policy in regard to Great Britain. Even this was not all. The failure of Napoleon in regard to France was no less complete. It is true that during the consulate and early empire he wrought important reforms that have been permanent; but it may well be doubted whether the most of these reforms were not the natural fruit of the Revolution. In making up our judgment it must not be forgotten that a great national upheaval or disaster, followed by a restoration, is always a period of great reform. Greece after the Persian invasions, Great Britain after the overthrow of the Stuarts, Prussia after Tilsit, even France after Sedan, give us intimations of what was the natural sequence of the Revolution of 1789; but whatever opinion may ultimately come to prevail in regard to the administrative reforms of the Napoleonic period, it will have to be admitted that what he fondly called his continental policy was a complete failure. In Italy, in Spain, in Switzerland, and in Germany his work perished with his overthrow. He found France in the peaceful and unquestioned possession of Belgium and the left bank of the Rhine, and he left it shorn of much of the richest and most populous portion of the realm. It was as the fruit of his policy that Cologne, Bonn, Coblenz, Mentz, and all the rich intervening territory which for twenty years had belonged to France, became permanently a part of Germany. It was not alone or even chiefly in losses of a material nature that the baneful influence of Napoleon's career left its impression on France. Far more damaging was the fact that it gave to the people those erroneous beliefs, unwholesome sentiments, and false ideals in which were bound up all the misfortunes of the second empire and the war of 1870.

AUTHORITIES.—Our knowledge of Napoleon was greatly modified by the publication, under the authority of the second empire, of the *Correspondance de l'Empereur Napoleon I.*, in thirty-two volumes 4to. Unfortunately, however, the published portion of the correspondence is by no means complete. The editors were under instructions to give to the public only "what the emperor himself would have given to the public had he survived himself." Of the entire correspondence in the French archives, numbering about 80,000 letters, only about 30,000 are included in the published collection; but the published letters have thrown new light on almost every important event of Napoleon's life. The most important of the systematic works that have received the benefit of these letters and dispatches are: Lanfrey, *History of Napoleon I.*, 4 vols.; Jarry, *Reminiscences et son Temps*, 3 vols.; Fauré, *Mémoires*; Sarrailh, *Short History of Napoleon the First*; Marmier, *Napoleon, Warrior and Ruler*; Ropes, *The First Napoleon*; Rives, *Waterloo*; Gardner, *Quatre Jours, Leipzig, and Waterloo*; Browning, *England and Napoleon*, &c. Of the more

elaborate standard works published before the *Correspondance*, Thiers, *Consulate and Empire* (20 vols.); Alison, *Political and Military Life of Napoleon I.* (4 vols.); and Alison, *History of Europe from 1789 to 1815* (14 vols.), are the most important. Of the almost countless *Mémoires* the most worthy of note, as throwing important light on the period by personal observers, are those of d'Abrantès, Rémusat, Talleyrand, Metternich, Marbot, Pasquier, Monthon, Gourgaud, Bourrienne, de Méneval, Las Casas, O'Meara, Marmont, Masséna, Sachet, de Ségur, and Miot de Melito.

C. K. ADAMS.

Napoleon II., FRANCIS JOSEPH CHARLES: the only child of Napoleon I. by Marie Louise of Austria; b. in the Tuileries, Mar. 20, 1811, and baptized June 9 as King of Rome. After the defeat at Waterloo, Napoleon I. abdicated in favor of his son, and proclaimed him Emperor of the French (June 22, 1815) under the title of Napoleon II., but the allied powers paid no attention to this proclamation. He was educated in Vienna, where he was known as the Duke of Reichstadt, from a small estate in Bohemia. He was instructed in military science, and in 1830 was raised to the rank of major. In Apr., 1832, he was suddenly seized with consumption, and died at Schönbrunn, July 22, 1832. As Napoleon III. ascended the French throne, the Duke of Reichstadt is reckoned among the French sovereigns by the Bonapartists and known as Napoleon II., though he never occupied the throne.

Napoleon III., CHARLES LOUIS: Emperor of the French; the youngest son of Louis Bonaparte, King of Holland, and Hortense Beauharnais, the stepdaughter of Napoleon I.; b. in Paris, Apr., 20, 1808. The parents lived separately, the children with the mother. After the fall of Napoleon I., Queen Hortense repaired in 1816 to Arenenberg in Thurgau, and Louis attended for eight years the gymnasium of Augsburg, and after 1824 for some time the military school of Thun. On the dethronement of the Bourbons by the revolution of 1830 he took an active part in public affairs. He joined in the unsuccessful revolt of the Italians against the papal rule in Romagna and afterward returned to France, but the law exiling the Bonapartes was still in force and he was obliged to leave the country. After the death of his elder brother in 1831, and of the Duke of Reichstadt in 1832, he became the heir of the house of Bonaparte. A sort of conspiracy in Strassburg proclaimed him emperor Oct. 30, 1836, but only for two hours. He was arrested and sent to the U. S. without trial. He returned to Switzerland in 1837, just before the death of his mother, and spent the next two years in London, where he was generally liked, though he inspired no great respect for his abilities. On Aug. 6, 1840, he landed at Boulogne with fifty men and conquered the toll-gates. This time, however, he was sentenced to imprisonment for life, and he remained in the citadel of Ham till May 25, 1846, when he succeeded in making his escape. He bore his imprisonment with courage, spending much of the time in writing papers on political questions. His pamphlets *Reveries Politiques* (1832) and *Des Idées napoléoniennes* (1839) had already appeared, and while at Ham he published *De l'Extinction du Paupérisme* (1844). After his escape he again went to London, where he lived till 1848, when the February revolution in Paris brought his name into prominence. He was elected to the Assembly from Paris and from three departments. On Sept. 26 he took his seat, and on Dec. 20 was elected president of the French republic by a majority of over 5,000,000. Soon, however, a quarrel arose between him and the Assembly, the latter suspecting him of an intention of overthrowing the constitution, while he in turn maintained that the Assembly opposed all his plans for promoting the welfare of the people. The trouble finally culminated in his masterly but unscrupulous seizure of power by the *coup d'état* of Dec. 2, 1851. On that day Paris found its walls placarded with proclamations to the effect that the president had discharged the Assembly, charging it with being the "hotbed of sedition," and appealing to the people in support of the course he had taken. All civil and military officers likely to oppose his scheme were then arrested, the army, which was hostile to the Parisian populace, was skillfully disposed in the streets, and finally the brutal and needless massacre of the crowds on the boulevards on Dec. 4 completed the work of overawing the city. Reports that Paris enthusiastically approved the president's course were dispatched to the provinces, and on Dec. 20-21 the people of France were called upon to vote on the questions as to

whether or not the course of the president should be sustained, and whether he should be authorized to draw up a new constitution and to retain the presidential chair for ten years. A negative answer would have meant temporary anarchy, and the result of the vote was an almost unanimous acceptance of the proposals submitted, the dissenting minority numbering only 640,000 out of a total of 8,000,000 votes. From this time on he possessed in effect arbitrary power, and on Dec. 2, 1852, was proclaimed emperor, a second plebiscite having resulted in a still larger majority in his favor than the first. On Jan. 30, 1853, he married Eugénie de Montijo, and Mar. 16, 1856, she bore him the Prince Imperial, who died June 1, 1879. For the first ten years of his reign he was a conspicuous and at times a brilliant figure among European sovereigns. The Crimean war (1854-56), which was only a half success, immensely expensive, and small in its results, nevertheless added to the military reputation of France, and the Italian war (1859), although disappointing to the Italians on account of their failure to secure Venice, made him immensely popular. The Mexican war (1862-63) was showy enough, in that it gave him a crown to dispose of, but after Maximilian's overthrow and death people began to view the emperor's policy with some suspicion, and although he entertained Europe well enough by the opening of the Suez Canal, the World's Exposition, the rebuilding of Paris, by congresses and visits, France began to lose something of her prestige in foreign relations. Both in the Danish war of 1864 and in the war of 1866 Napoleon's policy betrayed weakness and inconsistency, and its results were humiliating and disappointing to France. One of the chief motives for the fatal war with Germany in 1870 was the desire to strengthen the empire by an access of military glory. Napoleon, who was then slowly dying of an incurable disease, seems to have been the victim of gross misrepresentations as to the resources of France and her readiness for war. During the contest he was misled by his advisers and urged on to rash measures by the dread of a popular uprising against his government. He was made prisoner with his entire army at Sedan, Sept. 2, 1870, and sent to the castle of Wilhelmshöhe, near Cassel, whence he afterward removed to England. D. at Chiselmhurst, in England, Jan. 9, 1873. Among Napoleon's other writings are *Histoire du Jules César* (1865-66); miscellaneous works published under the title *Œuvres de Napoléon III.* (1854-69); and a collection of posthumous works, *Œuvres posthumes* (1873). See Delord, *Histoire du second empire* (1869-75); Gottschall, *Napoleon III., Eine biographische Studie* (1871); von Sybel, *Napoleon III.* (1873); Jerrold, *The Life of Napoleon III.* (1877); Hugo, *Histoire d'un Crime* (1877); Simson, *Die Beziehungen Napoleons III. zu Preussen und Deutschland* (1882); C. E. de Maupas, *Story of the Coup d'État* (Eng. trans. 1884); memoirs of the Duke of Coburg; Fyffe, *Modern Europe* (1890); and Murdock, *Reconstruction of Europe* (1891). F. M. COLBY.

Napoleon, Prince NAPOLEON JOSEPH CHARLES PAUL BONAPARTE: See BONAPARTE, N. J. C. P.

Napoleon IV., Prince LOUIS NAPOLEON: the name given by the Bonapartists to the only child of Napoleon III. and the Empress Eugénie, though he never ascended the throne. He was born Mar. 16, 1856, and was educated in the Tuileries; but when, on Sept. 4, 1870, the people of Paris, after the battle of Sedan and the downfall of Napoleon III., proclaimed the republic, he escaped with his mother to England. He received a military education at the Royal Military Academy at Woolwich. During the war against the Zulus, in South Africa, he volunteered his services, and was killed June 1, 1879.

Napoleona: a genus of two species of small trees, of the Myrtle family, natives of tropical Africa. The large flowers are crimson and orange in color, and of great beauty of form. These plants are now grown in conservatories, sometimes under the old name of *Belvisia*.

Nappe [= Fr. sheet, cloth < Late Lat. *nappa*, variant of Lat. *nappa*, cloth, table-cloth]: in mathematics, one sheet of a surface. Thus if an hyperbola is revolved about its conjugate axis, it will generate a surface which is everywhere continuous; this surface is an hyperboloid of one nappe; if the curve is revolved about its transverse axis, it will generate a surface composed of two parts or sheets; this surface is called an hyperboloid or two nappes.

Naquet, naā kā, ALFRED JOSEPH: chemist and politician; b. at Carpentras, in the department of Vaucluse, France, Oct. 6, 1834; studied medicine at Paris, and was appointed

professor at the medical school in 1863. His principal scientific works are *Principes de Chimie fondés sur les Théories Modernes* (1865); *De l'Atomicité* (1868); *Précis de Chimie légale* (1872). He was one of the organizers of the congress of Geneva, and his speeches on this occasion cost him fifteen months' imprisonment, besides a fine. For his *Religion, Propriété, Famille* (1869) he was also punished by imprisonment and a fine. In 1873 he published *La République radicale*, but his journal (*La République*, 1876) was not successful. He was prominent as a senator, radical politician, and Boulangist, 1882-90.

Nara: an ancient town of Japan; situated in the northern part of the province of Yamato, about 27 miles S. by E. of Kioto (see map of Japan, ref. 6-C). The name is said to be derived from *nara*, a species of oak no longer common in the neighborhood. For seven reigns (709-784 A. D.) Nara was the imperial seat, and retains, in its wonderful old temples, relics of its past glory. In a pagoda, 156 feet high, is contained the largest image of the Great Buddha in the empire. It is 53 feet in height, and is ascribed to a Chinese founder of the eighth century. Some of the finest specimens of wood-carving in Japan are to be found in the various temples and shrines, as well as collections of invaluable antiques. Modern Nara is noted for its cutlery, sold mostly to pilgrims as souvenirs, and for its park, where is kept a herd of tame sacred deer. Pop. 21,000. J. M. DIXON.

Naraka [Sanskrit]: in Brahmanism and the religious systems developed from it, the place to which the wicked are consigned for punishment; hell. Manu enumerates twenty-one such places, and describes with great elaborateness the varied punishments meted out for different crimes. According to the Buddhist system there are eight large hot hells, eight large cold hells, eight large hells of utter darkness, and ten large cold hells on the edge of the universe. Each of these has innumerable smaller hells attached to it. The eight large hot hells are situated in tiers beneath JAMBUDWIPA (*q. v.*); each has four gates, and outside each gate are four other hells, making 136 hot hells in all. The lowest of the eight large hot hells is called Avichi, or the hell of unintermitted suffering. To it are consigned all those who disobey parents, or who speak ill of Buddha or his law.

The eight large cold hells are situated beneath the double range of iron mountains which form the periphery of the universe. The eight hells of utter darkness are situated between these two ranges, and are called "living" or "vivifying" hells, because if a being dies in one he is immediately reborn in another, where he continues 500 years, and is then reborn in a third, and so on until his sins have been expiated, when he is again born on earth in some one of the remaining five gatis. (See GATI.) Attached to each of the cold hells on the edge of the universe are 100,000,000 smaller hells, while besides all this there are 84,000 other hells situated on mountains, in deserts, on the water, etc.

All these hells are in charge of YAMA (*q. v.*), the judge of the dead, who, with the assistance of eighteen officers and an army of demons, determines the kind, degree, and duration of torture to which each male culprit must be subjected. His sister performs the same duties in regard to female culprits. See BUDDHISM. R. LILLEY.

Narbada: See NERBUDDA.

Narbonne, naār'bōn' (anc. *Narbo Martius*): town; in the department of Aude, France; on a branch of the Canal du Midi; 8 miles from the Mediterranean (see map of France, ref. 9-F). It is an old town, and was known to the Greeks 500 B. C. In 118 B. C. it was colonized by the Romans, and in the times of the emperors it became a magnificent city, the capital of Gallia Narbonensis, adorned with temples, triumphal arches, and amphitheaters, and famous for the salubrity of its air. Three emperors, Carus (282-283) and his two sons, Carinus and Numerianus (283-284), were born here. In 719 the Saracens took and burned it; in 859 the Northmen plundered it; yet in the twelfth and thirteenth centuries it was a city with 40,000 inhabitants and extensive commercial connections; in 1271 it began building its magnificent Gothic cathedral, which was never finished. The town sank suddenly. All its splendor has now shrunk into a collection of antiquities. Even its pure air has been spoiled by poisonous gases from swamps in the vicinity. Its only celebrity at present is due to its honey, which is the best in France. Pop. (1891) 27,150.

Narcissus [= Lat. = Gr. *νάρκισσος*, perhaps deriv. of *νάρκη*, numbness, torpor. Cf. *NARCOTICS*]: name of a genus of bulbous plants of the family *Amoryllidaceæ*, natives of the

old World. The genus includes the garden and greenhouse plants called narcissus, daffodils, and poeony-thus, cultivated for ornament. They mostly have many stamens, appearing in spring, and many are very fragrant. See Daffodil.

Narcissus [Lat. *Narcissus*, Gr. *Nάρκισσος*, personification of narcissus; Narcissus is the beautiful youth who became a god of flowers and the nymph Echo (*q. v.*) loved him, but he repulsed her, and was punished by falling in love with his own image as reflected in a fountain, so that not attempting like most lovers to jump away and died. When the Naiads came to bury his body, they found only a flower—the narcissus. The myth is thought to have had its origin in the Boeotian pederasty, having been invented to frighten unresponsive boys. J. R. S. S.

Narcotics [from Gr. *ναρκοτικός*, benumbing, deriv. of *ναρκωίν*, benumb, deriv. of *νάρκη*, numbness]: in medicine, such drugs as have the power of stupefying the cerebral faculties, or inducing sleep, or deadening ordinary sensibility. No exact division of narcotics can be made, but such drugs as opium, belladonna, stramonium, henbane, Indian hemp, chloral, and the ethers are those to which the term is commonly applied.

Narcotine: See OPIUM.

Nard: See STURGEON.

Nares, nārz, Sir GEORGE STRONG, K. C. B., F. R. S.: navigator; b. at Daresbury, Scotland, in 1811; was educated at the Royal Naval College, Greenwich; engaged in the Arctic expedition 1852-54, and was in 1875 at the head of the expedition sent out in search of the north pole, commanding the *Alert*, which reached lat. 82° 37' N. He afterward made a survey of the South Pacific in the same ship. He published *The Naval Cadet's Guide* (1860; reprinted in 1862 under the name of S. C. Smith); *Expedition* (2d ed. 1868); *Reports on Ocean Soundings and Temperature* (in the *Challenger*; 6 parts, 1874-75); *The Official Report of the Arctic Expedition* (1876); *Narrative of a Voyage to the Polar Sea in 1875-76* (2 vols., 1878). In the period between his first and his second Arctic expeditions he was mostly employed in explorations of the southern polar seas and the coasts of China, being in command of H. M. S. *Challenger* 1872-74.

Nares, Robert, F. R. S.: clergyman and author; b. at York, England, June 9, 1753; was educated at Christ Church, Oxford; took orders in the Church of England 1778; became rector of Sharnford, Leicestershire; preacher at Lincoln's Inn 1788; assistant librarian at the British Museum 1795-1807; canon of Lichfield 1799; archdeacon of Stafford 1800; prebendary of Lincoln and rector of All Hallows, London. With Mr. Beloe he founded and edited *The British Critic* 1793-97; was a contributor to *The Classical Journal*; was vice-president of the Royal Society 1823; published several volumes of sermons and theology, and was author of *Elements of Orthodoxy* (2d ed. London, 1794), and a valuable *Glossary, or a Collection of Words, Phrases, Names, and Allusions, etc., which have been thought to require illustration in the Works of English Authors* (1822; new ed. by J. O. Halliwell and Thomas Wright, 2 vols., 1859; new ed. 1888). D. in London, Mar. 23, 1829.

Nariño, nā-reen'yō, ANTONIO: patriot; b. at Bogotá, New Granada, 1765. He had only the limited education afforded by a college in his native city, but he acquired some fame as an author and orator, and held responsible positions under the viceroys. About 1793 he translated and secretly printed a French work advocating republican principles. Subsequently, fearing the authorities, he burned all the copies, but one of them had been seen by a royalist officer, and Nariño, after a tedious trial, was condemned to ten years' penal servitude, and sent a prisoner to Spain (1795). He escaped, and in 1797 returned to New Granada, but was again arrested, and was only released by the revolution of 1810. He at once joined the patriots, and was made president (1811), and subsequently dictator of Cundinamarca, which embraced the city of Bogotá. Nariño was the leader of the centralist republicans, and Cundinamarca refused to join the New Granadan confederation; civil war broke out, and Nariño defeated the federalists, who attacked Bogotá, Jan. 9, 1813. Soon after he resigned his dictatorship and marched to the south against the royalist forces; at first successful, he was defeated at Pácora, May, 1814, and sent to Spain, where he remained a prisoner until 1820.

Returning, he was senator and vice-president of Colombia in 1822. D. at Villa de Leiva, Dec. 13, 1823.

HERBERT H. SMITH.

Naro, nār-rō: town; in the province of Girgenti, Sicily; about 15 miles from the town of Girgenti (see map of Italy, ref. 10-F). It is well built, and contains some fine churches and an old feudal castle with four towers. In the neighborhood are remains of ancient aqueducts, grottoes, and sepulchers. There are also productive sulphur mines in the vicinity. Naro is said to have been built by the Saracens on the ruins of the ancient *Molyum*. Tasso in his *Gerusalemme Liberata* calls it *Naja*. Pop. about 10,400.

Narragansets: See ALGONQUIAN INDIANS.

Narragansett Bay: an inlet of the Atlantic, extending 28 miles into the State of Rhode Island. It is deep and well sheltered from the sea, receives the estuaries of the Providence and Taunton rivers, and contains the islands of Aquidneck (or Rhode Island proper), Conanicut, Prudence, and other smaller ones. It has valuable fisheries.

Nar'ses: soldier and administrator; b. in the latter part of the fifth century; was a eunuch and a slave in the palace of the Byzantine emperors. His talents attracted the attention of Justinian, who made him keeper of the privy purse and a member of the council. In 538 he went to Italy as commander of a force sent either to re-enforce or to watch Belisarius, but he was recalled in 539. Nevertheless, after the death of Belisarius, he was made commander-in-chief in Italy in 552, and his success as a general was most brilliant. Near Tadini he defeated the Gothic king Totila, who was killed in the battle. He then conquered Rome; defeated Teias, Totila's successor, on the banks of the Sarna, and completely crushed the power of the Goths in Italy. Justinian made him governor of Italy, with the title of exarch. He fixed his residence at Ravenna, and governed the country with much severity, but also with much wisdom. After the death of Justinian and the accession of Justin II., he was ignominiously deprived of his office in 565, and died in retirement at Rome about 573. It is said that the invasion of the Lombards, which took place shortly before his death, was an intrigue by him to get revenge on the court of Constantinople.

Narthex: See GUM RESINS.

Narthex [Gr. *νάπηξ*, name of a hollow-stemmed plant, the giant fennel; a casket, case. From this latter signification came in eccles. Gr. the application to a part of a church]: a vestibule or inclosed porch extending across the whole front of a church. In the early Christian and Byzantine churches it was commonly vaulted, and entered from the *atrium* or forecourt by a number of doors corresponding with those leading into the church proper. The unbaptized and heretics were not allowed to pass beyond the narthex into the church. Like most of the arrangements of the Christian basilica the narthex appears to have been imitated from the Roman secular basilicas, as may be seen in the ruins of the basilica of Maxentius at Rome. The most magnificent examples of the narthex are those of Santa Sofia at Constantinople, now a mosque, but formerly a Christian church, built in 538 A. D., and St. Peter's at Rome, built by Maderna in 1625. The term is also applied to porches less wide than the whole front, and also to those still larger than the front would allow, as in the case of St. Mark's church at Venice, where the narthex is carried along the north flank as far as the transept. This use of the term is limited to the Byzantine or Romanesque styles.

A. D. F. HAMLIN.

Narvaez, nār-vaa'eth, PÁÑELO, de: soldier; b. at Valladolid, Spain, about 1478. He went to Santo Domingo, probably in 1502, and from 1512 was the principal lieutenant of Velasquez in the conquest of Cuba, where he settled. Cortés, who had been sent by Velasquez to conquer Mexico, threw off his authority there, and Narvaez was sent to supersede and imprison him as a rebel. He sailed with a powerful armament, and in Apr., 1520, landed at Vera Cruz with 900 men; but on May 28 he was defeated and captured by Cortés at Cempoala, losing an eye in the engagement; his soldiers were incorporated in the army of Cortés and took part in the siege of Mexico. Narvaez was well treated, and was soon released. He went to Spain, and in 1526 obtained a grant to conquer Florida, of which he was made governor. In Mar., 1528, he sailed from Cuba with five vessels and 400 men; landed probably at Apalache Bay, and marched inland; but after losing half his men in

encounters with the Indians was obliged to return. Unable to find his ships he built boats, in which he made his way westward along the coast, nearly to the mouth of the Mississippi; there he and nearly all his men perished in a storm. The four survivors reached Mexico after years of wandering.

HERBERT H. SMITH.

Narvaez, RAMON MARIA, Duke of Valencia: statesman; b. at Loja, Spain, Aug. 4, 1800; entered the army in youth, and in the first Carlist war attained the position of captain-general of Old Castile. He took part in an attempted revolution against Espartero in 1839, and had to take refuge in France, where he plotted with the ex-queen, Maria Christina. In her interest he placed himself at the head of an expedition with which he penetrated to Madrid in 1843 and overthrew the government of Espartero. In the following year he became Prime Minister; was created field-marshal, Count of Cañadas Altas, and Duke of Valencia, and effected the formation of a new constitution (1845), suppressing all his opponents with rigor. In 1846 he quarreled with the ex-queen, resigned his post, and went as ambassador to France; resumed power in 1847, but soon lost it again for the same reason as before. In 1849 he was again at the head of the government during the diplomatic quarrel with Great Britain which culminated in the withdrawal of the British ambassador, Sir Henry Bulwer. In 1851 he went as ambassador to Vienna; became again Prime Minister in 1856; repressed several revolutionary outbreaks, and took stringent measures against the press; was overthrown Nov., 1857; was again Prime Minister from Sept., 1864, to June, 1865, and from July, 1866, until his death, at Madrid, Apr. 23, 1868.

Narwhal [from Swed. and Dan. *narhval*; the latter element is akin to Eng. *whale*], or **Sea-unicorn**: a cetacean (*Monodon monoceros*) belonging to the family of the *Delphinidae*, or dolphins. It is most nearly related to the white whale (*Delphinapterus catodon*), and forms with it the sub-family *Delphinapterine*. Belonging to an order in which many of the members never develop teeth at all, it is supplied with a tooth altogether out of proportion to its size; and this tusk is moreover developed in utter contravention of the rules of bilateral symmetry, which in every other known case among vertebrates govern the production of the teeth. In both sexes the lower jaw is edentulous; in the male the upper jaw is provided, on the left side, with a tusk from 6 to 8 feet long, straight, spirally grooved externally, and hollowed within into a persistent pulp-cavity. On the right side the corresponding tooth generally remains hidden, smooth, and solid, within the jaw, but sometimes is produced symmetrically with the other. These teeth are generally described as incisors, but erroneously, as the alveoli are situated at the junction of the intermaxillary and maxillary bones, and, according to Mivart, are even "embedded entirely in the maxilla." In addition to these, there are two small rudimentary molars concealed in the upper jaw. The female, although as a rule without apparent teeth, has the incipient tusks concealed in the jaw; one of these is, however, said to be sometimes developed as in the male. The narwhal in form of body resembles the porpoise; its mouth is small, and its single spiracle or blow-hole is situated on the top of the head. Its flippers or "fins" are small, and it has no dorsal fin. It attains to a length of from 10 to 15 feet, exclusive of the tusk, and in color is whitish, marbled with brown. The single species inhabits the Arctic seas, where it lives largely on cuttlefishes, and in its turn serves an important purpose in the domestic economy of the Eskimos, yielding them a large supply of oil, etc., and an ivory of considerable commercial value. It has become somewhat rare. Revised by F. A. Lucas.

Nasalization: the adding of nasal resonance to a sound or sounds. Thus in French the adding of nasal resonance to the vowel *e* of *perte*, *mer* yields the nasalized vowel of *fin*, *plaire*, *bien*; to the *o* of *peur*, *peuple* yields the vowel of *un*, *parfum*; to the *o* of *mort*, *porte* yields the vowel of *rond*, *nom*; to the *a* of *lâche* yields the vowel of *an*, *dent*, *temps*. The physiological process of nasalization consists in dropping the soft palate toward the base of the tongue and opening the passage into the nasal cavity. This has the effect in the sounding of a vowel of adding a second resonance chamber, which conditions not only the color of the sound, but the natural or inherent pitch of the vowel. This pitch is lower than in the corresponding pure vowels. The "nasal twang," widely characteristic of American English, consists in a partial nasalizing of the entire current of speech-breath. The nasal valve is left partly open, so that

the nasal cavity participates to some extent in yielding the characteristic resonance of all the voiced sounds. An excellent test of the extent of nasalization may be made by holding a lighted candle before the nostrils and shielding the flame from the breath emitted at the mouth. The flickering of the flame will then indicate the presence of nasalized breath. See PHONETICS.

BENJ. IDE WHEELER.

Nasals: a class of speech-sounds characterized by the opening of the nasal passages. The term in its narrower use applies to the common sounds of *n*, *m*, *ng*, the dental, labial, and palatal nasals respectively. These are formed by making with the tongue or lips the closures for *d*, *b*, or *g* respectively, and deflecting the voiced breath through the nasal passages. The sounds are used both as consonants (non-syllabic) and as vowels (syllabic). They appear as nasal vowels, e.g. in *written* (pronounced *ri'tn*), *sicken* (pronounced *si'kən*). The nasal vowels differ from the nasalized vowels in that the latter leave the oral cavity open. See NASALIZATION.

BENJ. IDE WHEELER.

Nascent State [*nascent* is from Lat. *nas'cens*, *nascent'is*, pres. partic. of *nas'ci*, be born]: in chemistry, a state in which, at the instant of evolution from previous combination, some substances manifest tendencies to combine directly with, and even to decompose, bodies upon which in ordinary circumstances they are inactive. The most familiar and the most remarkable examples of this class of phenomena are exhibited by the element HYDROGEN (*q. v.*). When evolving from combination in a diluted acid by means of a soluble metal, it is endowed with affinities so intensified that it will not only combine with other elements that may be present, such as sulphur, phosphorus, arsenic, carbon, etc., but will in many cases decompose oxides or other compounds of these elements, combining with and carrying off the latter in gaseous or volatile forms. Thus when common iron, which contains carbon, is dissolved in a diluted acid, hydrocarbon gases and vapors of an interesting kind are found mixed with the hydrogen gas, giving it a peculiar disagreeable odor, pure hydrogen being odorless. According to the prevailing views, the explanation of the phenomena of the nascent state is not difficult. There is good evidence in favor of the idea that hydrogen gas, or free hydrogen, consists of molecules which, in turn, consist of atoms. Free hydrogen is a compound of atoms of hydrogen. In order that this may act upon other things, it is necessary that the atoms be separated from each other, or the molecules of hydrogen must be decomposed. Therefore, free hydrogen does not act readily. When, however, the element is set free, it is in the condition of atoms which are free to act upon whatever they may come in contact with. If they find nothing else with which they can combine, they combine with each other in pairs, thus forming the comparatively inert free hydrogen.

Revised by IRA REMSEN.

Naseby, nāz'bi: village; in the county of Northampton, England; famous for the battle in which Fairfax utterly defeated Charles I. On the morning of June 14, 1645, the two armies stood arrayed opposite each other—the royal commanded by the king himself, with Prince Rupert on his right wing and Sir Marmaduke Langdale on his left, and the Parliamentary commanded by Fairfax, with Cromwell on his right wing and Ireton on his left. The Parliamentary forces numbered nearly 14,000 men, while Charles had barely 7,500. The attack was made by the royal forces, and Prince Rupert succeeded in overwhelming Ireton and put his corps to flight. On the other side Cromwell routed Langdale, but, while Prince Rupert left the general battle in order to pursue Ireton, Cromwell wheeled round and attacked the royal center in the rear. Of the Parliamentary army there were only about 1,000 killed, while of the royal army there were about 800 killed and about 4,500 were made prisoners.

Nash, JOHN: architect; b. in London, England, in 1752; obtained in 1797 a patent for improvements in the construction of the arches and piers of bridges; was much employed in designing mansions for the nobility and gentry. In 1815 he was taken into the Government service, and for many years thereafter was engaged in laying out streets and building public edifices in London. Part of Regent Street, the terraces of Regent's Park, Haymarket theater, and Buckingham Palace show the character of his work. D. at East Cowes Castle, May 13, 1835.

Nash, RICHARD, known as BEAU NASH: leader of fashion; b. at Swansea, Wales, Oct. 18, 1674; studied at Oxford, but

was expelled about 1690; held for some time a commission in the army, and began the study of law at the Temple; became famous as a dicer-out, a gambler, and leader of fashionable dissipation, and in 1704 undertook the management of the balls at Bath, then the most celebrated watering-place in England. For fifty years he was master of ceremonies, acquiring a wide notoriety for his strictness in enforcing decorum in the midst of gayety and dissipation, and was popularly called "the king of Bath." He made his living chiefly by gaming, and was noted for generosity. In his old age he fell into neglect and often suffered from privation. D. at Bath, Feb. 3, 1761. He was honored by a public funeral, and his *Life* was written by Goldsmith (published anonymously, 1762).

Nash, THOMAS: author; b. at Lowestoft, Suffolk, England, in 1567; graduated at Cambridge in 1584; settled in London in 1589; attacked the Nonconformists in several pamphlets written in grotesque style; wrote a number of unimportant dramas. He lived in extreme poverty. Among the most interesting of his lampoons and miscellaneous pamphlets are *Power Powerless, his Supplication to the Devil* (1592); *The Turnes of the Night* (1594); and *How with you to Saffron Walden* (1596). D. in London probably in 1601. See his *Complete Works*, edited by Grosart (6 vols., London, 1883-84). Revised by H. A. BEERS.

Nashua: city (incorporated as a city in 1853); one of the capitals of Hillsboro co., N. H. (for location of county, see map of New Hampshire, ref. 10-E); on the Nashua river, near its junction with the Merrimack, and on the Concord and Montreal and the Boston and Maine railways; 35 miles S. of Concord, 40 miles N. W. of Boston. Since 1826 it has been noted for its manufactures, for the promotion of which a superior water-power was obtained from the rivers by means of a connecting canal 3 miles long, 60 feet wide, and 8 feet deep, with a head and fall of 36 feet. The principal manufactures are cotton goods, sheetings, embroidery, iron and steel, foundry products, furniture, edge tools, paper, and locks. The city has a public library (founded 1867) with over 10,000 volumes, 3 national banks with combined capital of \$370,000, 2 savings-banks with combined deposits of nearly \$3,700,000, a banking company with deposits of over \$1,075,000, and 2 daily and 2 weekly newspapers. The assessed valuation in 1893 was \$12,502,142, and the net debt on Jan. 1, 1894, was \$565,160. Pop. (1880) 13,497; 1890 19,311. Editor of "Telegraph."

Nashville: city; capital of Washington co., Ill. (for location of county, see map of Illinois, ref. 9-D); on the Centralia and Chester and the Louis and Nash. railways; 50 miles E. by S. of St. Louis, 120 miles S. of Springfield. It is in an agricultural and coal-mining region, and has 8 churches, high school, public school, 3 flour-mills, 2 coal mines, a State bank with capital of \$25,000, and a daily and 4 weekly newspapers. Pop. (1880) 2,222; (1890) 2,084; (1904) estimated, 3,000. Editor of "Democrat."

Nashville: city; capital of the State of Tennessee and of Davidson County (for location, see map of Tennessee, ref. 6-E); on the Cumberland river, 200 miles from its mouth, and on the Louisville and Nashville and the Nash., Chat. and St. L. railways; 233 miles E. N. E. of Memphis. The city rests on a rocky foundation, the river bluffs rising to a height of 80 feet above low water. It is noted for its educational institutions, commerce, and manufactures. A new charter granted in 1883 vested its government in a mayor and a salaried board of public works. The city contains the Central Tennessee College (Methodist Episcopal, opened 1866); Fisk University (Congregational, opened 1866); Vanderbilt University (Methodist Episcopal South, chartered 1873); Roger Williams University (Baptist, opened 1864); the Peabody Normal College (opened 1875); St. Cecilia Academy (Roman Catholic, opened 1860); Montgomery Bell Academy (non-sectarian, opened 1867); Boscobel Female College (Baptist); the Nashville College for Young Ladies (Methodist Episcopal South, opened 1880); Ward's Seminary for Young Ladies; Clark's Select School for Young Ladies; and 2 business colleges. In the school year 1890-91 there were 26,738 children of school age, of whom 10,501 were enrolled in the public schools and 1,200 in private and parochial schools. There were 18 public-school buildings, 153 regular teachers, and public-school property valued at \$320,000. The libraries in the educational institutions contained over 35,000 volumes, and 4 others, including the State Library, had together over 40,000 volumes. The city also contains the State School for the Blind, established 1844,

and the headquarters of the Tennessee Historical Society, the Tennessee Confederate Memorial and Historical Association, and of the Engineering Association of the Southwest. There are about 70 churches. The Merchants' Exchange reported commercial receipts in the year ending Aug. 31, 1892, valued at \$19,340,610. These included 45,991 bales of cotton, 4,604,900 bush. of wheat, 2,645,400 bush. of corn.



State Capitol, Nashville, Tenn.

842,000 bush. of oats, 7,543,256 lb. of bacon, 3,046,593 lb. of bulk meats, and 103,792 cases of boots and shoes. The census returns of 1890 showed that 389 manufacturing establishments (representing 67 industries) reported. These had a combined capital of \$9,166,626, employed 7,434 persons, paid \$3,318,961 for wages and \$7,727,010 for materials, and had products valued at \$13,673,730. The principal industry according to amount of capital employed was the manufacture of lumber products, which had 22 establishments and \$1,587,626 capital, employed 1,524 persons, and had products valued at \$2,217,420. In 1894 there were 3 national banks with combined capital of \$3,000,000, and 4 State banks with capital of \$400,000; 2 daily, 20 weekly, 17 monthly, and 2 other periodicals; and a debt (including a water debt of \$1,497,000) of \$3,057,500. The assessed valuations in 1893 aggregated \$37,521,500. Pop. (1880) 43,250; 1890 76,168.

Nashville, Battle of: a battle of the civil war in the U. S.; fought Dec. 15 and 16, 1864, between the Union forces under Gen. G. H. Thomas and the Confederates under Gen. J. B. Hood. After the battle of Franklin (see FRANKLIN, BATTLE OF) Gen. Thomas concentrated his forces at Nashville, Tenn., which was well fortified with field works extending along the crests of the low hills, surrounding the city on the S. with both flanks resting on the Cumberland river. Gen. Hood took up a position in his front Dec. 2-4. Thomas's army, although equal to or greater than Hood's in numbers, needed a few days for organization, and was without horses for the cavalry. He delayed making an attack upon Hood until he felt himself fully prepared to secure the best results. His army was ready to attack on Dec. 8, but was prevented by a sleet-storm which covered the country with ice and made a movement impossible up to the 15th. The impatience of the Secretary of War and of Gen. Grant at this delay was so great that on the 9th Grant issued an order directing Thomas to turn over his command to Schofield; but this order was revoked before it reached him. On the 13th Gen. Logan was sent to supersede Thomas, but stopped at Louisville upon learning the result of the battle which had taken place.

On the morning of Dec. 15 Thomas moved out. Making a demonstration on his left, he extended his right, turned Hood's left, carried his lines from left to right, and drove him back to a new position about 2 miles to his rear. On the 16th Thomas again attacked. He was held in check by Hood's right on Overton's Hill, but by turning his left he swept him from his new line and drove him from the field routed and in disorder. The well-equipped cavalry prepared for this contingency now led the pursuit, closely followed by the infantry. The pursuit was pushed vigorously to the Tennessee river, which the Confederates crossed at Decatur on Dec. 27; from here they fell back to Tupelo, Miss., where what remained of the army was broken up and the parts sent to different fields. The total Union loss was 3,057, of whom less than 400 were killed. The Confederate loss in killed and wounded was never accurately deter-

mined, but probably did not differ materially from that of the Union army. There were captured on the field about 4,500 prisoners, including four generals, besides 54 guns and numerous small arms. During the retreat a large number of prisoners were captured and deserters received. During the campaign of November and December over 15,000 prisoners and deserters, 72 cannon, and 3,000 small-arms were taken. See Cox, *Battles of Franklin and Nashville*, Scribner's War Series, and *Battles and Leaders of the Civil War*.

JAMES MERCUR.

Nashville, University of: an institution founded in 1785, fifteen years before the State of Tennessee was admitted into the Union, and chartered by the Legislature of North Carolina as Davidson Academy. The Legislature gave it 240 acres of land, now included in the city of Nashville. In 1806 the academy became Cumberland College, which in 1826 was organized as the University of Nashville. In 1850 the university was closed on account of the scourge of cholera; in 1855 the literary department was reorganized as a military school with Col. Bushrod R. Johnson as superintendent; in 1861 the teachers and students went to the war; after the close of the war the institution again became a military school under the direction of Gen. E. Kirby Smith; in 1875 the Peabody board and the trustees of the University of Nashville united in forming a college for the training of Southern teachers. Eben S. Stearns, LL. D., was elected president and chancellor; at his death in 1887 he was succeeded by William H. Payne, LL. D. The buildings are situated on an elevated campus of 16 acres, a mile from the public square. The Peabody board has established 184 scholarships, each worth \$100 a year, and each student's railway fare is paid from his home to Nashville and back. The medical department was organized in 1850; the number of students annually in attendance varies from 300 to 400. The total number of students in the general departments exceeds 1,000.

W. H. PAYNE.

Na'smyth, JAMES: mechanical engineer and astronomer; b. in Edinburgh, Aug. 19, 1808; the son of an artist; was educated at the School of Arts and the Edinburgh University; removed to London, and in 1834 to Manchester, where he became a successful machine constructor and inventor. The steam-hammer, steam pile-driver, and improved forms of ordnance are among his inventions. He also acquired fame as a practical astronomer, giving special attention to selenography, in which he employed telescopes and other instruments of his own construction. He published *Remarks on Tools and Machinery*, in Baker's *Elements of Mechanism* (1858), and *The Moon considered as a Planet, a World, and a Satellite* (1874). D. in London, May 7, 1890. See *Life*, by Smiles (1883).

Revised by R. H. THURSTON.

Nâs'r-ed-dîn, officially called CHAH EN CHAR (King of Kings): Shah of Persia; b. July, 1831; eldest son of the monarch Mehemet (or Muhammad) Shah, by Queen Velliat of the Kadiar tribe, and grandson of Abbas Mirza; succeeded to the throne Sept. 10, 1848; suppressed several revolts of the nomadic tribes; maintained neutrality during the Crimean war, at the close of which he signed a treaty with Russia; waged a nominal war against Great Britain in 1856, which was terminated by the Treaty of Paris 1857; gave his support to the passage of the Anglo-Indian telegraph through his dominions 1866; visited the principal countries of Europe 1873, and wrote an amusing diary, which was translated by J. W. Redhouse. The shah's desire to introduce reforms and material improvements into his kingdom actuated this visit, and was exemplified by the fact that he had learned French and Turkish in order to familiarize himself with the history and condition of European countries. He also visited Russia in 1878. Assassinated at Teheran, May 1, 1896.

Nas'sau: a part of the province of Hesse-Nassau, Prussia. Before 1866 it was an independent duchy of Germany, with an area of 1,800 sq. miles, and a population of (1864) 468,311 inhabitants. The country, extending along the Rhine, the Main, and the Lahn, and traversed S. by the Taunus and N. by the Westerwald, is beautiful and rich. The mountains are covered with extensive forests abounding in game, and contain iron, lead, copper, coal, marble, and building-stone. The valleys produce wheat, tobacco, flax, and fruit of superior quality, and grapes from which are made the choicest Rhenish wines, such as Johannisberger, Hochheimer, Rüdesheimer, and Marcobrunner. The mineral springs of Nassau are famous; the watering-places which are built around them, such as Wiesbaden, Ems,

and Selters, are visited by people from all parts. In the thirteenth century the ruling family split into two branches, called after the brothers Walram and Otho. The younger branch, the Othonic, became the reigning family in the Netherlands, while the Walram line obtained the title of Dukes of Nassau by the formation of the Rhenish confederacy in 1806, and their troops fought under Napoleon against Prussia and Austria in Spain and Russia. The duke, however, was shrewd enough to abandon Napoleon at the right moment, and in reward he received a considerable augmentation of his territory by the Congress of Vienna. In 1815 he granted a constitution; but when, in 1818, the constitution came into operation and the house of representatives demanded an account of revenue and expenditure, the duke employed force to silence the representatives. When the revolution of 1848 came, the duke was obliged to grant a more liberal constitution, but soon adopted a reactionary policy. In 1866, when the war between Prussia and Austria broke out, he openly supported the latter; hence was forced to flee before the Prussians, who overran the duchy, and on Oct. 3 Nassau was incorporated with Prussia.

Nassau: town of the island of New Providence, and capital of the BAHAMA ISLANDS (*q. v.*). It has a good harbor, is fortified and well built, and is celebrated for its salubrious climate. Pop. about 11,000.

Nassau, ADOLPHUS WILLIAM CHARLES AUGUSTUS FREDERICK, Duke of: b. July 24, 1817; assumed the sovereignty of Nassau, Aug. 20, 1839. His state was joined to Prussia in 1866, and he received over 15,000,000 gulden as indemnification. On the death of the King of the Netherlands, Nov. 23, 1890, he became Grand Duke of LUXEMBURG (*q. v.*).

Nassau, JOAN MAURITZ, van, Count of Nassau-Siegen (commonly called Mauritz or Maurice of Nassau): general and administrator; b. near Delft, Holland, June 17, 1604. He early fought against the Spaniards and particularly distinguished himself at the siege of Breda, 1625. From Jan., 1637, to May, 1644, he was governor-general of the Dutch possessions in Brazil, and this period was the most prosperous in the history of the colony. Nassau was repulsed in an attack on Bahia 1638; but he gained a brilliant victory over the Spanish and Portuguese fleet Jan., 1640, and was able to send expeditions against the Portuguese in Africa and the Spanish on the Rio de la Plata. After his return he was lieutenant-general of cavalry, and from 1647 governor of Cleves; in 1652 he was made a prince of the German empire. As commander of the Netherlands army in 1665 he repulsed the invading army of the Bishop of Münster. He defended the frontier in 1672, and was prominent in the campaign of 1674 in the Spanish Netherlands. D. at Cleves, Dec. 20, 1679.

HERBERT H. SMITH.

Nast, THOMAS: illustrator; b. at Landau, Bavarian Palatinate, Sept. 27, 1840; went with his father to the U. S. in 1846; received art instruction under Theodor Kaufmann; began when fifteen years old to furnish illustrations for papers; was in Europe 1860-61, and during the civil war began a long series of powerful and effective political caricatures, many of which appeared in *Harper's Weekly*. He has edited *Nast's Illustrated Almanac* and *Nast's Weekly*, and has given many public lectures, illustrated with pictures drawn in the presence of the audience. In 1894 he went to London to undertake an important task in connection with *The Pall Mall Magazine*. Revised by RUSSELL STURGIS.

Nastur'tium [= Lat.; *na'sus*, nose + *torque're*, *tor'tum*, twist. Named from the wry face caused by its pungent taste]: name of a genus of cruciferous herbs, mostly aquatic, containing many species, among which are water-cress and horseradish. (See CRESSSES.) Popularly, the name nasturtium is given to *Tropaeolum majus*, a fine, showy, climbing herb, a native of Peru, often seen in gardens. Its flowers are used in salads, and its pungent buds and fruit are pickled and incorrectly called capers.

Natal': a British colony on the southeast coast of Africa, extending along the Indian Ocean from lat. 28° to 31° S. Area about 20,460 sq. miles. Pop. (1891) 46,788 Europeans, 41,142 Indian coolies, and 455,983 Kaffirs, a total of 543,913. Natal is a temperate, healthful, and undulating but not mountainous region, more productive than the neighboring Cape Colony, on account of the greater rainfall. It is attractive to European colonists, who have doubled in number since 1879, while the foreign trade has doubled in the same time. The chief products are sugar, wool, hides, cotton, and ostrich-feathers. The large coal-fields now developing are becoming

of great advantage to the colony. Railway lines owned by the Government connect the port of Darban with Paternmaritzburg, the capital, and the frontier of the South African Republic. The capital is a fine town, noted for the beauty of its churches, residences, and gardens.

C. C. ADAMS.

Natal, often called **Rio Grande do Norte**: capital and principal town of the state of Rio Grande do Norte, Brazil; on the Potengi or Rio Grande, 2 miles above its mouth. The river is navigable to this point and for some miles farther, but the bar does not admit vessels of over 13 feet draught. The town is on low land and has a picturesque appearance, owing to the coconut-groves around it; but the climate is hot, and yellow fever is a frequent visitant. Natal was founded in 1559, and was held by the Dutch from 1655 to 1654. Pop. about 9,000.

H. H. S.

Natalie. **Queen of Swaziland**. See **MILAN I**.

Natatores [Lat., plur. of *natator*, swimmer, deriv. of *nata're*, swim]: the name for an artificial combination of birds, agassiz's body, and bat, partially even in this respect—in being adapted for swimming. It was formerly regarded as an order or sub-class, but is now discarded.

Natchesan Indians: a name applied to two tribes of North American Indians, called Natchez and Taensa. I. *Natchez*.—Of this tribe Commander P. Lemoine d'Iberville, in 1699, mentions nine villages which were contiguous and constituted one town only. Probably there were more of them, and apparently only a part spoke the Natchez language. They were situated on or around St. Catharine creek, near Natchez City, Miss. This Natchesan confederacy was controlled by a head chief who belonged to the ruling family of the *suns*, and wielded a more centralized power than the chiefs of other Mississippian tribes. His confederacy formed a part of the larger league of the Chickasaw and Yazoo river villages. The Natchez people had three serious conflicts with the colonial French troops, the last of which (in 1730) brought on their dispersion and decimation. At that time the population of the confederacy probably reached 1,200. Scattered remnants of the tribe still linger among the Creeks and Cherokees.

II. *Taensa*. The Taensa people, who lived on the west side of the Mississippi river, above the Natchez, are now, on the strength of two passages in de Montigny's and Gravier's letters (about 1700), classed with the Natchesan family. These people were in 1714 settled on Mobile Bay, and about the year 1764 removed W. of the Mississippi river. Both the Taensas and the Natchez had a house of worship where the perpetual fire was kept.

See Margry, *Découvertes* (Paris, 1880), iv., 179, and *passim*.

A. S. GATSCHEP.

Natchez: city (settled by the French 1716, settlers massacred by Indians 1729, occupied by the English 1763–79 and by the Spanish 1779–98, made capital of the Territory of Mississippi 1798, became a city 1803); capital of Adams co., Miss. (for location, see map of Mississippi, ref. 8–E); on the Mississippi river, and the New Orleans and N. W. and the Yazoo and Miss. Val. railways; 100 miles S. W. of Jackson, 280 miles N. W. of New Orleans. The business part of the city is a narrow stretch of river bank, and the larger part, occupied by public buildings and residences, is the summit of a bluff 150 feet above the river. The entire brow of the bluff in the city limits has been converted into a public park. Its location on the river gives the city a large commercial importance. It handles 50,000 bales of cotton annually, and has steam saw, planing, grist, and cotton mills, cottonseed-oil factory, steam-ginneries, ice-factory, and other manufactories. There are a national bank with capital of \$100,000, a State bank with capital of \$50,000, and incorporated and private banks, and a monthly, 2 daily, and 3 weekly periodicals. The assessed valuation in 1893 was \$4,197,062, and the net debt on Feb. 1, 1894, was \$347,463. Pop. (1880) 7,058; (1890) 10,101.

EDITOR OF "DEMOCRAT."

Natchitoches: See **CADDOAN INDIANS**.

Natchitoches: town (founded by the Spaniards in 1713); capital of Natchitoches parish, La. (for location of parish, see map of Louisiana, ref. 8–B); on the Cane river, and the Natchitoches Railroad; 95 miles S. of Shreveport, 450 miles N. of New Orleans. It is in the Red river valley, in a fertile region yielding large crops of cotton, corn, sugar-cane, and all kinds of vegetables. The surrounding country contains large tracts of Bermuda grass, on which cattle-raising is

carried on extensively. The town is the seat of the State Normal School; has seven churches, a cathedral, Convent of the Divine Providence, U. S. land-office, free iron draw-bridge across the river, a State bank with capital of \$10,000, and two weekly newspapers; and contains an oil-mill, ice-factory, and other manufactories. Pop. (1880) 2,785; (1890) 1,820; (1894) estimated, 2,700. EDITOR OF "ENTERPRISE."

Naticidae [Mod. Lat., named from *Natica*, the typical genus, from Mediæv. Lat. *natica*, buttock, deriv. of Lat. *na'tes*, buttocks]: a family of Gasteropod molluscs with globular shells containing numerous species, occurring in the shallow seas and on the shores of the ocean in all parts of the world. The naticas, or sea-snails, have a very large fleshy foot; the shell has the aperture rounded in front and pointed behind. These animals are very voracious, feeding upon other molluscs, which they kill by rasping holes in the shell with their lingual ribbon. (See **GASTEROPODA**.) The members of one species lay their eggs in those curved bands known to people on the shore as sand-saucers. J. S. K.

Natick: town (settled by John Eliot 1651, church of Christian Indians established 1660, town incorporated 1781); Middlesex co., Mass. (for location of county, see map of Massachusetts, ref. 2–H); on the Charles river, and the Boston and Albany Railroad; 17 miles S. W. of Boston. The town contains several villages and business centers, water, gas, and electric light plants, Morse Institute with library of over 16,000 volumes, national bank with capital of \$100,000, savings-bank with deposits of nearly \$1,200,000, a monument to the memory of John Eliot, and three weekly newspapers. The principal manufactures are boots and shoes, woodenware, clothing, rubber goods, chairs, and baseballs. A portion of Cochituate Lake, from which Boston derives a part of its water-supply, is within the town limits on the N. Pop. (1880) 8,159; (1890) 9,118; (1895) 8,814. EDITOR OF "BULLETIN."

National or Constituent Assembly, The: a convention of delegates of the French people, constituted as a national assembly June 17, 1789. See **FRANCE**, **HISTORY OF**.

National Banks: See **BANK**.

National Convention, The: an assembly of deputies of the French people at the extreme stage of the Revolution. See **FRANCE**, **HISTORY OF**.

National Debt: See **DEBT**, **PUBLIC**.

National Guard [trans. of Fr. *garde nationale*]: a kind of militia in France, mostly recruited from the bourgeois class, and representing the burgher interests. In some of the French towns the national guards had long been known, but they were first organized in Paris in 1789 by the revolutionary Committee of Safety. There were 48,000 in Paris, and in 1790 a paper organization of 4,000,000 in France, and the whole were under La Fayette and carried the tricolor flag. Frequent changes in organization were made. In 1795 they were defeated and broken up by Napoleon, were reorganized by him in 1814, dissolved by Charles X. in 1827, were again reorganized in 1830, and again in 1831. They fell away from Louis Philippe in 1848, were remodeled in 1851, dissolved and reorganized in 1855, served against the Germans in the war of 1870–71, and in the latter year a part of them took a share in the Communist struggle. After the re-establishment of the government they were disarmed and ceased to exist. In some other European countries and in some of the U. S. there are militia organizations called national guards. See **MILITIA**. Revised by J. MERCUR.

Nationalism: a theory of social reconstruction through the nationalization of the entire system of production and distribution. It demands the extension of the functions of government to include the control of all economic operations, and all personal services now rendered for profit or hire. In the U. S. in 1888 it was taken as the basis for a party organization by readers of *Looking Backward*, a work portraying an ideal state framed in accordance with the above theory. Approving of the economic system there pictured, and believing it attainable, they organized so-called nationalist clubs, and began the work of propagandism. It is proposed that the economic government of nations, now conducted by irresponsible private persons for their personal ends, shall be assimilated in the method and purpose of its administration to the so-called political government, and that just as under the latter all citizens not willfully evading their duties to the state have equal claims to the benefits and services afforded by the government, without regard to the extent to which they have contributed, whether by tax or

personal service to its support, so they should share equally in the benefits resulting from collective action in economic matters, notwithstanding unavoidable inequality in their contributions of service.

In order to protect the people in their equality the democratic polity gives to all citizens, whatever their inequalities in intelligence, character, or possessions, an equal voice in law-making. Nationalists propose the strict application of these fundamental principles of democracy to the organization of the economic system of nations. According to their plan all economic operations shall be carried on by the people under a uniform law of service, but, while this law will be equal for all, it is expected that the nature of the services rendered will vary as widely as do the amounts of tax and military service under the present system. Efforts will be made to prevent and punish willful evasion of duty, but no account will be made of the difference in the value of the services rendered in distributing the resulting total product among the citizens. It appears obvious to the adherents of nationalism that it is merely the strictly logical evolution of democracy, and that, unless a reversion to personal or clan government shall check the progress of democracy, nationalism must inevitably in the near future furnish the solution of the industrial and social problem. It should be understood that while the nationalist movement originated with admirers of the economic system depicted in *Looking Backward*, it by no means follows that the various details and devices introduced in that book in depicting the systems in operation form any necessary part of the plan of nationalism, which is, on the contrary, confined to general principles, leaving details to be filled out as occasion arises. Nationalists agree in deprecating the use of violent methods to bring about the desired reorganization, but favor a gradual and peaceable evolution, advocating as first steps toward nationalism all measures looking toward the assumption by municipality, States, and the nation of the ownership and operation of all forms of business, discharging quasi-public functions, such as lighting and water-works, milk-supply, tramway system, telegraphs, railways, etc., and wherever any sort of business has become an oppressive trust monopoly they would have the State or the nation take such business into its own hands. The growth in popularity of nationalistic ideas in the U. S. since the inception of the movement in 1888 has been notable. The idea of assumption by municipalities of all sorts of quasi-public functions, such as lighting, water-works, and local transit, has found great favor, and is being widely adopted. In general politics a national party under the name of the PEOPLE'S PARTY (*q. v.*) has adopted for its platform nearly the entire immediate programme of nationalism, including nationalization of the telegraphs, telephones, railways, and money system, and secured 1,000,000 votes in the presidential election of 1892 for a ticket representing these ideas. The nationalist movement, while represented by organization and publications in all parts of the Union, has at present the most general popular backing in the States between the Mississippi and the Pacific.

EDWARD BELLAMY.

National Museum of the United States: an institution, located in Washington, D. C., which dates its existence from Aug. 10, 1846, when the act of Congress establishing the Smithsonian Institution was formally approved, and all Government collections assigned to its charge. The use of the present name, however, did not begin until much later, and was first legally sanctioned in the act providing for the erection of a building to contain the material received at the close of the Centennial Exhibition of 1876.

The germ of the museum is to be found in a collection of minerals, containing about 10,000 specimens, which formed a portion of Smithson's bequest to the U. S., and was, so far as can be ascertained, the first scientific cabinet owned by the Government. This collection was lost in the fire of 1865, which destroyed a portion of the Smithsonian Institution.

The idea of a national museum was first prominently brought forward by the National Institution for the Promotion of Science, a scientific society organized in Washington, May 15, 1840, whose objects were, among others, "to promote science and the useful arts, and to establish a national museum of natural history." This institution, which was for many years the official custodian of the Government collections, made an earnest and nearly successful attempt to secure both the management of the Smithsonian fund and the

care of all collections belonging to the U. S., and the failure of the effort was the death-blow to the association.*

The Government collections, consisting mainly of the objects collected by the Wilkes exploring expedition, were transferred to the Smithsonian building in 1857, the regents of that institution having accepted the trust on the condition that Congress should provide the funds necessary for their preservation. Prior to that date material had been received but not displayed, and up to 1876 the exhibition of specimens for the benefit of the public may be said to have been considered as of secondary importance, as well as largely precluded by lack of funds for their proper preparation. At the close of the Centennial Exhibition of 1876 the Smithsonian Institution came into the possession of the collections prepared to illustrate the animal and mineral resources, the fisheries, and the ethnology of the native races of the U. S., and in addition a large amount of material was presented by the governments of thirty foreign nations.

As these objects could by no possibility be displayed in the Smithsonian building, the bulk of them were placed in storage, and Congress was asked for funds for the erection of a museum building. After a delay of two years Congress on Mar. 3, 1879, passed a bill appropriating \$250,000 for the construction of a building 300 feet square. On Apr. 14 of the same year ground was broken for its erection, and with the beginning of 1882 the work of installation was actively begun. The structure, which is of brick, has small architectural pretensions, but is well adapted for exhibition purposes, the sixteen halls into which it is divided affording on one floor 80,000 sq. feet of space. The main portion of the building is only a single story in height, but at each corner and on either side are towers three stories high, used for laboratories and offices. Owing to the fact that there is neither basement nor attic, the only space available for the storage of duplicate specimens is in the lower part of the exhibition cases, and the rapid growth of the collections has caused this defect to be severely felt.

The formal organization of the museum staff was in 1881, when the various departments were first defined and their curators appointed. Other departments have from time to time been established, until there are thirty-three departments, and a scientific staff of forty-one, including, however, a number of honorary curators who receive no salary.

By act of Congress the regents of the Smithsonian Institution are charged with the duty of preserving and utilizing all objects of art, all objects of foreign and curious research (*i. e.* ethnological collections), all geological and mineralogical specimens belonging, or hereafter to belong, to the U. S. The National Museum is thus the museum of the Smithsonian Institution, and its officers are appointed by the secretary of that institution. A practical distinction lies in the fact that the money for the maintenance of the museum is annually appropriated by Congress, while the operations of the Smithsonian are carried on by the fund bequeathed by Smithson.

By virtue of the provisions above noted the museum has been greatly enriched by various Government explorations and surveys, and especially by the material gathered during the investigations of the U. S. Fish Commission. Aside from specimens thus obtained the collections are increased by exchanges, by gifts, and to a limited extent by purchase, a privilege that has been granted comparatively recently, the earlier appropriations being simply for the "preservation of collections."

The museum is naturally richest in material relating to North America, particularly so in specimens illustrating the arts and occupations of the Indians, to which the Catlin paintings form an interesting supplement. In zoölogy the series of deep-sea fishes and invertebrates is very extensive, the collections of shells is one of the finest in the world, and the mammals and birds of North America are represented by large series. The departments of metallurgy and geology contain material exhibiting the mineral resources of the U. S., and many illustrations of the phenomena of physical geology. The fisheries of the U. S., and to a considerable extent those of other countries, are well shown by means of apparatus, models of vessels, and illustrations of modes of capture, and the section of animal products contains many examples of the direct and indirect ways in which animals are of use to man. The historical collections

* For a full account of the steps leading to the founding of the National Museum, see the article by Dr. G. Brown Goode on *The Genesis of the United States National Museum in the Report of the United States National Museum for 1891*, pp. 373-380.

include personal relics of such well-known men as Washington, Jefferson, and Grant. The collection of mineral specimens is good, and the section of graphic arts gives a comprehensive history of the art of illustrating.

In 1882 the number of specimens in all departments was estimated at about 200,000; in 1893 the total was, approximately, 3,277,000. While the exhibition series is very extensive, containing the best specimens in their respective groups, or those of the highest educational value, the great proportion of this material is in the study series to which especial attention has been paid.

The chief publications of the museum consist of papers issued at intervals, corresponding to the bulletins of other institutions, and longer or monographic papers, of the nature of memoirs and issued as bulletins. Fifty of the bulletins have been published and 1,000 of the shorter papers, these latter forming seventeen volumes of the *Proceedings of the U. S. National Museum*. The museum also publishes an *Annual Report* containing, in addition to the reports of the assistant secretary and the curators on the condition and progress of the various departments, papers of general interest, and often of considerable length, descriptive or illustrative of the collections. Articles by museum officers or based on its collections are also printed in the Smithsonian publications or in those of other Government departments.

The work of the museum, by the accumulation and study of specimens, their exhibition, and by the publication of papers, is thus threefold, and its aim is to be in every particular an educational museum in the broadest sense of the term.

Every aid is given to students, and, in addition, a large amount of work is done in reporting on material submitted to the museum for identification or other information. The building is open to the public every day but Sunday.

FREDERIC A. LUCAS.

Nativism (in philosophy): the doctrine that the mind has certain kinds of knowledge, or principles of organization of its experience, native to itself or inborn. It is opposed to empiricism, which holds that knowledge is derived exclusively from experience. Other terms for nativism are *apriorism* and *intuitionism* (q. v.). J. M. B.

Natolia: See ANATOLIA.

Na'trolite [Eng. *natron*, soda (via Fr. and Span. from Arab. *natrūn*, *nitrūn*, whence Eng. *niter*) + Gr. *λίθος*, stone]: a mineral belonging to the zeolitic section of hydrous silicates, and essentially a silicate of aluminium and sodium, with 9.5 per cent. of water. It occurs generally in slender crystals assignable to the trimetric system, also frequently in radiated fibrous masses. It is met with most commonly in volcanic rocks, but occasionally also in granite and gneiss. Bergen Hill, N. J., Copper Falls, Lake Superior, Mich., and localities in Nova Scotia have yielded fine specimens.

Natron: See SODA.

Natu'nal Islands: a group of islands situated in the China Sea, between Borneo and the peninsula of Malacca, belonging to the Dutch. Area, 664 sq. miles. Pop. 7,500. They are high and mountainous, and produce rice, maize, sago, and coconuts. Fishing is the chief occupation of the inhabitants.

Natural: a term used in music. The regular notes of the scale when unaffected by sharps or flats (as in the key of C major) are said to be *natural*, or in their original and ordinary condition; and when any note has been modified by the use of a ♯ or ♭ (whether placed at the clef or occurring as an accidental), such alteration may be revoked by prefixing to the note the sign ♮. This sign is called a "natural," because it restores to the altered note its original character. The natural is also of service in cases where a change of key takes place, as at the opening of a second or third movement, where such sharps or flats in the signature as are no longer needed are revoked by the substitution of as many naturals. Double sharps and double flats are restored to simple sharps and flats by the signs $\sharp\sharp$ and $\flat\flat$. RICHARD DONN BLY.

Natural Bridge: an arch of great size and beauty, carved or eroded in the horizontal strata of Cambro-Silurian magnesian limestone (Knox dolomite) in Rockbridge co., Va. The bridge is a small remnant of the roof of a former cavern, now for the greater part opened into a gorge, through which Cedar creek flows. The bridge is 150 feet wide, and is carried with three arches, the highest being the

bridge; under the arch the walls are bare and vertical, about 50 feet apart. The arch has a thickness of 44 feet and a span of from 45 to 60 feet. The crown of the arch is almost 200 feet above the creek, while the top of the bridge is 236 feet above the water. A public road leads across the bridge, the width of the top being about 30 feet.

W. M. DAVIS.

Natural Gas: a form of bitumen that under natural conditions exists as a gas. Before its true relations had been discovered it was familiar to the inhabitants of certain localities as escaping from springs and crevices in rocks, producing the phenomena of burning springs and fire-wells, and furnishing the fuel for the perpetual fires of Baku and other shrines of the Fire Worshipers.

History.—Travelers overland to Persia and India, from the time of Marco Polo in the fourteenth century to the first half of the nineteenth century, describe the burning springs of Asia Minor and the fires of Baku. Abbé Hue, in his *Travels in China*, describes the fire-wells and the method of drilling them. The gas from these wells was used in China for boiling brine and in domestic heating. Natural gas was also used in the fire-temples of Tibet and Northern India.

In the U. S. the burning springs that were common in the valleys of the western slopes of the Appalachian chain, from the St. Lawrence river to Alabama, early attracted attention. In the valley of the upper Cumberland, in Southern Kentucky, accumulations of gas beneath the thin horizontal strata of that region sometimes gained sufficient force to tear up a mass of earth and stone with explosive violence, thus producing what are locally called "gas volcanoes."

The earliest attempt to utilize the gas was made at Fredonia, N. Y. The gas was first used in 1824 from wells dug into the rock strata that underlaid the town, but later wells were drilled. At about this period, as borings for brine were made in the valleys of the streams that drain the western slopes of the Alleghanies, gas was often encountered, and was frequently utilized as fuel to evaporate the brine. This was particularly true of the valleys of the Kanawha and Muskingum rivers.

As the development of the petroleum-fields increased, the vast accumulations of natural gas that often accompanied the petroleum were utilized for fuel.

The immense number of test-wells that were drilled for petroleum during 1865 and 1866 throughout the valleys of the Mississippi and its tributaries led to the discovery in many localities of deposits of natural gas outside the limits of any productive petroleum-field. Yet for many years few attempts were made to utilize the gas. Among these the Neff Wells near Gambier, Knox co., O., may be mentioned. In drilling the first of these wells water was encountered in large quantities at a depth of 66 feet. At a depth of 600 feet gas was struck under great pressure. The boring throughout its whole length became alternately filled and discharged. The enormous volume of water thrown out—perhaps 10,000 barrels per day—kept the derrick soaked so thoroughly that at night the gas could be fired, when a struggle between the burning gas and water followed. Another similar phenomenon was witnessed in a well at Kane, Pa., on the Philadelphia and Erie Railroad. This well was drilled 2,000 feet deep, but as no oil was obtained the casing was withdrawn and the well abandoned. Then the struggle between the gas and water began. The stratum from which the gas issued was encountered at about 1,400 feet. The fresh water flowed into the well on top of the gas until the pressure of the confined gas became greater than the weight of the superincumbent water, when the water was forced out of the well to a great height, producing all of the phenomena of a geyser.

Gradually the great value of the escaping gas for fuel began to be appreciated. In several instances the gas was used to generate power without being burned, the pressure of the escaping gas alone being sufficient to operate an engine, as if the gas were steam. More frequently the gas escaping from one well was used as fuel under the boilers in drilling an adjoining well. The gas was also gradually introduced into the towns that were adjacent to oil territory. By 1880, besides Fredonia, N. Y., natural gas was being used notably in Rochester, Sheffield, Erie, and Bradford, in Pennsylvania; Painesville, East Liverpool, and Gambier, in Ohio; and in New Cumberland, W. Va.

The town of Findlay, O., was settled in 1836. The settlers dug a well which yielded sulphurous water and inflammable gas. By a new method of boring the

carried into the house, and then used for domestic heating. The extended use of natural gas in the so-called oil region of the Ohio valley led in 1884 to the formation, in Findlay, of a company to drill for gas. The successful drilling of the first well at Findlay was immediately followed by others, until in Jan., 1886, the famous Karg well was drilled to a depth of 1,144 feet in twenty-four days. It is estimated to have yielded from a 4-inch pipe 12,080,000 cubic feet daily. The total gas-production in Findlay soon amounted to 25,000,000 cubic feet daily, numerous manufactories were established, and the place increased rapidly in population. Other towns throughout Ohio, Indiana, and Illinois had the same experience. The gas was carried into Chicago, Detroit, and other cities more than 100 miles distant from the wells through pipes that had scarcely been laid before the decreased pressure and volume of the gas necessitated the substitution of pumps for the natural pressure of the gas. Natural gas as a fuel has become an important factor in the commercial and industrial world of the central U. S., but it is generally conceded that an artificial substitute must soon take its place in the progress of civilization.

Geographical Distribution.—Natural gas is very generally distributed. It is particularly abundant in those regions that furnish petroleum and other forms of bitumen, but it is also found in other regions where metamorphic or volcanic action has not disturbed the crust of the earth. In the U. S. the most eastern point that has furnished it is Dutchess co., N. Y., on the east side of the Hudson river. The points, however, E. of the Alleghany Mountains at which it has been observed are few, if any, S. of the State of New York. It has been reported from nearly every county in New York State except the Adirondack region, but it is in the region tributary to the city of Buffalo that large and remunerative quantities have been obtained. Throughout the entire oil region of Western Pennsylvania, and extending into Armstrong and Westmoreland Counties to the E., enormous quantities of natural gas have been supplied, particularly to the city of Pittsburg. West Virginia and Eastern Kentucky have long furnished gas, while nearly the whole State of Ohio, Northern and Central Indiana, and Central Illinois have been prolific fields, in many instances furnishing enormous quantities for many years. Outside this territory, lying in the northern Mississippi basin, there is scarcely a section of country to the W. and S. of large extent that has not yielded natural gas, but rarely in quantities of economic importance.

On the Pacific slope natural gas occurs throughout nearly the entire State of California. It accompanies petroleum in the counties of Los Angeles and Ventura. A large part of the fuel consumed in the city of Stockton is supplied from wells. A large area around Sacramento yields natural gas in quantities sufficient to make it an important factor in the fuel-supply of that region.

Outside the U. S. the peninsula of Ontario, in Canada, has yielded natural gas in quantities locally valuable. In South America and the Eastern continent, with the exception of China, natural gas has never been developed by artesian borings, and the extent to which it exists is unknown.

The Chemistry of Natural Gas.—The natural gas which is the subject of this article should be distinguished from natural gas which occurs in volcanic regions and is the product of volcanic action. In a general way the first may be distinguished as a combustible gas, the second as consisting of the products of combustion.

The following results of analyses will, by comparison with those that are given of combustible gases, illustrate more clearly the generic differences between the two classes of gases. Nos. I. and II. are analyses of the gases rising through the Lago di Nafta in the Val del Bove of Etna. No. III. is an analysis of the gases evolved from fumaroles on the island of St. Paul.

CONSTITUENTS.	I.	II.	III.
CO ₂	94.23	84.58	14.24
CH ₄	1.82	2.42	.....
O.....	0.28	4.52	17.01
N.....	3.79	1.89	68.75
H ₂ S.....	.....	6.17	.....

No combustible gases are evolved by the Caldeira de Fumas, San Miguel, Azores, which differs in this respect from the geysers of Iceland and the Suffioni of Tuscany, both of which invariably yield hydrogen and marsh-gas (CH₄), mingled with various incombustible gases. The gases evolved from solfataras contain CO₂, H₂S, O, and N. The Great Solfataras yields steam, hydrogen sulphide (H₂S), carbonic acid (CO₂), oxygen, and nitrogen.

The composition of the combustible natural gas of Pennsylvania, etc., is found to vary not only in different wells, but in the same wells on different days.

The following analyses were made on four different days in four months of gas from Westmoreland co., Pa., used at the Cambria iron-works:

CONSTITUENTS.	1.	2.	3.	4.
Marsh-gas, CH ₄	67.00	49.58	57.85	75.16
Hydrogen.....	22.00	35.92	9.46	14.45
Ethyl hydride, C ₂ H ₆	5.00	12.30	5.20	4.80
Ethylene, C ₂ H ₄	1.00	0.60	0.80	0.60
Oxygen.....	0.80	0.40	2.10	1.20
Carbonic oxide, CO.....	0.60	0.40	1.00	0.30
Carbonic acid, CO ₂	0.60	0.40	.....	0.30
Nitrogen.....	3.00	.....	23.41	2.89

Analysis of the Fredonia gas shows it to be a mixture of marsh-gas (CH₄) and ethyl hydride (C₂H₆), with a small quantity of carbonic acid and nitrogen. Analysis of the gas from two burning springs in West Virginia showed it to consist almost exclusively of marsh-gas, with a small quantity of carbonic acid and nitrogen, and traces of carbonic oxide and oxygen.

In the following table is shown the composition of the gas of five wells in the oil regions of Pennsylvania, and immediately following that is a table showing the composition of the gas from seven wells in Northwestern Ohio and Central Indiana, all of which yielded gas from the Trenton limestone:

ANALYSES OF GAS FROM WELLS IN THE OIL REGIONS OF PENNSYLVANIA.

NAME OF WELL.	Oxygen.	COMBUSTIBLE CONSTITUENTS.					Carbonic acid, CO ₂ .	Nitrogen.	Specific gravity.
		Hydrogen.	Methyl hydride, CH ₄ .	Ethyl hydride, C ₂ H ₆ .	Propyl hydride, C ₃ H ₈ .	Carbonic oxide, CO.			
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Burns's gas-well		6.10	75.44	18.12	trace.	trace.	0.34		0.6148
Leechburg gas-well...		0.56	89.65	4.39	trace.	0.26	0.35		0.5580
Harvey gas-well		13.50	80.11	5.72	trace.	trace.	0.66		0.5119
Cherry-tree gas-spring.	0.83	22.50	60.27	6.80			2.28	7.32	
Pioneer Run well.					chiefly.		small.	small.	

ANALYSES OF GAS FROM THE TRENTON LIMESTONE OF OHIO AND INDIANA.

LOCALITY.	Oxygen.	COMBUSTIBLE CONSTITUENTS.					Carbonic acid, CO ₂ .	Nitrogen.	Hydrogen sulphide, H ₂ S.
		Hydrogen.	Marsh-gas, CH ₄ .	Olefiant gas, C ₂ H ₄ .	Carbonic oxide, CO.				
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Fostoria, O.	0.35	1.89	92.84	0.20	0.55	0.20	3.82	0.15	
Findlay, O., sp. gr. 0.566	0.39	1.64	93.35	0.35	0.41	0.25	3.41	0.20	
St. Mary's, O.	0.35	1.74	93.85	0.20	0.44	0.23	2.98	0.21	
Muncie, Ind.	0.35	2.35	92.67	0.25	0.45	0.25	3.53	0.15	
Anderson, Ind.	0.42	1.86	93.07	0.49	0.73	0.26	3.02	0.15	
Kokomo, Ind.	0.30	1.42	94.16	0.30	0.55	0.29	2.80	0.18	
Marion, Ind.	0.55	1.20	93.68	0.15	0.60	0.30	3.42	0.20	

A comparison of these several tables shows that marsh-gas is the principal constituent of all of these gases, at the same time it will also be observed that, while a marked variation is found in the gases from Pennsylvania, a very remarkable uniformity prevails in the Trenton limestone gas from wells scattered over a very wide area. This is due to the fact that the gas of Pennsylvania is uniformly associated with petroleum in greater or less quantity, and it therefore is nearly impossible to secure it free from the lighter products of petroleum that under varying conditions of temperature and pressure assume the liquid or gaseous form and mutually dissolve each other.

The presence of hydrogen sulphide in the gas from the Trenton limestone is characteristic of the bitumens issuing from that formation.

As related to the constituents of the petroleum issuing from the older rocks of the northern Mississippi basin, natural gas is composed to the extent of more than 90 per cent. of the initial member of the marsh-gas or paraffin series of hydrocarbons, of which those petroleum are largely composed. Some varieties also contain olefiant gas, which is the initial member of the ethylene series, a series of hydrocarbons also found in small quantity in Pennsylvania and other petroleum. As the production of oils similar to petroleum by artificial means is always accompanied by the formation of varying quantities of marsh-gas and olefiant gas, it is not surprising that similar operations in nature should result in similar products. So also the natural products of combustion are similar to the gases issuing from fumaroles and other forms of volcanic action. See HYDROCARBONS.

Drilling of Wells and Distribution of Gas.—The method of drilling wells for natural gas is precisely like that employed in the drilling of petroleum-wells. (See WELL-DRILLING.) The distribution of the gas is conducted in a manner precisely similar to that of distributing ordinary illuminating gas.

Use of Natural Gas.—With the exception of the Neff wells near Gambier, O., and a few others, natural gas is used exclusively for fuel. The gas of the Neff wells was used for the production of lampblack soon after they were drilled. The black is obtained from the imperfect combustion of the gas, by which a large part of the carbon is deposited in a dense form of lampblack of excellent quality, known as diamond black.

Natural gas is the most valuable form of fuel known. Theoretically, 1 lb. of Pittsburg coal is equal to 18.33 cubic feet of Pittsburg gas; but experimentally 7.5 feet of gas is equal to 1 lb. of coal. Findlay gas has been proved to be somewhat better. At the height of the use of natural gas in Pittsburg, 28,000 domestic services and 900 manufacturers' services supplied the city. These used between 400,000,000 and 500,000,000 feet per day, displacing 8,500,000 tons of coal per year. It has been found excellent for the manufacture of iron, steel, and glass, for burning fire and other brick and pottery, and for the generation of steam.

See BURNING, HYDROCARBONS, PETROLEUM, and MINERAL GAS.

S. F. FIDHAM.

Natural History: a term used in different senses at different times and by different persons. (1) Formerly it was extended to embrace the consideration of all the objects, as well as the phenomena, of nature, and hence, in addition to mineralogy, zoology, and botany, embraced chemistry, physics, and astronomy; and protests were made by physicists at the attempt to restrict the term to its present more generally accepted sense. (2) It is now, however, limited to the history of the natural objects known under the names of minerals, plants, and animals in their normal conditions. (3) There is also a tendency to still further restrict it to zoology, for which it is frequently used in conversation, and occasionally in popular literature, as an interchangeable term. This last usage, however, is not sanctioned by good authority or by the necessities of the case, the word zoology being all-sufficient, and the common name being necessary for that branch whose objects of study belong to the three kingdoms in question. The objects taken cognizance of by natural history fall naturally into two great groups: (1) the *mineral empire* or *mineral kingdom*, considered under the head of MINERALOGY; and (2) the *organic empire*, discussed under the term BIOLOGY. Biology is itself subdivided into (a) botany, which treats of the vegetable kingdom, and (b) zoology, which has for its domain the animal kingdom. Nothing can be predicated respecting characters common to all the

bodies which belong to the several kingdoms indicated which does not more properly pertain to the science of somatology, which falls within the sphere of the physicist; and there is little in common even as to methods of study of both sciences.

Naturalization: an act or process performed by an alien when he transfers his allegiance from the country of his origin and from his sovereignty to another country and sovereign. His original allegiance remains until replaced by the new. There may be *partial* or qualified naturalization, which does not make aliens completely equal in all respects to native-born citizens or subjects; thus by the Constitution of the U. S. (Art. II, Sect. 2, § 5) no naturalized citizen can become President of the U. S., and for some time in England no such person could be a member of the privy council or of either house of Parliament. Complete naturalization gives all the rights and imposes all the obligations of a native-born citizen. Most states give privileges of naturalization, but there is great difference in regard to the conditions. Hence a conflict of laws may arise with respect to the same individual on his return to his original country. The English doctrine for a long time was that allegiance to the crown was perpetual and indissoluble. Hence an Englishman naturalized by the law of the U. S. was held to be still a British subject, and many such were in the early part of the nineteenth century taken on the high seas out of U. S. vessels, on the ground of owing military duty to the crown, and were impressed into the English naval service. If the allegiance were indissoluble, *jure gentium*, it would not follow that this procedure of taking these persons out of neutral vessels was authorized, since it was an attempt to enforce a municipal law of one state within the jurisdiction of another; at present this claim must be abandoned as far as the U. S. are concerned, owing to the new position in regard to naturalization which treaty has imposed on Great Britain, and in regard to taking persons out of neutral vessels on the high seas, which that Government took in the case of the Trent.

Naturalization involves all rights of person and property, including generally that of holding real estate, but does not extinguish claims which were in force at the time the person concerned altered his allegiance. Thus numbers of young men have left different parts of Germany to escape from the military duty required for a certain time of all able-bodied males. The fact of passing through the forms of allegiance according to the laws of the U. S. would not protect such persons from the operation of laws to avoid which they removed from their native country.

How far the incomplete process of naturalization is to have effect in entitling a person to protection is a matter of doubt, since it depends on the person himself whether he will complete the act according to his expressed intention. The case of Koszta, who was seized in a Turkish port at the instigation of the Austrian consul-general, next was put into the hands of the French consul-general in consequence of the threat of force made by a captain of a U. S. vessel then in the port, and finally set free so as to go to the U. S., is in point. This was in 1854.

Treaties of the U. S. with German powers and with Great Britain have so defined the claims of the original and the adopted country as to prevent conflict of laws as far as possible. In the treaty with the North German confederation, and in that with Bavaria made in 1868, five years of uninterrupted residence with formal naturalization constitutes citizenship on both sides. The mere declaration to become a citizen is of no effect. Residence is understood, as the Bavarian treaty expresses it, in the *jural* sense, so that it is not interrupted by a transient absence. A person returning to his former residence is not protected by his naturalization from responsibility for crimes committed before his emigration; and such a person residing more than two years in his original country is held to have renounced his naturalization. In the Bavarian treaty it is agreed that the treaty shall not affect a provision of the military law by which Bavarians, emigrating before the end of the prescribed military service, can not on their return be admitted to permanent residence in the land until they shall have become thirty-two years old; but it is understood that if a certificate of emigration has been granted liability to military service shall be wiped out by naturalization. Such treaties were made with Baden, Bavaria, Belgium, Hesse, Mexico, the North German Union and Württemberg in 1868; with Sweden and Norway in 1869; with Austria and Great

Britain in 1870; with Denmark in 1872. It should be added that in the treaties with Austria and Baden evasion of military service, when the emigrant actually was in the ranks or had been drawn, was not to be pardoned though naturalization followed. This was expressly stated in these treaties, but the same rule would probably hold good in the other treaties, desertion being a crime. The convention with Great Britain provides that the subjects or citizens of either nation, naturalized according to the laws of the other, shall be held to be for all purposes subjects or citizens of the other; that they may again exchange their nationality on terms to be agreed upon within a certain time after the date of the convention; and that on renewing their residence in either country they may be readmitted to the character and privileges of a citizen or subject, and not be claimed by either country on account of the previous naturalization. In 1868 the U. S. gave up the claim to indelible allegiance.

Revised by T. S. WOOLSEY.

LAWS GOVERNING NATURALIZATION IN THE UNITED STATES AND GREAT BRITAIN.—At the common law a foreigner or temporary resident in a country is bound to yield a local or temporary allegiance to the state and obey its laws, and is entitled to protection by its government, and redress for his injuries in its tribunals. This allegiance, however, is to be distinguished from the allegiance which is due from a citizen to the state; and the right to protection and redress does not include many of the rights which belong to a citizen to acquire and dispose of property, to exercise political franchises, etc. See the articles on ALIEN, ALLEGIANCE, and CITIZEN.

Before the formation of the U. S. the American colonies of Great Britain each exercised the prerogative of adopting naturalization laws, and the laws passed mainly aimed to promote immigration; but the Constitution of the U. S. provides that "Congress shall have power to establish a uniform rule of naturalization." This power vested in Congress by the Constitution is held to be exclusive; and in the exercise of it various statutes have been passed prescribing the qualifications and formalities requisite for an alien to become naturalized. This exclusive authority, however, does not deprive the States of the right to regulate by statute the abilities and disabilities of aliens in regard to the acquisition and transfer of property, nor does it prohibit them from investing aliens with the privileges of State citizenship, such as the right to vote in State elections, hold State offices, etc. (See CITIZEN.) The Federal naturalization laws are very liberal, and in nearly all respects naturalized citizens are placed on the same footing as those who are native-born. The Constitution provides that no naturalized citizen shall be eligible to the office of President or Vice-President, and that no person shall be elected to the U. S. Senate who shall not have been a citizen for nine years, or to the House of Representatives unless he shall have been a citizen for seven years.

In substance, the naturalization laws of the U. S. at present provide that to become naturalized the alien must declare on oath before a circuit or district court of the U. S., or a district or Supreme Court of the Territories, or a court of record of any of the States having common-law jurisdiction and a seal and a clerk, two years at least prior to his admission, that it is *bona fide* his intention to become a citizen of the U. S., and to renounce forever all allegiance and fidelity to any foreign prince, state, or sovereignty of which the alien may be at the time a citizen or subject. His full admission to citizenship can not, however, take place until he has resided within the U. S. for the continued term of five years next preceding his admission, and one year at least within the State or Territory where the court is held to which he makes application. At the time of this application to be admitted he must declare on oath before some one of the courts above mentioned that he will support the Constitution of the U. S., and that he absolutely and entirely renounces and abjures all allegiance to every foreign power, and particularly to that state of which he was before a citizen. These proceedings must be recorded by the clerk of the court. It must be made to appear to the satisfaction of the court admitting the alien to naturalization that he has duly fulfilled the prescribed qualifications in regard to the term and place of residence, and that during that time he has behaved as a man of good moral character, is attached to the principles of the Constitution of the U. S., and is well disposed to the good order and happiness of the same. If the alien has borne any hereditary title or been of any of the orders of nobility in the kingdom or state from which he

came, he must also make an express renunciation of his title or order of nobility; and this renunciation must be recorded in the court.

If the alien is a minor the rules in regard to his admission of citizenship are somewhat different. If he has resided in the U. S. three years next preceding his twenty-first birthday, and five years (including the three of minority) before making his application to be naturalized, the residence being continuous, he is not required to make the preliminary declaration above described of intention to become a citizen; but he must make the same declaration at the time of his admission as is required of other applicants; and must further declare on oath, and prove to the satisfaction of the court, that for two years next preceding it has been his *bona fide* intention to become a citizen, and must in all other respects comply with the naturalization laws. The minor children of alien parents who are naturalized become thereby citizens themselves, without any application on their own part being necessary if they are then dwelling in the U. S.

If a husband dies before he is actually naturalized but after he has taken the preliminary oath of intention to become a citizen, his widow and children are declared to be citizens, and are entitled to all rights and privileges as such upon taking the oath prescribed by law. There are also special statutory provisions in regard to the naturalization of aliens who have served in the U. S. army, and of foreign seamen. The general provisions of the naturalization laws apply to aliens of African nativity and to persons of African descent. Under the laws as they now (1894) stand Chinese and Japanese can not become naturalized.

Aliens who are citizens or subjects or denizens of a country with which the U. S. is at war at the time of their application can not be naturalized until the restoration of peace.

In Great Britain no general naturalization law was enacted until the year 1844. Before that time naturalization could be effected only by special act of Parliament, but it had been provided by statute that an alien naturalized in this mode should still remain under important disabilities; he was still incapable of being a member of the privy council or of Parliament, or of holding a civil or military office, or receiving grants of land from the crown. A practice, however, has existed from an early period for the king to grant letters of denization to aliens, which have the effect of removing an alien's disqualifications to a limited extent. A denizen is described as occupying a kind of middle state between an alien and a natural-born subject, having, as it were, an intermediate legal status. Thus he may take lands by purchase or devise, though an alien can not; but he can not take by inheritance. A denizen, moreover, can not belong to the privy council or Parliament or hold any public office of trust. A comprehensive statute in regard to the naturalization of aliens was enacted in 1870 (33 Vict., ch. 14), and this with slight changes or additions is the law at present in force. By this it is provided that an alien who has resided in the United Kingdom, or has been in the service of the crown, for a term of not less than five years, and intends, when naturalized, to continue either his residence or his service, may apply to one of her Majesty's principal secretaries of state for a certificate of naturalization. The applicant must present such evidence of residence or service and intention to reside or serve as the Secretary of State may require, and the Secretary may then, in the exercise of his own discretion, with or without assigning a reason, give or withhold a certificate as he thinks most conducive to the public good, and no appeal lies from his decision; but such certificate will not take effect until the applicant has taken the oath of allegiance. An alien to whom a certificate of naturalization is granted is entitled in the United Kingdom to all political and other rights, powers, and privileges, and is subject to all obligations, to which a natural-born British subject is entitled or subject, with this qualification, that he shall not, when within the foreign state of which he was previously a subject, be deemed to be a British subject unless he has ceased to be a subject of that state in pursuance of the laws thereof or pursuant to the provisions of a treaty to that effect.

For a fuller treatment of the whole subject, and the particulars of statutory provisions, see the works of Cockburn and Howell on *Nationality*; the works of Scott, Cutler, Bidoulac, and Boese on *Naturalization*; Hansard on *Aliens and Naturalization*; and the works of Woolsey and Wheaton on *International Law*.
F. STURGES ALLEN.

Natural Philosophy: that branch of physical science which deals with properties of bodies that are unaccompanied by essential changes of the bodies themselves. See MECHANICS.

Natural Selection: See EVOLUTION.

Natural Theology: a science treating of the existence and character of God as these may be known from reason and nature. It investigates the evidences of his being and seeks to determine his attributes and relations to the world. The conclusions thus reached and scientifically established form what is rightly termed rational theism, or the doctrine of God as ascertainable apart from supernatural revelation.

The primary idea upon which it proceeds is that, if there be a God as the Creator or First Cause of the universe, his existence and character must be found impressed upon it and discoverable from it. The author of a work is revealed in the work he has done. The world is viewed as a visible expression of the being and thought, if there be any, of its source. One of the primary conceptions of science is that nature holds and presents in its constitution and order some record of its origin, legible to the reason of those who honestly study it. Natural theology therefore seeks to examine this record, take its testimony, and thus, if possible, ascend through nature up to nature's God.

History. Efforts to construct a natural theology appear very early. The most ancient literatures of the nations present many of its truths or conclusions in more or less systematized form. The *Vedas* of the Hindus, the *Zend-Avesta* of the Persians, the *Book of the Dead* and other writings of the ancient Egyptians, contain illustrations of the earliest recorded efforts of the human mind toward a knowledge of Deity. Socrates and Plato among the Greeks, and Cicero and Seneca among the Romans, made earnest and to some degree successful efforts to give rational account of men's spontaneous faith in the divine existence. In all ages of the Christian Church theologians have claimed that the works of nature exhibit the being, power, wisdom, and goodness of their author, and that revelation presupposes and recognizes this truth. The *Theologia Naturalis* *sive Liber Creaturarum* of the Spanish physician Raymond de Sabunde, in the early part of the fifteenth century, however, seems to have been the first attempt to construct a distinctively natural theology. During the seventeenth century natural theology made considerable progress, rose to increased prominence in the eighteenth, and reached a golden period in the early part of the nineteenth century through the celebrated Bridgewater Treatises and other able works. The subject has continued to hold a place of undiminished interest amid the surpassing philosophical and scientific progress with which the nineteenth century closes.

Its Fundamental Postulates.—In its reasoning it assumes as valid the so-called intuitional or *a priori* truths, especially the law of causation, which demands an adequate cause for every event. In this, however, it does only what all true science does. Whatever psychological explanation may be given of these truths or beliefs, it is undeniable that their authority is supreme and invincible in the practical thinking and reasoning of the race, and that neither science nor philosophy can impeach their validity without suicide.

Great variety has marked the theistic evidences from the numerous sources whence they are drawn. Since the proper proofs of the divine existence must be regarded as including all the phenomena of the whole world of matter and mind open to our study and interpretation, these evidences must be literally countless and inexhaustible. They are impressively cumulative, as the immeasurable realm of nature, life, and history is more and more explored. They appear in thousands of different ways to different minds. If it is fair to assume a single evidence, there are many evidences. If there is one, there are innumerable points of light revealing the divine. Natural theology therefore rests its conclusions not simply on one or several formal proofs, but upon the aggregate testimony of the whole cosmical system and all its particulars, upon the force and consilience of the indications in nature, thought, and history as they are found running up and compacting their varied logic in one common demand.

Forms of Argument.—Different methods of viewing nature's testimony, as well as difference as to the parts considered, have given the theistic reasoning a number of leading characteristic forms. These stand simply for generic methods of shaping our view of nature's witness to the real

existence and attributes of the Being for whom the idea of God stands in the human mind. Sometimes the method is *a priori*, proceeding directly from ideas which are held to be necessary in the mind's own insight and consciousness. Sometimes it is *a posteriori*, as necessary inference or logical conclusion from observed facts. Commonly the reasoning is found to unite the two methods. Sometimes the argument is based upon the existence and phenomena of mind; sometimes upon the facts of physical organization and life; sometimes on the order and glory of the heavenly bodies; sometimes on the structure and adaptation evident in the chemical elements and material atoms. Besides some forms of presumptive proof, such as the universality of the idea of God in the human mind, so normal as to force itself in some form or other into the belief of all ages and tribes; the religious instinct of the race, showing a natural and profound adjustment of the human constitution to worship; the benign influence of belief in God, quickening the sense of duty and responsibility, in which personal and social life reaches its best and happiest order; and the fact that all the phenomena of the world are best explained on the assumption of the existence of God, the theistic arguments, though wrought out in greatly diversified ways, have for the most part fallen under the following types:

1. The *ontological* argument. The germs of this were involved in Plato's "ideas," but it was first formulated by Anselm in the eleventh century. From the existence in the human mind of the idea of a most perfect being it concluded that the most perfect being exists—because real existence is a necessary part of the idea of the most perfect being. Descartes, Bishop Butler, Leibnitz, Cousin, Samuel Clark, and many other eminent writers have used this method of argument; but, standing alone, it has often been shown to be unsound, in confounding real objective existence with the simple idea of it in the mind. Its only force rests on the *necessity* of the idea in human thought. The universality of the idea proves it to be spontaneous and necessary in the action of mind in the presence of nature. Our knowledge of actual being compels us to believe in self-existent or unoriginated being. Thus God becomes the ultimate necessity in human thought. This method of reasoning, however, besides being too metaphysical for general apprehension, fails to exclude pantheistic conceptions or make clear the distinction between God and the universe itself.

2. The *cosmological* or, more exactly, *atiological* argument. This reasons from the existence of the world as contingent and dependent, to the existence of God as the necessary unconditioned self-existent cause. That the world has had a beginning is indisputable, and science is busy only with the question *how* it came to be. In all its parts, and as a whole, nature is found to be finite and conditioned. In searching for the cause of it all, the inexorable demand of the law of causation can never be satisfied till a cause is reached that is not itself an effect, a first cause, a self-existent, absolute cause. This draws the line clearly between self-existent being and all originated and dependent being. Modern research and progress have not discredited, but rather, if possible, strengthened, the force of this argument, for they have left no place for the anciently asserted notion that the world itself may be regarded as eternal, and, despite former metaphysical questionings, they have recognized with the most absolute confidence the validity and universality of the law of causation for the real system of the world.

3. The *teleological* argument. This seems to have been the earliest form of theistic reasoning, and still remains the most prominent and impressive. It is usually known as the proof from design or "final cause." Its peculiarity is that while based, as is the cosmological, on the principle of causation, it considers specifically the marks of order and purpose everywhere in nature. Teleology, or clear adjustment of structure to predetermined ends, is so omnipresent a reality in the world that we are never out of sight of it. It seems to be coextensive with the highest law of the universe. The world appears to be a thought with purpose or intent shining all through it, from its primary adapted atoms acting like "manufactured articles" up through all the aggregations in which atoms are built into a cosmos. The correlate to all this is a Thinker, as the creator of the world. The excellence of this argument is that its conclusion leads directly and necessarily to the intelligence and personality of the self-existent First Cause. This argument, together with the cosmological, has been assailed by severe criticism in

some modern philosophies and forms of speculative science. The chief philosophical objection, apart from that which has sought to vacate the law of causation itself as but a "form of thought," has been the claim that the world, being only finite, can not demand the infinite as its cause. This is conceded; but the value of the argument remains practically the same; for all that is sought from this form of proof is the existence of a personal creator of the actual universe. This is enough; but the main objection has come from a form of speculative science in connection with the hypothesis of evolution. This is thought by some to show how the universe of structure and organism has been immanently evolved from primordial matter without intelligent purpose. The answer to this, believed to be amply sufficient, is that any atheistic hypothesis of evolution must resolve itself into the incredibility of "chance," and especially that the great majority of evolutionists themselves maintain that evolution, being not a *cause*, but only a *mode*, does not set aside teleology, but enlarges its scope and range. Numerous discussions, especially the masterly work on *Final Causes*, by Paul Janet, have thoroughly vindicated the high place of this form of proof.

4. The moral argument, drawn from the facts of conscience and ethical law in the world. It is shaped in different ways, according as it reasons directly from the existence of conscience or from the course of history, with their realities of moral law and necessary presuppositions of a moral law-giver. In the ethical capacities and obligations human nature reaches its highest ascent. As the cosmical system thus culminates in ethical law, its author must be a moral governor. To this argument evolutionism suggests the objection that what is reputed to be ethical law is but the race's experiences of utility transformed into judgments of approval and incorporated as mental instincts by hereditary descent, but this objection fails by disregarding the fact of an irreducible distinction between the judgments of utility and those of right or righteousness.

Divine Attributes.—Natural theology claims that the evidences of the divine existence necessarily fix some fundamental conceptions of the divine nature and attributes. Over against the negations of agnosticism it claims to be able to know not only that God is, but to some degree *what* he is. Reflected from the realities which prove his being, we learn some of the perfections which belong to him and by which he is indeed God. Hence natural theology affirms of him self-existence, as the absolute First Cause; eternity, as necessarily involved in self-existence; personality, as the logical presupposition for the cosmic order and design; unity, as the one and only ground of the universe; omniscience, omnipresence, omnipotence, infinite wisdom, perfections reflected from the immensity of nature; holiness or righteousness, necessarily presupposed from the moral constitution of man and the world; and goodness, evident from the general arrangement of nature's structures for creature enjoyment.

God's Relation to the World.—This also is in a measure reflected from the evidences of his being; but it presents many profound and difficult problems which at once challenge thought and baffle satisfactory solution. Yet as the Cause of the world God is necessarily apprehended as before and above it, in a divine transcendence. As nature, however, exhibits the divine causation as working everywhere within it, the divine immanence is equally certified. He is in the world, but not a part of it. There are thus excluded both a pantheistic identification of God with nature, and a deistic separation or withdrawal from it. The world is God's world, and must have its purpose and plan in the divine counsel; but here natural theology joins on to supernatural revelation, which gives the fuller needed knowledge both of the divine attributes and of God's relation and purposes with respect to nature and man.

LITERATURE.—Besides the older discussions by Clarke, Newton, Derham, Nieuwentyt, Paley, and the Bridgewater Treatises, the chief later works are Tulloch's *Theism* (New York, 1855); Thompson's *Christian Theism* (London, 1855); Buchanan's *Modern Atheism* (Boston, 1867); Mahan's *Science of Natural Theology* (Boston, 1867); Chadbourne's *Natural Theology* (Boston, 1867); Jackson's *Philosophy of Natural Theology* (New York, 1875); Cocker's *Theistic Conception of the World* (New York, 1875); J. P. Cooke's *Religion and Chemistry* (Boston, 1864); Fairbairn's *Studies in the Philosophy of Religion and History* (New York, 1876); Flint's *Theism* (Edinburgh, 1878); Flint's *Anti-Theistic Theories* (Edinburgh, 1879); Janet's *Final Causes* (trans.

from French, Edinburgh, 1878); Diman's *Theistic Argument* (Boston, 1881); Bowne's *Studies in Theism* (New York, 1879); Harris's *Philosophical Basis of Theism* (Boston, 1883); Fisher's *Grounds of Theistic and Christian Belief* (New York, 1883) and *Natural Theology* (1893); Valentine's *Natural Theology or Rational Theism* (Boston, 1890); Bowne's *Philosophy of Theism* (New York, 1887).

M. VALENTINE.

Nauck, nowk, AUGUST: scholar; b. in Auerstädt, near Merseburg, Germany, Sept. 18, 1822; was educated in the gymnasium of Schulpforta and at Halle. After teaching at various gymnasia in Berlin, he was called in 1856 as member extraordinary of the Imperial Academy of Sciences to St. Petersburg, where he remained until his death Aug. 3, 1892. Nauck was one of the greatest text-critics of modern times. Of his many works, exclusively confined to Greek, the following are the most famous: *Aristophanis Byzantii fragmenta* (1848); Euripides with the fragments (3d ed. 1877); *Tragicorum Græcorum fragmenta*, his masterpiece, and the standard work on the subject (2d ed. 1889, with *Tragicæ dictionis index*, 1892); Sophocles with German notes, first edited by Schneidewin (text ed. 1867); Homer's *Odyssey* (1874) and *Iliad* (1877); *Iamblichus de vita Pythagorica* (1884); *Porphyrus Opuscula selecta* (2d ed. 1886). Cf. Th. Zielinski, *August Nauck* (Berlin, 1894), where a complete list of his writings, 121 in all, is given.

ALFRED GUDEMAN.

Naucratis, or **Naukratis**: a garrison city established by PSAMMETICHUS I. (q. v.) about 665 B. C., for his Ionian and Carian mercenaries. It was located at what is now called Tell Nebireh, on a canal W. of the Rosetta branch of the Nile, near Sais, the capital of the twenty-sixth dynasty, and close to the Libyan frontier (30° 50' N. lat., 30° 30' E. of Greenwich). Its site was discovered by W. M. Flinders Petrie in 1883, and explored by him in 1885-86. Its origin was entirely Greek. The subsequent history of the Persian, Ptolemaic, and Roman periods of the city is in doubt, on account of the excavations made by natives, which uncovered the Greek antiquities but destroyed all later accretions. A factory for making Greek imitations of Egyptian scarabs was found by Petrie, with remains dating down to Apries (Hophra), but none from the reign of Amasis. This dates the original town quite exactly, but the discoveries at Daphnæ (see TAHFANHES) serve to determine the time more closely still. The pottery found at Naucratis was clearly Greek, and apparently formed of Greek clay; in style it was quite distinct from that of Daphnæ. Naucratis contained a number of large buildings—a temple to Hera, another to Aphrodite, a small one to the Dioscuri, the Panhellenion, the largest of all and the Greek religious center of Egypt, and, oldest of all, a temple to the Milesian Apollo, in the center of the town. The whole was originally fortified. The discovery of Naucratis was important, not only in itself, but in its results, since it threw light upon the earliest intercourse between Egypt and Greece, and also upon the history of the Greek alphabet, the Naucratian specimens of Greek caligraphy being among the oldest known. After the time of Amasis and the destruction of Daphnæ the place was the only one where trade with Greece was allowed. See Herodotus, ii., 178; Strabo, xvii., i., 18, 23, 33; Petrie, *Ten Years' Digging in Egypt*; and Edwards, *Pharaohs, Fellas, and Explorers*.

CHARLES R. GILLET.

Naugatuck: borough (incorporated in 1893, made co-terminous with the town in 1895); New Haven co., Conn.; on the Naugatuck river, and on the Naugatuck Division of the N. Y., N. H. and Hart. Railroad; 5 miles S. of Waterbury (for location, see map of Connecticut, ref. 10-F). Its manufactures include rubber and woolen goods, malleable iron, paper boxes, pins, buttons, belt-lacing, and electro-plated ware; and it has a public library (3,600 vols.), a public-school building (both the gift of a citizen), a national bank with capital of \$100,000, a savings-bank, and three weekly newspapers. Pop. (1880) 4,274; (1890) 6,218; (1894) 8,325.

T. F. KANE, SUPERINTENDENT OF SCHOOLS.

Nauplia: town of Greece, in the Peloponnesus; on a rocky peninsula in the Argolic Gulf (see map of Greece, ref. 17-K). Of small importance in the classic period, it was entirely deserted at the time of Pausanias (174 A. D.), but became prominent during the Middle Ages. The Ottomans and Venetians long disputed its possession; it was held by the former from 1715 to 1825, when it was captured by the Greeks, who made it the seat of their government from 1829 to 1834. Its deep harbor, well sheltered from the winds, is

protected by the citadels of Palamedes and Ithaca, the former 720 feet above the town, and the latter built on the site of the ancient acropolis. From a military standpoint Nauplia is the most important town in the kingdom, and the Greeks call it the Gibraltar of Greece. Pop. 1880, 5,450. E. A. CROSVENOR.

Nauplius [Lat., a kind of shellfish, from Gr. *ναῦς*, ship + *πλῆν*, to sail], a name given to the young of certain crustacean under the impression that it was adult, and now used as a term for a particular stage in the development of these forms. A nauplius has an unsegmented body, a single median eye, and three pairs of appendages. Of these the anterior pair is simple and sensory, the two remaining pairs are two-branched and serve as swimming organs, while their basal joints, on either side of the mouth, are used for the comminution of food. A nauplius stage occurs in the history of most *EXTOMOSTRACA* (q. v.), but it is rare in the development of other Crustacea. From the wide distribution of the stage it was formerly regarded as indicating that the Crustacea had descended from a naupliiform ancestor, but many zoologists no longer regard it as having any phylogenetic significance. See CRUSTACEA. J. S. KINGSLEY.

Nausea [= Lat., from Gr. *ναῦρα*, sea-sickness]: the sense of impending vomiting. It is a symptom of many diseases, and occurs as a result of irritation of some part of the alimentary canal or of the nervous centers which preside over its functions. In some cases nausea passes on to vomiting, in others it goes no further than to produce a feeling that vomiting might occur if the conditions provoking nausea were to continue. Vomiting may occur without nausea. The exciting causes of nausea are very numerous. It may be provoked by certain drugs known as emetics, such as ipecacuanha, tartar emetic, apomorphia, sulphate of zinc, sulphate of copper, and alum; while lukewarm water, with or without the addition of ground mustard seeds, and tobacco are familiar excitants of vomiting. Nausea is also often observed after the administration of morphia and after prolonged debauches. Nausea may be provoked by mechanical irritation of various parts of the alimentary canal, as, for instance, tickling the fauces. Overloading the stomach is a well-known cause of nausea and vomiting, and another—equally known to medical men—is the irritation caused by the compression of a loop of intestine which sometimes takes place in hernia or in a form of entanglement of the bowels within the abdominal cavity. Nausea may be caused by blows upon the head, the abdomen, the testicles or the ovaries, and it is a symptom of various disorders or diseases of the stomach and intestines, the brain, and the kidneys. Nausea and vomiting are induced by many poisons, and often occur in the early months of pregnancy, sometimes being in the latter case of a most intractable character. Nausea occurs in surgical shock, in fainting, and after the administration of ether. A peculiar form of nausea with vomiting is seen in some cases of consumption and in a disease of the ear called Ménière's disease or labyrinthine vertigo, and in hysteria. In many fevers—especially in children—nausea is an early symptom, and vomiting occurs almost invariably in whooping-cough, although there is usually little nausea (in the strict sense of the term) in connection with the vomiting. In addition to these causes of nausea may be mentioned the mental impression made by disgusting sights or odors, terrifying circumstances, and the fact that individual peculiarities (idiosyncrasies) make certain persons prone to nausea from causes which do not similarly affect most persons.

Nausea is often a salutary condition, either as a warning of some impending danger or as an indication of the presence of some insidious disease; it is also the customary forerunner of vomiting, which itself is very often a most salutary process.

For the elaboration of these ideas and much that ought to be understood in connection with nausea and vomiting conjoined, see the article on VOMITING. CHARLES W. DILLIS.

Nauteh (raweh) Girls: See BAYAGERI.

Nautical Almanac: See EPHIMERIS.

Nautical Schools: schools principally for the purpose of training boys for the merchant marine. They were of early origin, and were maintained with more or less success by the various nations engaged at different times in the struggle for commercial supremacy. In Great Britain there are a number of vessels upon which schools are maintained, some reformatory, others industrial in their nature, but all

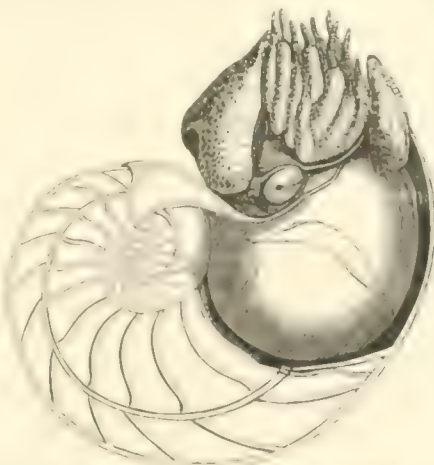
for the purpose of educating as sailors a class which otherwise would be unprovided for. In addition, there are two school-ships upon which boys are trained with a view to becoming officers in the merchant service.

By act of Congress, June 20, 1874, the Secretary of the U. S. Navy was authorized, for the purpose of promoting nautical education, to furnish, upon application of a Governor of a State, a suitable naval vessel, with her apparel, charts, books and instruments of navigation, to be used for the benefit of any nautical school established at New York, Boston, Philadelphia, Baltimore, Norfolk, San Francisco, (Wilmington, Charleston, Savannah, Mobile, New Orleans, Baton Rouge, Galveston, and in Narragansett Bay, added later), upon condition that there shall be maintained a school for the instruction of youths in navigation, seamanship, marine engineering, and all matters pertaining to the construction, equipment, and sailing of vessels, or any particular branch thereof. The President was authorized at the same time to detail proper officers of the navy that could be spared as superintendents or instructors.

By virtue of this act old wooden sailing vessels were assigned as follows: St. Mary's to New York in 1874; Jamestown to San Francisco in 1876; Saratoga to Philadelphia in 1889; and the steam-sloop Enterprise to Boston in 1892. While the nautical school in San Francisco lasted but a short time, that in New York has been maintained ever since its inception, and has served as a model for the others. Application for admission to it must be made in writing to the board of education of New York city, which controls the school, or in person on board the St. Mary's. The qualifications of candidates are as follows: Age between sixteen and twenty years; average size, sound constitution, and freedom from physical defects; inclination for seafaring life; and knowledge of reading, writing, spelling, and arithmetic. Candidates admitted are required to furnish their outfits and to deposit \$30 to cover cost of uniform; the latter amount is forfeited should the lad desert or be withdrawn or expelled. The St. Mary's passes nine months of the year at sea, during which instruction is given in seamanship and navigation; the course lasts two years, and at its conclusion the proficiency attained is determined by examination.

According to the Postal Subsidy Act of Mar. 3, 1890, all subsidized ships must draw their apprentices from the nautical schools. C. BELKNAP.

Nautil'idæ [Mod. Lat., named from *Nautilus*, the typical genus, from Lat. *nautilus* = Gr. *ναυτίλος*, nautilus, liter., sailor, deriv. of *ναῦρος*, sailor, deriv. of *ναῦς*, ship]: the only existing family of the once numerous group of Tetrabranchiate Cephalopods. (See MOLLUSCA.) The animal differs from that of other Cephalopods (squids and cuttlefish) by having numerous tentacles, an eye formed on the type of the pin-hole camera (i. e. without a lens), four gills, and a chambered shell. This shell is well known. It is coiled in



Section of a nautilus, showing its interior.

a flat spiral, and the interior is divided by partitions into numerous chambers, which are connected with each other by a tubular structure, the siphuncle. The animal occupies the large outer chamber. The only existing genus is *Nautilus*, and of the habits of this almost nothing is known, but with the shells—familiar as the nautilus shell is to

common, the animals are among the greatest rarities. These animals feed on small crabs. Fossil forms belonging to this family are numerous, over 2,000 species being described; only six living species are known. J. S. KINGSLEY.

Nauvoo: city (founded by Mormons in 1840, subsequently occupied by a company of French Icarians, now settled principally by Germans); Hancock co., Ill. (for location of county, see map of Illinois, ref. 5-B); on the Mississippi river, at the head of the lower rapids; 8 miles S. of Fort Madison, Ia., 12 miles N. of Keokuk. The nearest railway station is that of the Chi., Burl. and Quincy, at Montrose, Ia., directly opposite, which is reached in summer by ferry and in winter on the ice. The city contains 5 churches, high school, 3 district schools, St. Mary's Academy for girls, a State bank with capital of \$25,000, and 2 weekly newspapers. The principal business is agriculture and horticulture. About 100,000 gal. of wine are made annually, and from fifty to eighty carloads of table-grapes and twenty of strawberries are shipped each season. For events during the Mormon occupation, see MORMONS. Pop. (1880) 1,402; (1890) 1,208; (1894) estimated, 1,300. EDITOR OF "INDEPENDENT."

Navajos: See ATHAPASCAN INDIANS.

Naval Academies: schools especially devoted to the training of officers for the naval service.

France.—Special instruction in the art of war originated in France, but it was carried on with no well-defined policy until 1810, when two schools for the navy were established, one at Brest, the other at Toulon. In 1816 they were united at Angoulême, and in 1827 the school was removed to Brest, where it has since remained. The naval school is on board the Borda, an old ship of the line, anchored in Brest roads; at its head is a captain, assisted by a commander, and a staff of 8 lieutenants, 12 professors, and 1 principal mechanician (engineer) as instructors. About 45 candidates are admitted annually. Admission is gained to the school by public competitive examinations held annually in various parts of the country. The qualifications, in addition to a good bodily constitution and an age between fourteen and seventeen years, comprise a knowledge of history, geography, French, English, Latin, drawing, physics, chemistry, arithmetic, algebra, geometry, plane trigonometry, and analytical and descriptive geometry. The course of instruction embraces literature, history, geography, English, drawing, physics, chemistry, astronomy, analytical and mechanical science, naval architecture, and the theory and practice of seamanship, gunnery, steam-engineering, and small-arms. These are supplemented by practical exercises and drills of various kinds, and by an annual practice cruise of two months. The discipline maintained is severe and the students, from whom over ten hours' daily work, Sundays included, is expected, are subjected to constant surveillance. With certain exceptions, the pupils are required to pay 700 francs yearly for subsistence, and 1,000 francs for outfit. After two years at the school those found qualified at the annual examination are transferred, with about four graduates yearly from the Polytechnic School at Paris, to the Flore, a screw steamer, eighteen guns, for the final practice cruise of ten months, after which, upon passing an examination in professional subjects, they become eligible for active service as midshipmen.

The school of naval architecture, founded in Paris in 1765, and after several changes finally established at Cherbourg in 1872, is under the management of the naval constructors, the corps which designs and supervises the construction of ships and engines for the navy. At the head of the school is a director of naval construction, who gives instruction, assisted by two naval constructors and two civil professors. The course of instruction covers two years, and includes the following subjects: Ship-building, strength of materials, naval architecture, free-hand, mechanical, and ship and engine plan-drawing, workshop technology, steam-engine, thermodynamics, naval ordnance, compass deviation and compensation, accounts, and English. Graduates of the Polytechnic School to the number of four annually are assigned to this school, where they receive theoretical instruction for eight months of the year, and practical illustration for the remaining four months in the dockyard at Cherbourg (first year) and in the national engine works at Indret (second year). Those found qualified at the end of the course are appointed assistant naval constructors. Private students having the necessary qualifications are admitted to this school by permission of the Ministry of Marine, and upon the conclusion of the course are given diplomas stating the work done and the proficiency attained.

The gunnery school for officers is on board the *Souverain*, twenty-five guns, at Toulon; in special cases the course is two years. At Lorient there is an artillery school for the instruction of officers of the marine artillery exclusively, and at the same place a number of officers are annually trained at small-arms. A torpedo-school was established at Boyardville, Isle of Oleron, in 1869, and transferred in 1886 to Toulon. Lately it has become the school of submarine defense, that of torpedoes having been separated and placed on board the *Algeiras* at Hyères. The course is five months, but those who show special aptitude receive a supplementary course of four months; the instruction is both theoretical and practical. Special schools are also maintained at the various naval ports for the training of officers of the medical and commissariat staff, the course lasting in both classes two years. In France, engineer officers of the navy are selected from mechanicians.

Great Britain.—The system is complex, and the changes made since the foundation of the Royal Naval Academy at Portsmouth in 1729 have been many; they have resulted in the formation of two schools, one for the training of naval cadets, the other for the education of officers of higher rank. The training-school for cadets, established in 1857, at first at Portsmouth, but now on board the *Britannia*, at Dartmouth, is in charge of a captain, assisted by 9 officers, 9 naval instructors, 2 French, 1 Latin and 2 drawing masters, and 6 warrant officers. About 40 cadets are appointed to the school semi-annually by the admiralty, the qualifications for admission being, in addition to a sound physique and an age between thirteen and fourteen and a half, knowledge of elementary mathematics, English, French, Latin, and Scripture history. The cadets are required to pay for their outfit, clothing, materials used, and also a fee of £70 yearly (in some cases reduced to £40), but receive their subsistence and a small weekly allowance for pocket-money. The course of study embraces arithmetic, algebra, geometry, plane and spherical trigonometry, astronomy, navigation, dictation and composition, physics, and French, and lasts two years; the cadets are then sent to sea, and after a year's service become ensigns. After five years' sea-service, and after attaining the age of nineteen, the ensign is examined, wherever he may be, in seamanship, and upon passing receives an appointment as acting sub-lieutenant. He then returns to England for instruction and examination in navigation and gunnery, and if successful is commissioned sub-lieutenant.

The Royal Naval College was re-established in 1873 at Greenwich, to provide for the education of officers of all ranks above midshipmen in theoretical and scientific study bearing upon their profession. At its head is a flag-officer, assisted by a captain, a civilian director of studies, and a corps of thirty-one professors and instructors. Courses of study (compulsory) are provided for acting sub-lieutenants, gunnery and torpedo lieutenants, naval construction students, acting assistant and assistant engineers, probationary lieutenants of the marine artillery, naval instructors, and (voluntary) for other officers on half-pay, and private students. The courses vary in length from six months for acting assistant engineers and sub-lieutenants to three sessions of nine months each for construction students and assistant engineers.

The gunnery-school is on board the *Excellent* at Portsmouth; the course for gunnery lieutenants is six months, for acting sub-lieutenants, marine artillery, and other officers, three months. The torpedo-school is on board the *Vernon*, also at Portsmouth; the course lasts nine months.

United States.—The U. S. Naval Academy was founded in 1845 by George Bancroft, Secretary of the Navy during the administration of President Polk. For several years prior to this there was a school at the Naval Asylum in Philadelphia, where the midshipmen prepared themselves for examination for promotion. The Naval School, as it was at first called, was formally opened Oct. 10, 1845, in Fort Severn, at Annapolis, Md., which had been transferred by the War to the Navy Department for the purpose. The course was fixed at five years, of which the first and last only were to be passed at the school, and the intervening three at sea. The first midshipmen that received a course of instruction and graduated from the school were those who entered the service in 1840. In 1850 the school was reorganized; the name was changed to the U. S. Naval Academy; the course was increased to seven years, the first and last two years to be passed at the school, the intervening three at sea; the number of instructors was increased, and separate departments of instruction established; a vessel

was provided, and annual practice cruises instituted; and provision was made for an annual board of visitors to inspect and report upon the condition of the school to the Secretary of the Navy. In 1851 the requirement of sea-service was abolished, leaving the course four consecutive years of study.

At the outbreak of the civil war in 1861 the Naval Academy was removed to Newport, R. I., where it remained until the summer of 1865, when it was re-established at Annapolis. In 1870 the title of cadet-midshipman was substituted for that of midshipman, and three years later the course was increased by the addition of two years' sea service in cruising vessels, at the expiration of which the cadet-midshipman returned to the Naval Academy for examination in professional subjects prior to final graduation. In 1866 the education of engineer officers was begun at the Naval Academy by the admission of a class of acting third assistant engineers, who pursued a special course of instruction for two years. Later cadet-engineers were admitted annually until 1882, when it was provided by act of Congress that naval cadets should be appointed in place of cadet-midshipmen and engineers, and that from those who successfully completed the six years' course appointments should thereafter be made to fill the vacancies in the lower grades of the line and of the engineer and marine corps, and that those for whom no vacancy existed should be discharged with a year's pay. By act of Congress, Mar. 2, 1889, it is provided that the academic board shall, prior to the beginning of each academic year, separate the first (highest) class of naval cadets into two divisions in the proportion which the aggregate number of vacancies that have occurred during the preceding fiscal year in the lowest grades of commissioned officers of the line and of the marine corps shall bear to those which have occurred in the engineer corps, and that the cadets so assigned shall thereafter pursue separate courses of study: those in the line and marine division, one arranged to fit them for service in the line of the navy; those in the engineer division, one to fit them for service as naval engineers. It is further provided that all vacancies in the line and in the marine and engineer corps shall be filled by appointments from final graduates at the end of the six years' course, in order of merit, the assignments to be made by the Secretary of the Navy upon recommendation of the academic board.

At the head of the Naval Academy is the superintendent, a naval officer of high rank, who is assisted by the commandant of cadets, and by the academic board, which is composed, in addition to the foregoing, of the heads of the different departments of study, who are, with one exception, naval officers. One naval cadet is allowed for each member and delegate of the House of Representatives, and, by appointment of the President, one for the District of Columbia, and ten for the country at large. Should a member of Congress fail to fill the vacancy that may exist in the cadetship for his district by July 1, the Secretary of the Navy is authorized to do so. In the regular sequence of affairs vacancies occur therefore in cadetships once in six years. The examinations for admission are held at Annapolis in May and September; the requirements, in addition to robust constitution, freedom from physical defects, and an age between fifteen and twenty years, are a knowledge of spelling, grammar, geography, history of the U. S., arithmetic, and algebra as far as equations of the first degree. If admitted, cadets are required to sign an engagement to serve in the navy for eight years, unless sooner discharged, and to make a deposit of \$200 to cover the cost of outfit; the expenses of travel from their homes to Annapolis are refunded to them, and they receive \$500 a year, but are required to pay for their subsistence, clothing, and other expenses.

For the first three years all the cadets pursue the same course of study, which includes English studies, history, French, Spanish, or German, algebra, geometry (including descriptive and analytical), trigonometry, calculus, mechanics, astronomy, physics, chemistry, mechanical drawing, and seamanship. During the fourth year the course of study is the same for both divisions of the class in naval construction, method of least squares, applied mechanics, electricity, and hygiene, but while the cadets of the line division pursue a course in seamanship, ordnance, gunnery, infantry tactics, navigation, surveying, compass deviation, and international law, those of the engineer division receive a separate course of instruction in marine boilers and engines, and in designing machinery. The academic year begins Oct. 1 and ends May 31, and is divided into two terms; the system of in-

struction is by means of daily recitations (oral), and by monthly, semi-annual, and annual examinations (written); those found physically or mentally disqualified at the half-yearly examinations are dropped; the instructors are almost exclusively naval officers. The course of study is supplemented by a very thorough system of practical exercises in seamanship, signals, management of boats under oars and sail, and of steam-launches, in infantry, howitzer, and great-gun drill, in ordnance, gunnery, and torpedoes, in marksmanship with revolvers, rifles, and rapid-fire guns, in navigation, surveying, and compass deviation, in machine-shop work and in running engines, and in athletics, including fencing with small and broad swords, bayonet exercise, boxing, swimming, and dancing. The departments of study are amply illustrated by models and apparatus of all kinds; the observatory contains a large collection of instruments, including an equatorial telescope; the library contains 32,000 volumes. The *Monongahela*, a wooden sailing vessel, and the *Bancroft*, a steel barkentine-rigged vessel, 838 tons displacement, with triple-expansion engines, and twin screws, carrying an armament of four 4-inch rapid-fire guns, and seven guns of smaller calibers, with tubes for both Howell and Whitehead torpedoes, are stationed at the Naval Academy for purposes of instruction in sail and spar drill, and in great-gun, torpedo, and other exercises, and for use in making the summer practice cruises.

Immediately after the annual examination the cadets of the graduating class are ordered to cruising vessels for the two years' service prior to final examination; the first and third classes, with the candidates that have been admitted, are embarked on board the practice-vessels for the annual cruise of three months; the second class remains at the academy for practical instruction in the machine-shop for a month, and then joins the others on the cruise. All the cadets, except those of the fourth class, are granted leave to visit their homes in September.

The limits of this article do not permit description of other systems of naval education; in general, it may be said that all nations making any pretensions to naval power provide for the training of naval officers; the methods pursued resemble more or less closely those already described above.

REFERENCE: *Foreign Systems of Naval Education*, by J. R. Soley, late professor U. S. navy. C. BELKNAP.

Naval Architecture: See SHIP-BUILDING.

Naval Signals: the means of transmitting intelligence at sea by the agency of sight or hearing. The code of day and night signals used in the U. S. navy is contained in two volumes—the *General Signal-book* and the *Fleet Drill-book*. The first contains about 7,000 words and sentences arranged alphabetically and regularly numbered. Resort is had also to a vocabulary of some 10,000 conversational words, to which is added an alphabet and a geographical list of nearly 11,000 places, each letter and word having its appropriate number. The *Fleet Drill-book* relates to the tactical formations of a fleet or squadron. Now, every vessel in the navy having a set of these books, it is only necessary, in order to signal a message from one ship to another, to indicate the volume and the number in that volume corresponding to the required words or sentences. To do this there are nine rectangular signal-flags representing the digits, one to stand for zero or ten, and three triangular pennants called *repeaters*, wherewith to make duplicate numbers. The sentence, for example, "Anchor in the order of steaming" may stand opposite No. 112 in the signal-book. To make this we first bend on signal-flag No. 1, next the first repeater, and lastly No. 2. Had the signal been No. 122, we should first bend on signal-flag No. 1, then No. 2, and lastly the second repeater, because the second number in the hoist is to be repeated; and so on. The lowest flag in the hoist represents the units. Besides the above-named flags there are the cornet, the danger-signal, the guide-flag, the annulling flag, the telegraph flag, the dispatch, quarantine, and convoy flags; also the answering pennant, the preparatory, interrogatory, numeral, geographical, and position pennants, their names suggesting their uses, save the cornet, which indicates a vessel's number in one case, and serves as a recall in another. Flags of various colors are available as signals only for a distance but little over 3 miles. Beyond that long-distance signals are used, such as the semaphore, the collapsing drum, or the use of cones, balls, and squares—in which the shape takes the place of color. *Night-signals* are made according to the system of Lieut. E. W. Very, U. S. navy, by which fire-balls

or stars are shot to a height of about 400 feet. Only two colors are used, red and green, with which any desired signal may be made, a rocket being used to indicate a ship's number and as a signal of execution. Electric lights are now used for distant night signaling. The search-light may be used for signaling a ship below the horizon, by reflecting the light on a cloud. Signals have been exchanged in this manner between two ships 60 miles apart. *Fog-signals* are made by firing guns, blowing horns, the steam-whistle, and by sounding the ship's bell. The long and short blasts of the steam-whistle, by representing the two elements of the army code, furnish the means of signaling in thick weather.

The army code, as it is generally called, invented by Gen. A. J. Myer, U. S. army, is used, with certain modifications, as a part of the naval signal system. By this method the signalman spells each word of the message, shortening the process by abbreviations. The letters of the alphabet are represented by signs, each sign and its corresponding letter having an arbitrary number assigned to it. A, for example, may be represented by 22, B by 2112, C by 121, etc. The usual manner of making these numbers is by a flag attached to a staff and waved by the signalman. At night the staff is surmounted by a torch. The signalman, facing the point of communication, and holding the staff in a vertical position to his front center, dips his flag to the right to represent 1, to the left for 2, and to his front for 3, each dip describing the quadrant of a circle. Nos. 1 and 2 are made in a vertical plane at right angles to the line of communication; No. 3 in a vertical plane in that line. All the letters of the alphabet are made up of combinations of 1 and 2, No. 3 being used to mark the end of a word, and when repeated the end of a sentence or message. Two practiced signalmen can communicate freely by this method, transmitting with accuracy and expedition long messages. Its great advantage consists in not requiring a signal-book. See SIGNAL-SERVICE.

The international code of signals furnishes a species of universal language to the entire maritime world. One system of flags having been adopted by all nations, and each one having a signal-book common to all, printed in its own language, it is plain that on the meeting of two ships at sea signals may be made and understood whatever their respective nationalities. A full explanation of the system may be found in the preface of *International Code*, together with a description of distance signals, semaphore, boat, and weather signals. S. B. LUCE.

Naval Tactics: See TACTICS.

Navarino, nã-vã-ree'nô (anc. *Pylos*): town of Greece; in the Peloponnesus, on the Bay of Navarino; situated on a rocky promontory, with a strong citadel (see map of Greece, ref. 18-J). Pop. (1889) 2,128. In the harbor the Turco-Egyptian fleet was destroyed by the allied British, French, and Russian fleets Oct. 21, 1827. The former consisted of 120 vessels of all sorts, carrying 2,240 cannon; the latter of only 26 vessels, with 1,324 cannon. The Turco-Egyptians lost 3 ships of the line, 16 frigates, 26 corvettes, 12 brigs, and 5 fire-ships, and 6,000 men killed. The allies lost one gunboat, 140 men killed, and 300 wounded. See MEHEMET ALI PASHA.

E. A. GROSVENOR.

Navarre (Span. *Navarra*): a province of Northern Spain; between the Pyrenees and the Ebro. Area, 6,046 sq. miles. Pop. (1887) 304,122. The whole country is mountainous, traversed by branches of the Pyrenees, whose tops generally are bare, while their sides are covered with forests of beech-trees or afford excellent pastures where numerous cattle and sheep are reared. The mountains, which contain much iron and salt, inclose many beautiful and fertile valleys, such as that of Roncesvalles and Roncal, which produce wheat, olive oil, figs, grapes, chestnuts, and many varieties of fruits. The inhabitants are an almost pure Basque race, speaking the Basque language to a considerable extent (see BASQUES), and very jealous of their old customs and privileges; they are hardy, industrious, and hospitable. Besides agriculture, cattle-breeding, and manufactures of iron, glass, paper, and soap, they are much engaged in hunting and in smuggling. The old kingdom of Navarre (which originally included also what is now the French department of Basses-Pyrénées) successfully resisted the invasions of the Saracens, and remained independent until Ferdinand and Isabella conquered it in 1512 and annexed it to Aragon; it preserved many peculiar privileges, however, which were not finally abolished until 1876.

Navarrete, nã-vã-rã-tã, FRANCISCO MANUEL, de: poet; b. at Zamora, diocese of Michoacan, Mexico, July 16, 1768. On the completion of his studies at Zamora he went into business in the city of Mexico, but felt a strong call to the religious career, and about 1787 became a Franciscan. He obtained much fame as a preacher, and on account of his scholarship was made Professor of Latin in the college of Valladolid. His first poems were published in the *Diario de Méjico* in 1805, and before his death he had composed a considerable quantity of verses, some of them upon religious themes, but others modeled upon the works of his beloved Latin poets. He died July 19, 1809, in the monastery of Talpukahua, after trying, it is said, to burn all he had written: but his brother was able to gather a considerable body of poems and to issue them under the title *Entretimientos poéticos del P. Navarrete* (Mexico, 1823; Paris, 1835). A. R. MARSH.

Navarrete, MARTIN FERNANDEZ, de: naval officer and historian; b. at Avalos, Logroño, Spain, Nov. 8, 1765. He entered the navy in 1781 and took part in the attack on Gibraltar Sept., 1782; in 1789 he had attained the rank of lieutenant, and was already known as a promising author. He then received orders to collect documents relating to the Spanish navy, and for this purpose he examined all the principal archives and libraries of Spain. Returning to active service in 1792, he served against the French; in 1796 he was attached to the Department of Marine, holding important positions in it until 1807, when he resigned rather than recognize Joseph Bonaparte. After the restoration he was again given office, and for many years he was one of the highest authorities on naval affairs. From 1823 he was director of the hydrographic office, and from 1824 director of the Madrid Academy of History, which owed its fame largely to his exertions. In later life he was several times senator. His best-known work is the collection of annotated documents entitled *Colección de los viajes y descubrimientos que hicieron por mar los Españoles desde fines del siglo XV.*, etc. (7 vols., 1825-65). He also wrote *Vida de Cervantes*, published by the Academy with its edition of *Don Quixote* (1820); *Biblioteca marítima española* (posthumous, 1851), etc. He edited the first four volumes of the great collection of documents relating to the history of Spain. D. at Madrid, Oct. 8, 1844. HERBERT H. SMITH.

Navasota: city; Grimes co., Tex. (for location, see map of Texas, ref. 4-I); at the confluence of the Brazos and the Navasota rivers, and on the Houston and Texas and the Gulf, Colorado and Santa Fé railways; 70 miles N. of Houston. It is in an agricultural and cotton-growing region, and is principally engaged in milling and several branches of the cotton industry. It contains a national bank, a private bank, and three weekly newspapers. Pop. (1880) 1,611; (1890) 2,997.

Nave [viâ O. Fr. from Lat. *navis*, ship, Mediæv. Lat., body of a church > Mod. Fr. *nef*, Ital. *nave*]: in architecture, a term used to designate in general the principal hall of a church as distinguished from the choir, transepts, chapels, or side aisles. It is also sometimes applied in secular architecture to large and imposing halls of more than usual length and loftiness, which resemble in form and proportion the nave of a church. The typical arrangement of the nave and side aisles in Christian architecture was derived from the Roman secular basilicas. These were halls with nave, side aisles, a species of transept, and an apse or tribune. The naves, separated from the aisles by arcades or colonnades, were lighted by clerestory windows and covered with wooden roofs, sometimes with open trusses, sometimes with richly paneled or coffered ceilings. In a cruciform church the nave extends from the front to the transepts, and is commonly flanked by single or double side aisles on either hand. There are, however, many parish churches in England having a double nave, i. e. two nearly or quite equal naves side by side, without side aisles. In Southern Europe especially, though not exclusively, there are also many churches having a nave flanked by chapels without intervening side aisles, as in the cathedral at Alby in France, the cathedral at Gerona in Spain, and in a number of Italian churches of the Renaissance. In churches with a nave and aisles the former is separated from the latter either by columns, as in the early Christian basilicas of Rome and the East and their mediæval copies in Italy, or by piers, square, polygonal, or clustered, as is the case in all Romanesque, Lombard, Norman, and Gothic churches, and generally in those of the Renaissance. The piers or columns sustain arches called *pier-arches*, upon

which are built the upper side walls of the nave, which rise above the side-aisle vaulting and roofs, and are pierced with windows; the wall thus pierced is called the *clerestory*. Above it is the ceiling or vault of the nave. In most mediæval churches of importance in France, England and Western Europe generally the broad band of wall between the pier arches and clerestory windows, corresponding to the "lean-to" roofs over the side-aisle vaulting, is pierced with arches forming a *triforium* or gallery; but many German churches, and a few elsewhere, have the side aisles nearly or quite as high as the nave, all the light being received from windows in the side walls. Another type of basilica nave that was destined to profoundly influence Christian architecture was evolved in the basilica of Maxentius and Constantine, where the tepidarium halls of the greater *thermæ* were imitated with their huge groined vaults in three compartments spanning the great hall, while the three compartments or bathing recesses on either side were converted into side aisles by piercing arches through the wing walls or buttresses separating these recesses. These wing walls, continued above the vaulted roofs of the side aisles, formed buttresses to withstand the lateral thrust of the nave-vaulting. This Constantinian type of nave, with the substitution of domical for groined vaulting, became the prototype of Byzantine structures like Aya Sofia ("St. Sophia" so called) in Constantinople. It had the advantage of greater loftiness as compared with the earlier types, and of being thoroughly fire-proof. It solved in one way the problem of the vaulted nave with side aisles which the architects of the Middle Ages afterward sought for 300 years to solve in another way. Gothic architecture is indeed the outcome of long-continued experiments in the adaptation of vaulting to the typical basilica plan of pagan and early Christian Rome. (See ARCHITECTURE.) In this effort to vault with masonry the nave as well as the aisles of the original basilica type by methods which reached their culmination in the splendid cathedrals of the thirteenth and fourteenth centuries—like Salisbury, Amiens, Strassburg, and Cologne—the nave took on an entirely new form. In place of the monolithic columns which formerly separated it from the aisles, heavy piers—square or round in the earlier examples, but in the later ones resembling clusters of shafts about a central core—sustained the greatly thickened clerestory walls by means of heavy arches richly moulded, some of the shafts being carried up to receive the spring of the ribs of the groined vaulting. The width of the nave was considerably reduced owing to the difficulty of constructing vaults of large span, while the span of the pier-arches was increased, the number of bays in the nave being correspondingly reduced. As the complexity, refinement, and perfection of the construction advanced, the piers were made lighter and loftier; each vaulting-rib was given its own shaft, carried clear to the ground; the arches, at first round, became pointed; the clerestory was made higher and its wall-surface treated as a mere screen between the vaulting and the supporting shafts; the clerestory windows were made of enormous size, and filled with magnificent stained glass held by elaborate geometric or "flowing" traceries in stone; the triforium was made a wholly subordinate but ornate feature between the clerestory and the pier-arches; and in England, and to some extent in Germany, the vaulting itself was made highly decorative by the rich patterns of a complex system of vaulting-ribs. In Italy, however, the Gothic system was never comprehended, and the broad divisions and ample scale of parts of the old Roman vaulted halls seem to have prevailed in such naves as that of the Duomo at Florence, where there are only five bays of nearly 55 span each, against an average span of 18 to 25 feet for the 7 to 12 bays of French and English Gothic naves. The English naves are lower than the French, 70 to 80 feet to the crown of the vault being a common height, against 100 to 150 feet for the French; but the vistas of English naves are, on the other hand, enhanced by the almost excessive length of the choirs beyond.

In the Renaissance period Italy took the lead in the building of imposing churches; the dome at the crossing of the nave and transepts became the central and culminating feature of the design, and this arrangement was imitated in most of the large Renaissance churches of England, France, and Germany, as at St. Paul's (London), the Pantheon (Paris), and many others. Of the Italian churches St. Peter's is the archetype; its stupendous nave, 330 feet long to the opening of the dome, is 87 feet wide and 153 feet high. In this, as in most of the Italian churches of the Renaissance, the vault is a barrel-vault with penetrations, richly adorned

by paneling executed in stucco and gilded. The arrangement of piers, invariably treated with one or another of the classic orders, varies greatly, with corresponding variety in the architectural effect of the nave. Stucco enrichments, inlays of precious marble, and sumptuous pictorial decorations in fresco on the vaults and spandrels contribute to these effects. See articles *Architecture* and *Cathédrale* in Viollet le Duc's *Dictionnaire Raisonné*; Mrs. Van Rensselaer's *English Cathedrals*; Parker's *Gothic Architecture*; Lübke's *Medieval Architecture*; Prof. Moore's *Development of Gothic Architecture*; Fergusson's *History of Architecture and History of Modern Architecture*; also ARCHITECTURE and RENAISSANCE ARCHITECTURE. A. D. F. HAMLIN.

Na'vesink (or Neversink) Highlands: a range of hills on the south side of Sandy Hook Bay, in Monmouth co., N. J. They are important landmarks to ships approaching New York. The highest point, Mt. Mitchell, is 282 feet high. Two first-class lighthouses, 53 feet high, stand 100 feet apart on ground 195 feet high. The southeasternmost tower is in lat. 40° 23' 43" N., lon. 73° 58' 49" W. Both show fixed white lights.

Navicular Disease: See FARRIERY.

Navigation [from Lat. *navigatio*, a sailing, deriv. of *navigare*, sail; *na'vis*, ship + *a'gere*, lead, drive, conduct]: the art of conducting a ship from port to port and across the ocean with safety and dispatch, and, more particularly, of determining her position from time to time on the face of the globe by observations of the heavenly bodies.

The inhabitants of ancient Sidon were the pioneers in this branch of knowledge. Neglecting the history of its development, this article gives a brief description of the practical navigation of a ship in making a voyage. The reader is referred, for a complete understanding of the subject, to Coffin's *Navigation and Nautical Astronomy* and to Bowditch's *Navigator*.

Before proceeding to sea, the ship should be furnished with charts of the ocean to be traversed; a sextant or sextant, a compass fitted with attachments for observing azimuths; a nautical almanac for the current year; a chronometer running on mean time whose error for a given meridian (generally that of Greenwich, England) and daily rate of error are known; a standard work on practical navigation; a lead-line properly marked for taking soundings; and a log-line for measuring the ship's speed. When the cargo is stowed and the vessel otherwise ready for sea the local deviation of her compass should be determined. In iron or steel-built ships the local deviation, due to the magnetism of the ship, is usually very great, and renders the compass unreliable. When this is found to be the case, the compass is adjusted by placing near it other magnets which neutralize the ship's magnetism. These are generally horizontal magnets, acting in the direction of the ship's magnetic force; a vertical magnet directly under the center of the needle; vertical soft iron bars, called Flinders bars, with one end on the level of the compass needle; and two hollow spheres of soft iron, placed on a line through the center of the compass, with their centers in the plane of the needle, and at equal distances from the compass. Full directions for determining the deviation and for the adjustment of the compass will be found in the *Admiralty Manual of Compass Deviation*.

As the ship stands out to sea a *departure* is taken. This is finding the ship's latitude and longitude from the chart by the bearing and distance of one landmark, or from the bearing of two or more marks whose positions are laid down on it. As soon as this departure is taken the *course is shaped* for the port to which the ship is bound, due regard being had for the winds, currents, and dangers to navigation to be encountered by the way, and from this time on the courses steered, the speed of the ship, etc., are duly noted in the log-book. Suppose the ship sails at night. At or about 8 A. M., or, better still, when the sun bears most nearly true E., and yet has sufficient altitude to avoid the irregular refraction near the horizon, its *altitude* (angular distance above the sea horizon) is measured with the sextant, and the instant of observation is noted by the chronometer. With the latitude and longitude of the ship at the time of taking the departure, with the courses and distances sailed, the former corrected for variation, leeway, and deviation to the time of the observation, we compute by trigonometry the latitude and longitude, or the position by *dead reckoning*. From the altitude of the sun observed (corrected, as all altitudes of the sun taken at sea have to be, for semi-diameter, parallax, dip, refraction, and the index error of the sextant), we

have the true altitude of the sun's center as seen from the center of the earth; from *The Nautical Almanac* we obtain the sun's declination for the instant of the observation; and by the dead reckoning we have the approximate latitude, data giving the three sides of the astronomical triangle; and from this we compute one of its angles, the hour-angle of the sun, the local apparent time, which is converted into mean time by the application of the equation of time taken from the almanac; the difference between the local mean and the chronometer times gives the longitude by observation. When taking the sun's altitude its bearing by compass and the ship's heading by compass should be noted. With the same data as above the sun's true bearing can be computed, and by comparing its true and compass bearings the errors of that compass on that heading of the ship are obtained.

Near noon the observer again begins to observe the sun, and continues to do so as long as the altitude increases, noting the sextant reading at the greatest altitude attained. The sun is said to *dip* when the altitude begins to decrease. The greatest altitude is assumed to be that when on the meridian, which is correct within small limits. By combining the sun's meridian altitude with its declination we obtain the declination of the zenith, which is the latitude of the position. The ship's run worked from the place of departure gives the *latitude and longitude by dead reckoning*; from the longitude by the A. M. observation corrected for the ship's run to noon we have the *longitude by observation*, and from the meridian altitude the *latitude by observation*. Any difference between the ship's position by observation and dead reckoning is ascribed to *current*, and its set and amount are the bearing and distance of the position by observation from that by dead reckoning. From the noon position by observation the reckoning begins as from the place of departure. In the afternoon, when the sun bears most nearly W., the observations for longitude and variation are repeated, and the above observations continue daily throughout the voyage.

The sun, however, may be obscured by clouds at the time of its crossing the meridian, and then it becomes necessary to resort to some other method than the one above given for finding the latitude. Appropriate formulas have been deduced for this by considering in the astronomical triangle the coaltitude, codeclination, and the hour-angle. This last, at sea, is always somewhat in doubt, but small errors in the hour-angle, when the angle itself is small, produce but slight errors in the latitude; under most circumstances good latitude results can be obtained from observations taken within one hour of the transit over the meridian. Observations of other heavenly bodies, as well as those of the sun, may be used for determining the latitude, longitude, and error of the compass. They are less resorted to, however, because of the difficulty of clearly seeing the horizon at night, this obscurity throwing some doubt upon the accuracy of all altitudes measured after dark at sea.

The position at sea can also be found by a method introduced to the nautical world by Capt. Thomas H. Sumner in 1843, and known as Sumner's method. If an altitude of the sun or other heavenly body be measured, and the Greenwich time noted, we can with its hour-angle and declination plot its position on a terrestrial globe. With this as a center and the coaltitude (zenith distance) as the radius, draw a circle; the observer was at the instant of observation somewhere on this circle. After the lapse of sufficient time repeat the above, and the observer, who is supposed to be stationary, will be found on a second circle. As he is thus on two circles he must be at one of their intersections. In practice the observations are so timed that the intersections are far apart, and the observer has no difficulty in knowing at which one he is. It is not essential that he remain stationary between the observations, as by appropriate reductions any change may be allowed for. In practice the plotting is made upon a chart, and only a small part of the circumference coming within the belt in which the ship is known to be is laid down, and that by points computed from each observation. The line joining the points calculated from one observation is called the *line of position*. The intersection of the lines obtained from the two observations gives the ship's position. The bearing of the heavenly body is always at right angles to the line of position, and the method gives the best results when the azimuth at the time of the second observation differs from that at the first by about 90°. The line of position is of much use in finding the bearing of the port in approaching land. For instance, suppose we have determined a single line and laid it down on the chart and

find that it cuts the land, say, 20 miles to the N. of the port to which we are bound. If we sail due S. for 20 miles and draw a line parallel to the first line, the ship is somewhere on this second one. As the new line passes through the port the course to the port is known, though not the distance; and by keeping a good lookout for the land and getting casts of the lead, the ship can sail on her way with confidence.

If, on a long voyage, the ship passes within sight of any known land, the longitude given by the land and that by observation should be compared as a check upon the running of the chronometer. The chronometer can also be checked by an observation called a *lunar*. The almanac gives for every three hours of Greenwich mean time the moon's angular distances (as seen from the center of the earth), from the sun, planets, and certain stars. Carefully measure with the sextant the distance between the moon and one of these heavenly bodies, and note the time by the chronometer. The angle measured can be reduced to what it would have been had the observation been made at the earth's center. By comparing our reduced angle with the almanac angle of the same magnitude for the body observed we obtain the Greenwich mean time, which, compared with our noted time, gives the error of the chronometer.

The winds and currents of the ocean have a material influence upon the speed of ocean voyages, even with modern steamers; with sailing vessels they are most important, and are truly said to control the mariner in his course, and to know how to steer his ship on this or that voyage so as always to make the most of them is the perfection of navigation. The voluminous works of Horsburgh, Findlay, Kerhallet, and Maury contain full information as to the winds and currents. For many years Maury accumulated the log-books from many ships in every part of the world, and tabulated and plotted the winds and currents they had encountered. The information thus collected has been graphically represented by the British Board of Trade, and conveys at a glance most complete information as to the winds and currents of the ocean highways. The approaches to the ports and the appearance of the land in their vicinity are described in local *Sailing Directions*, which are very complete for all parts of the globe, and are the guides for entering port and anchoring.

A. H. McCORMICK.

Navigation, Freedom of: the right to navigate freely the waters of seas or rivers. While the jurisdiction over the sea, near the land, and within bays and gulfs inclosed within not very remote headlands, is conceded to the territorial sovereign, it is admitted now on all hands that the open or high sea is common to all nations. Yet this rule has not always been conceded. Thus Portugal claimed the exclusive use of the African seas, together with the empire of Guinea, under a bull of Pope Nicholas V., given out in 1454. The pope's claim to do this seems to have been connected with his being the vicar of Christ, to whom the heathen were given "as an inheritance and the uttermost parts of the earth as his possession." The bulls of Alexander VI., issued in 1493, soon after Columbus had discovered America, carried out this assignment of parts of the world still further. One of them granted to Spain the lands lying W. of a meridian drawn 100 leagues W. of the Azores, and another divided the occupation of the seas between Spain and Portugal. It was to attack such pretensions, with others, that Grotius wrote his *Mare Liberum* in 1609. Other nations, especially Protestant ones, paid no regard to these grants, but the English in the seventeenth century claimed property in the narrow channels adjoining Great Britain, and on that account demanded that especial respect should be paid to their flag. This brought on war with Holland. In the peace of 1674 it was stipulated that even fleets should furl the flag and lower the topsails in honor of any English vessel of war between Cape Staten in Norway and Cape Finisterre in North Spain—quite beyond the claim of jurisdiction. Russia at a much later date claimed exclusive jurisdiction over the Pacific, N. of the 51st degree of latitude, on the ground that its territory, and no other, bordered on the ocean beyond that line; but this claim was abandoned in treaties made with the U. S. in 1824 and with Great Britain in 1825. All such claims may be considered as being now mere matters of history.

The free navigation of rivers forms another branch of this topic. Where a navigable stream flows through several countries and into the sea, by strict law exclusive rights of navigation of its lower waters and access to the ocean are

possessed only by the state within whose territory its mouth lies. Thus at the close of the eighteenth century the Spanish colony of Louisiana could impose its own conditions upon traffic on the Mississippi river between the Ohio valley and the Gulf of Mexico. In vain it was attempted to establish free navigation of the whole river as a natural right. Failing this, as necessity grew and liberal views also, partly through negotiation, partly through force, most of the great navigable rivers of the world have been made free to the world's commerce. By the Louisiana purchase the U. S. acquired the entire Mississippi. The Rhine and the Scheldt were opened at the Congress of Vienna in 1815; their free navigation was reaffirmed in 1841. In 1845 the Danube was opened to the common use of both Spain and Portugal. By various decrees and treaties between 1853 and 1859 the navigation of the Roon in Plata system was declared free. The Treaty of Paris in 1856 opened the Danube. The Emperor of Brazil gave the Amazon free by imperial decree in 1866. In 1854 the common right to navigate the St. Lawrence was arranged. This treaty expired in 1866, but the free mutual use forever of the St. Lawrence river, its canals, and Lake Michigan was again provided for by the Treaty of Washington in 1871, subject, however, to certain conditions and rights of regulation "on terms of equality." In 1871 also the navigable Alaskan rivers were opened to the free use of both Great Britain and the U. S. The treaty of 1846, which secured the Oregon country for the U. S., stipulated for the free navigation of the Columbia by the Hudson Bay Company and its trade. Lastly, at the Congo conference in Berlin, 1884-85, the free navigation of the Congo and the Niger was declared, subject to the regulations of an international commission. Thus in this direction little more remains to be asked for. These various decrees and treaties all prove that the free navigation of rivers has been granted as a concession, not secured as a right.

Revised by T. S. WOOLSEY.

Navigation, Inland: See CANALS, RIVERS, and LAKES.

Navigation Laws: See INTERNATIONAL LAW.

Navigator's Islands: a group of volcanic islands in Polynesia, now usually called SAMOA (q. v.)

Navy [from O. Fr. *navie*, navy < Late Lat. *navia*, ship, neut. plur. for Lat. *naves*, fem. plur. of *navis*, ship]: a fleet or assemblage of ships or vessels; specifically, the whole of the war vessels of a nation; the war marine of a state. Navies have grown out of either military necessities or the requirements of an ocean commerce obstructed by pirates. Trade and navigation may be said to be the parents of navies, those countries most largely interested in the former generally boasting of the most powerful fleets. While foreign trade produces wealth, and at the same time trains a class of men to the hardships of the sea, it requires protection and assistance in return. This is rendered by the military marine, whose service is largely recruited from the commercial. The Carthaginians, descended from the Phœnicians, were the most successful navigators of their day, their powerful navy being the natural offspring of an extensive ocean trade. The Romans, on the other hand, were not a commercial people. Their navy was forced into existence as an implement necessary in the great game of war, but it always occupied a minor position in comparison with their land forces. The military value of a navy was demonstrated in the earliest pages of its history. We may cite the first Persian invasion of Greece as the earliest case in point. Defeated at Marathon, the Persians hastily took to their ships, and threatened Athens. Having no navy to oppose them, it was only by the rapid march of Miltiades that the barbarians were prevented from landing again. The facility with which the Persians transported a large army to a great distance by means of their fleet; the advantage they enjoyed of striking the coasts of Greece at any particular point, and of afterward transferring the field of operations to other parts, imposing exhaustive marches on their enemies, taught the Greeks the necessity of a floating force. The Athenians were among the first known to authentic history to maintain a navy respectable in its character and distinguished for its organization, its discipline, and its efficiency. By a skillful use of this arm during the Peloponnesian war they were enabled to hold certain strategic points, giving them great advantage over their enemies, as Sestos, by which they kept control of the Hellespont and the corn-trade of the Euxine.

A navy proportioned to the commercial tonnage of a country and the extent of its shores is the best and most effective

sive protection to the coasts and commerce of that country. Since an efficient naval force (unlike an army) can not be improvised, every maritime state has found it necessary to maintain a permanent navy; and such navies have seldom lent themselves to the subversion of the political organization of the state. Besides the ordinary duties of policing the seas to keep down piracy and of affording a moral support to ministers at foreign courts and merchants in foreign trade, navies are constantly engaged in the fields of science, and have contributed generously to the common stock of knowledge and the advancement in civilization.

From these general views the reader may understand how and why navies have come into existence. To render it clearer, many examples might be drawn from modern history, but we may cite the origin of the U. S. navy alone as a fair illustration. In Sept., 1775, the British troops, closely invested in Boston, could receive supplies only by water. To intercept these, Gen. Washington, by virtue of his commission as commander-in-chief of all the Continental forces, detailed certain of his officers and men familiar with nautical pursuits to operate afloat in small armed cruisers. Vessels were purchased, fitted out, armed, and manned by the seamen of New England, and cruised in Massachusetts Bay with such success that, while depriving the enemy of necessary supplies, their prizes furnished the colonial army with such materials of war as alone rendered the successful prosecution of hostilities possible. The measures adopted by Washington being confirmed by Congress, other vessels were soon added to the list by legislative authority, prize-laws enacted, and a navy gradually formed. The country was so exhausted by the struggle that on the termination of the Revolutionary war the navy for a time passed out of existence. Its re-establishment under the present constitution furnishes another illustration. The commerce of the republic spread to every sea, but the new flag was treated with little respect by either civilized or uncivilized states; the former disregarded its neutral rights, the latter did not hesitate to offer it insult. The U. S. was bound therefore, in the interests of peace and civilization, to create a navy. Peace with Algiers put an end for a time to naval preparations, when statesmen were again admonished of the necessity of an armed force on the ocean by the depredations of French cruisers; but as hostilities with France were of short duration and never fully recognized, the first notable service of the young navy was to fulfill the mission for which it was primarily created by putting down the Barbary powers, who had been plundering U. S. merchantmen and imprisoning U. S. citizens. The successful prosecution of the war with Tripoli, by which the dey was compelled to recognize the laws of nations, redounded greatly to the credit of the navy. The war of 1812 with Great Britain was the next in which the navy was called to take a prominent part. Although the U. S. had nothing on the ocean that could contend against the powerful fleets of Great Britain, yet the few single engagements that were fought developed so much professional skill on the part of the officers, such fine qualities on the part of the seamen, that the republic soon saw itself possessed of all the elements for one of the finest navies in the world. On the lakes, where the forces of the two countries were more nearly equal, this was still more manifest, for the results of the victories gained on Erie and Champlain were immediate and important, the British themselves admitting that they lost there all but their honor. During the Mexican war and the civil war the field of operations of the navy was confined to blockading and to service on shore, there being no seagoing ships on either occasion to contend with.

The single fights of isolated cruisers, however heroic, rarely have any effect upon the ultimate results of a war. The real fighting strength of a navy is measured by its line of battle, and the U. S. has never had ships in sufficient number and of requisite military value to form a line of battle; so that in reality its strength as a naval power has never been tested.

Among the notable scientific undertakings of the navy of the U. S. may be mentioned the U. S. Exploring Expedition and that to Japan, the interoceanic canal surveys, Arctic voyages, and those for deep-sea soundings, the Pacific explorations for hidden dangers, and the distant voyage of the Swatara (which, like that of Capt. Cook to Otaheite in 1769, was undertaken for the purpose of observing the transit of Venus), and besides these the War College, the Naval Observatory, the Coast Survey, Hydrographic Office, torpedo station, and Naval Academy are all contributing to scientific research and the common stock of useful information.

Organization of the U. S. Navy.—The Constitution of the U. S. imposes on Congress the duty of providing and maintaining a navy, and of making rules for the government and regulation of the naval forces. It declares the President to be commander-in-chief of the army and navy, and requires him to commission all officers of the U. S. Such commissions continue in force only during the pleasure of the President of the U. S. for the time being. The Secretary of the Navy presides over the Navy Department, and is the duly constituted adviser of the President on all questions relating to naval affairs. In his former duties he is assisted by an assistant secretary and the chiefs of eight bureaus, as follows: Equipment, yards and docks, navigation, ordnance, medicine and surgery, supplies and accounts, steam-engineering, and construction and repairs. The chiefs of bureaus are appointed by the President, with the sanction of the Senate, for a term of four years, and while so acting have the relative rank of commodore, unless already holding a higher grade. The law declares that the orders of the chiefs of bureaus shall be considered as emanating from the Secretary of the Navy, "and shall have full force and effect as such." The active list of the line officers is divided into eleven grades, the number in each grade being limited by the act of Aug. 5, 1882, as given below. The relative rank between officers of the navy and army on the active or retired list is as follows:

The admiral of the navy to rank with general of the army.	
The vice-admiral " " lieutenant-general of the army.	
6 rear-admirals " " major-generals " "	
10 commodores " " brigadier-generals " "	
45 captains " " colonels " "	
85 commanders " " lieutenant-colonels " "	
74 lieutenant commanders " " majors " "	
250 lieutenants " " captains " "	
75 lieutenants (jr. grade) " " first lieutenants " "	
Ensigns " " second lieutenants " "	

The offices of admiral and vice-admiral expired on the death of Admiral D. D. Porter and of Vice-Admiral S. C. Rowan.

All staff officers are appointed by the President, with the sanction of the Senate. By act of Aug. 5, 1882, the active list of the medical corps consists of 15 medical directors, 15 medical inspectors, 50 surgeons, and 90 assistant surgeons, with the relative rank respectively of captain, commander, lieutenant-commander or lieutenant, and of lieutenant (junior grade) or ensign. The pay corps consists of 13 pay-directors, 13 pay-inspectors, 40 paymasters, 20 passed assistant paymasters, and 10 assistant paymasters, having a like relative rank; and the engineer corps of 10 chief engineers having the relative rank of captain, 15 of commander and 45 that of lieutenant-commander, 60 passed assistant engineers, and 40 assistant engineers. The law authorizes the appointment of 24 chaplains, who are permitted to conduct public worship according to the manner and forms of the Church of which they are members. The law also authorizes the appointment of 12 professors of mathematics, and as many naval constructors as the service may require. The foregoing officers are commissioned. The President is authorized to appoint for vessels in actual service as many boatswains, gunners, sailmakers, and carpenters as may, in his opinion, be proper. These are called warrant officers. All officers not entitled to hold commissions or warrants, except secretaries and clerks, are called petty officers. The number of enlisted persons in the navy, including seamen, ordinary seamen, landsmen, mechanics, firemen, coal-heavers, apprentices, and boys, is limited by act of Mar. 3, 1893, to 9,000.

The pay of all officers of the navy is fixed by law, and may be seen by reference to the *Navy Register* issued for the year. The pay allowed to petty officers (excepting mates), and the pay and bounty upon enlistment of seamen and others of inferior rating, are left by Congress to the President, with the sole proviso that the total amount of pay for officers and seamen shall not exceed the amount appropriated for that purpose. By the act of Aug. 5, 1882, vacancies in the lower grades of the line, Engineer Corps, and Marine Corps are to be filled from the graduates of the Naval Academy. The Marine Corps forms part of the naval organization.

Naval discipline is maintained by the code embraced in the "act for the better government of the navy of the U. S.," commonly known as the "Articles of War." By navy regulation of Dec. 26, 1891, the ships of the navy of the U. S. are classed as follows:

Ships of 5,000 tons displacement and above are classed as *first rates*; those of and above 3,000, but below 5,000 tons displacement, as *second rates*; those of 1,000 and above,

but below 3,000 tons displacement, as *third rates*; and all those of less than 1,000 tons displacement, as *fourth rates*.

Vessels are named by the Secretary of the Navy, under direction of the President, as follows: First rates after the States of the Union, second rates after cities, third rates after important events, or names connected with the naval history of the U. S., fourth rates after lakes and rivers of U. S. Vessels of special class to be named appropriately to the service for which they are designed. The number of cruising vessels (which are built of steel) has been fixed at seventy.

The act of Apr. 21, 1806, authorizes the President to keep as many ships in commission during peace as he thinks proper, but Congress practically limits the number by the amount annually appropriated for the maintenance of the navy.

The following table shows the area, docks, etc., of the navy-yards and stations of the U. S.:

NAVY-YARDS AND STATIONS.	Acres.	Dry docks.	Floating docks.	Ship houses.	Slips.
Portsmouth, N. H.	164		1 balance.	3	3
Boston, Mass.	87½	1 granite.		4	6
New London, Conn.	86				
Brooklyn, N. Y.	161½	1 granite, 1 timber.		1	4
League island, Pa.	92½	1 timber.			
Washington, D. C.	42			1	4
Norfolk, Va.	82½	1 granite, 1 timber.			5
Port Royal, S. C.	41	1 building.			
Pensacola, Fla.	83½		1 sectional (in part only).		1
New Orleans, La.	22	1 appropriated for.			
Key West, Fla.	2½		1 stern dock.		
Mare island, Cal.	900	1 granite.	1 sectional.		1
Puget Sound, Wash.	192½	1 appropriated for.			
Sackett's Harbor, N. Y.	3½				
Coaster's Harbor isl and, Newport, R. I.	90				
Naval Home, Philadelphia, Pa.	24½				

Shore Stations.—Naval apprentice station, Naval War College, and naval torpedo station at Newport, R. I.; Naval Academy at Annapolis, Md.; Naval Observatory at Washington, D. C. S. B. LUCE.

Navy Department: that department of a government to which is intrusted the control and administration of its navy. The official designation for this department varies in different countries. That of Great Britain is called the Board of Admiralty, constituted by the lords commissioners for discharging the office of lord high admiral, a controller of the navy, and an expert civilian. Of these the first lord has supreme authority, and is a member of the cabinet.

That of the U. S. is officially denominated the Department of the Navy, and its head or chief is a civil officer, called the Secretary of the Navy, who receives his appointment from the President, by and with the advice and consent of the Senate, and is a member of the President's cabinet. His salary is \$8,000 per annum, without allowances of any description. As the President is, under the Constitution, the commander-in-chief of the army and navy of the U. S., the Secretary of the Navy is in reality his representative in the Navy Department. With the exception of cases in which independent powers are specially invested in him by law, his acts are regarded as having the direction and sanction of the President, and have full force and effect as such. Prior to the establishment of the Navy Department the administration of naval and maritime affairs was intrusted to committees, agents, and boards appointed under resolutions and acts of the Continental or the Federal Congress, and for nearly ten years (1789-98) to the Secretary of War. The establishment of a separate Navy Department was due to the increase in the size and importance of the navy, which took place partly as a result of the naval contests with Great Britain, and partly from the necessity of affording a reasonable degree of protection to the maritime interests of the nation.

By the act of Apr. 30, 1798, it was organized as a separate department, to be denominated the Department of the Navy, the chief thereof to be called the Secretary of the Navy, whose duty it should be to execute such orders as he should receive from the President of the U. S. relative to the procurement of naval stores and materials, and the construction,

Morals and Legislation (1830); *The Down-easters* (1833); *True Womanhood* (1859); *Wandering Recollections of a Somewhat Busy Life* (1870); and a very large number of other works. D. at Portland, June 21, 1876.

Revised by H. A. BEERS.

Neale, JOHN MASON: theologian and hymn-writer; b. in London, England, Jan. 24, 1818; was educated at Trinity College, Cambridge, and graduated 1840; took orders in the Church of England 1842; was made incumbent of Crawley in Sussex, and warden of Sackville College, East Grinstead, May, 1846. He became one of the literary champions of the High Church party, and was the founder of the sisterhood of St. Margaret 1856; obtained the Seatonian prize at Cambridge for an English sacred poem on nine occasions between 1845 and 1861. He published nearly seventy volumes, chiefly upon theological and ecclesiastical subjects, of which the best known were *The History of the Holy Eastern Church, the Patriarchate of Alexandria* (4 vols., London, 1847-51); *Medieval Preachers* (1857); *History of the so-called Jansenist Church of Holland* (1858); *Essays on Liturgiology and Church History* (1863); *Medieval Hymns from the Latin* (1851); and *Hymns of the Eastern Church* (1863). He also published an edition of Bunyan's *Pilgrim's Progress* (1853) for the use of children of the Anglican Church, and his notes to that work gave rise to much controversy. He wrote the popular hymns on the New Jerusalem (*Jerusalem the Golden*, etc.) on the basis of the original, besides a great number of other hymns, partly original, partly translated; *Hymns for the Sick* (1843); *Hymns for Children* (1842-46, 3 series); *Rhythm of Bernard de Morlaix* (1858). D. at East Grinstead, Aug. 6, 1866.

Revised by S. M. JACKSON.

Neander, nā-an'der, JOHANN AUGUST WILHELM; ecclesiastical historian, whose real name was David Mendel; b. at Göttingen, Jan. 17, 1789, of Jewish parents and in humble circumstances; was educated in Hamburg, where he frequented the Johanneum; embraced Christianity in 1806, when he changed his name; studied theology at Jena and Göttingen, and was appointed professor extraordinary at Heidelberg 1812, and Ordinary Professor of Church History at the University of Berlin 1813, where he died July 14, 1850. With immense learning and decided genius he joined great simplicity of character, earnestness, and enthusiasm. By his works he rightfully won the title of the "father of Church history." The old conception of history as a mere concatenation of individual exertions he abandoned, and represented the history of the Christian Church as a general process by which a divine force works its way into the life of the human race. By this idea, first developed by Hegel and afterward manifoldly elaborated by the romantic school, Neander remodeled or regenerated the science of Church history; and he was prominent in that circle of theologians whose center was Schleiermacher, and which, in the earlier part of this century, awakened the educated classes of the German nation from their rationalistic indifference and led them back to Christianity, without throwing them into the arms of Romanism, as the romantic school did. As a writer of history he lacks dramatic power, and his style is heavy. His principal work is his *General History of the Christian Religion and Church*, from the close of the apostolic age to the Council of Basel in 1431 (6 vols., in 11 parts, 1825-52), translated into English by Prof. Joseph Torrey; but several of his monographs, on Julian the Apostate (1812), St. Bernard (1813), Gnosticism (1818), St. Chrysostom (1821), *Memorials of Christian Life in Early and Middle Ages* (translated into English by Ryland, London, 1852), are models of that kind of composition. He also wrote *History of the Planting and Training of the Christian Church by the Apostles* (translated by Ryland, Edinburgh, 1842, 2 vols.; revised by E. G. Robinson, New York, 1864) and *The Life of Jesus Christ* (translated by John McClintock, New York, 1848), in refutation of Strauss, etc. A complete edition of his *Works* appeared at Gotha in 13 vols. (1862-66). His library was purchased after his death for the Baptist theological seminary of Rochester, N. Y. See his *Life*, by A. Wiegand (Erfurt, 1890). Revised by S. M. JACKSON.

Nearchus, nēe-aar'kūs: one of the generals of Alexander the Great; commanded the fleet during the Indian expedition, and conducted it at the end of the campaign from the mouth of the Indus, through the Persian Gulf, to the mouth of the Tigris. Of his voyage he wrote an account, *Παρπάλους*, of which the substance is in Arrian's *Indica*, and shows the trustworthiness of the author.

Neat-work: See FOUNDATION.

Neb-neb: name given to the dry pods of a species of acacia, especially *A. arabia*, a native of the East and of Senegal. These pods contain much tannic acid, and are used by tanners in Egypt and in some other countries. They have also been used in dyeing.

Ne'bo [Heb. *N'bo*, the planet Mercury, worshiped by the Chaldeans and Assyrians as a god: Assyr. *Nabu*: Accadian, *Nabin*]: one of the principal divinities of the Babylonian pantheon, generally identified with the Egyptian Thoth and the Greek Hermes. His greatest temple was at Borsippa (Birs-Nimrud).

Nebo [Heb. *N'bo*, appar. named from being a seat of the worship of the god NEBO (*q. v.*): a mountain of Eastern Palestine, "over against Jericho" (Deut. xxxii. 49), identified, in 1875, by Prof. John A. Paine, of the American Palestine Exploration Society, with *Jebel Nebba*, 5 miles S. W. of Heshbon. It is 2,685 feet high. There was also a city of the same name (Num. xxxii. 3) in the immediate neighborhood.

Nebraska [from Indian, liter., shallow water, or Water Valley]: one of the U. S. of North America (North Central group); twenty-fourth in order of admission into the Union; popularly known as the "Blackwater State."

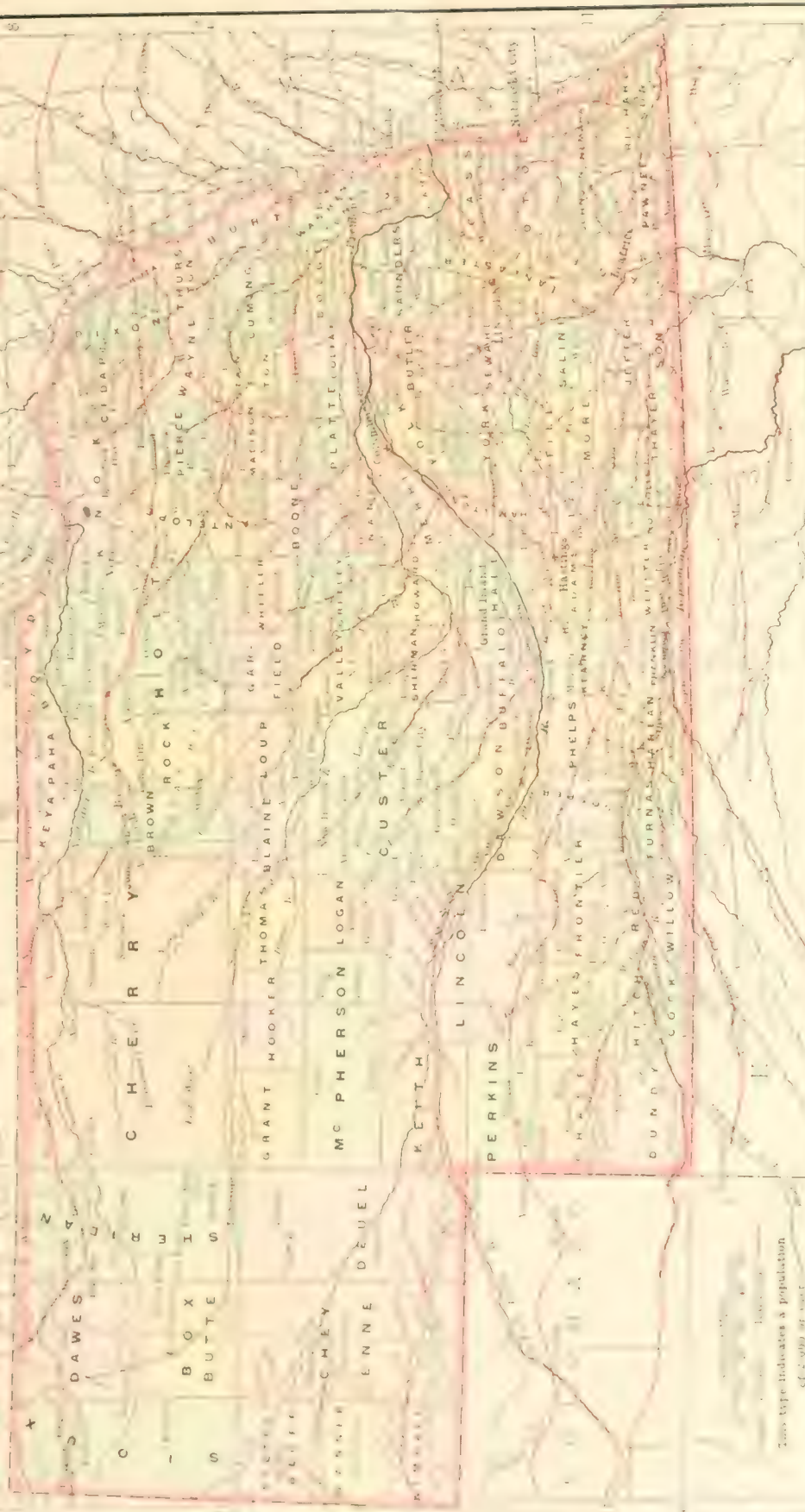
Location and Area.—It lies between 40° and 43° N. lat., and 95° 23' and 104° W. lon.; South Dakota lies N., the Missouri river separates it from Iowa and Missouri on the E., Kansas and Colorado lie S., and Wyoming W.; extreme length E. to W. 420 miles, N. to S. 208 miles. Area, 76,840 sq. miles (49,177,600 acres).

Physical Features.—Nebraska is one of the prairie States, with gently rolling surface in the E., which breaks into a few hills in the extreme W. The general slope of the surface is toward the southeast corner, which is about 875 feet above the level of the Gulf of Mexico. From here the ascent is very gradual both to the N., up the Missouri, and to the W., toward the foot-hills of the Rocky Mountains. In the northeast corner the elevation is 1,140 feet; in the N.W., at Mansfield, it is 3,628 feet; and at the southwest corner 3,258 feet. The general elevation along the entire western boundary exceeds 4,000 feet. The highest point in the State is Scott's Bluff, situated a little to the S. of the point where the North Fork of the Platte enters the State. Its elevation is over 6,000 feet. The gentle inclination of the surface allows water to flow off slowly, so that rivers are generally wide and shallow. Nebraska ranks second in the area of its rivers and small streams (630 sq. miles). The forks of the Platte river, rising in Colorado and flowing through Colorado and Wyoming, unite in Western Nebraska and run the full length of the State, turning a third of it into a fertile valley. The North Platte river from its source to its mouth at the Missouri has an estimated length of more than 1,400 miles, making it the seventh river in length in the U. S. The Niobrara river flows through the northern portion of the State, flowing into the Missouri. The extreme S. E. is drained by the Missouri directly, but the S. and S. W. are drained by the Republican, a tributary of the Kansas. The rich black soil, in a past age the bottom of a great fresh-water lake, washes into the streams and renders them very dark colored. Along with the deposits of limestone, sandstone, and shale, in the southeast counties are light veins of coal. These are not productive enough for more than local use. Rocks of the Permian age appear only in and near Gage County, in the S. E. The rocks of the Dakota group are found within an area extending from the upper half of the eastern border to the Kansas line, through Saunders, Lancaster, Saline, and Jefferson Counties. The "rotten limestone" and "chalk rock" of the Colorado group



Seal of Nebraska.

NEBRASKA



2000 1000 500 250 125 62.5 31.25 15.625 7.8125 3.90625 1.953125 0.9765625 0.48828125 0.244140625 0.1220703125 0.06103515625 0.030517578125 0.0152587890625 0.00762939453125 0.003814697265625 0.0019073486328125 0.00095367431640625 0.000476837158203125 0.0002384185791015625 0.00011920928955078125 0.000059604644775390625 0.0000298023223876953125 0.00001490116119384765625 0.000007450580596923828125 0.0000037252902984619140625 0.00000186264514923095703125 0.000000931322574615478515625 0.0000004656612873077392578125 0.00000023283064365386962890625 0.000000116415321826934814453125 0.0000000582076609134674072265625 0.00000002910383045673370361328125 0.000000014551915228366851806640625 0.0000000072759576141834259033203125 0.00000000363797880709171295166015625 0.000000001818989403545856475830078125 0.0000000009094947017729282379150390625 0.00000000045474735088646411895751953125 0.000000000227373675443232059478759765625 0.0000000001136868377216160297393798828125 0.00000000005684341886080801486968994140625 0.000000000028421709430404007434844970703125 0.0000000000142108547152020037174224853515625 0.00000000000710542735760100185871124267578125 0.000000000003552713678800500929355621337890625 0.0000000000017763568394002504646778106689453125 0.00000000000088817841970012523233890533447265625 0.000000000000444089209850062616169452667236328125 0.0000000000002220446049250313080847263336181640625 0.00000000000011102230246251565404236316680908203125 0.000000000000055511151231257827021181583404541015625 0.0000000000000277555756156289135105907917022705078125 0.00000000000001387778780781445675529539585113525390625 0.000000000000006938893903907227877647697925567626953125 0.0000000000000034694469519536139388238489627838134765625 0.00000000000000173472347597680696941192448139190673828125 0.000000000000000867361737988403484705962240695953369140625 0.0000000000000004336808689942017423529811203479766845703125 0.00000000000000021684043449710087117649056017398834228515625 0.000000000000000108420217248550435588245280086994171142578125 0.0000000000000000542101086242752177941226400434970855712890625 0.00000000000000002710505431213760889706132002174854278564453125 0.000000000000000013552527156068804448530660010874271392822265625 0.0000000000000000067762635780344022242653300054371356964111328125 0.00000000000000000338813178901720111213266500271856784820556640625 0.000000000000000001694065894508600556066332501359283924102783203125 0.0000000000000000008470329472543002780331662506796419620513916015625 0.00000000000000000042351647362715013901658312533982098102569580078125 0.000000000000000000211758236813575069508291562669910490512847900390625 0.0000000000000000001058791184067875347541457813349552452564239501953125 0.00000000000000000005293955920339376737707289066747762262821197509765625 0.000000000000000000026469779601696883688536445333738811314105987548828125 0.0000000000000000000132348898008484418442682226668694056570529937744140625 0.00000000000000000000661744490042422092213411133343470282852649688720703125 0.000000000000000000003308722450212110461067055666717351414263248443603515625 0.0000000000000000000016543612251060552305335278333586757071316242218017578125 0.00000000000000000000082718061255302761526676391667933785356581211090087890625 0.000000000000000000000413590306276513807633381958339668926782906054950439453125 0.0000000000000000000002067951531382569038166909791698344633914530274752197265625 0.00000000000000000000010339757656912845190834548958491723169572651373760986328125 0.000000000000000000000051698788284564225954172744792458615847863256868804931640625 0.0000000000000000000000258493941422821129770863723962293079239316284344024658203125 0.00000000000000000000001292469707114105648854318619811465396196581421720123291015625 0.000000000000000000000006462348535570528244271593099057326980982907108600616455078125 0.0000000000000000000000032311742677852641221357965495286634904914535543003082275390625 0.00000000000000000000000161558713389263206106789827476433174524572677715015411376953125 0.00000000000000000000000080779356694631603053394913738216587262286

The following summary from the census reports of 1880 and 1890 shows the growth of farm operations in the State:

• 11.11.1971

Groups	Age 1992	Age 1993	Value
G	1 414 126	1 428 560	\$42 465 000
	1 328 171	1 328 580	4 251 130
	1 400 280	2 288 580	5 451 180
	188 580	2 048 580	5 451 180
	10 000	200 580	250 580
	14 400	200 580	150 580
	152 800	4 000 580	4 021 130
2 001 800	2 000 000 000	12 021 130	
Z	11 412 810		\$60 200 000

Fauna.—The large mammals are almost extinct. The bison does not occur wild. Elk, deer, and antelope are very rare. In the western part of the State there are many o

Climate.—The mean annual temperature varies from 46.8 to 51.4°. The southeast part of the State has both higher temperature and greater rainfall than the other portions. The facts of greatest value to agricultural interests are that there are many consecutive days in the spring and summer with temperature above 50°, and that a large portion of the annual rainfall occurs during the months when crops are growing. The rainfall for the whole State is not quite as large as for the States immediately E., but the fall is better distributed according to the needs of the crops. The following tables show the temperature and rainfall for the year 1892:

Divisions.—For administrative purposes the State is divided into ninety counties, as follows:

COLLINS AND COLONY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	P. 1880.	P. 1890.	COUNTY TOWNS.	P. 1890.
Adams	11 F	10,275	22,494	Hastings	13,584
Antelope	9 F	6,356	16,400	Neligh	13,090
Arthur + ...	10 F		91		
Barrow	10 F		2,445	Halesburg	
Blaine + ...	9 D		1,446	Reinsdorf	
Bozette	10 F	4,170	8,686	Adrian	
Box Butte	9 E		5,494	Hemmingford	
Box 2	8 E			Butte	
Brayton	8 D		4,359	Answorth	1,444
Box Butte	10 E	7,591	22,102	Kearney	8,641
Burt	9 H	6,937	11,000	Beatrice	1,244
Burt + ...	10 G	9,394	17,144	Devel City	2,028
Cass	10 H	16,683	24,870	Plattsmouth	8,392
Cedar	8 G	2,699	7,128	Harrison	
Class	11 C	70	4,807	Superior	
Cherry + ...	8 C		4,448	Vandeventer	1,100
Chyenne	10 E	1,558	7,071	St. Mary	
Cody	11 F	12,144	16,400	Clay Center	1,400
Colfax	10 G	1,288	10,400	Selma	2,100
Conrad	9 G	1,000	12,967	Ward	1,812
Conrad	10 E	2,411	21,677	Broken Bow	1,647
Corral	9 G	241	5,396	Lincoln	
Crawford	8 A		9,000	Omaha	1,895
Crawford	10 E	2,800	10,120	Lexington	1,392
Crow	10 B		2,814	Clayton	
Crow	9 G	4,177	8,084	Frederick	1,600
Crow	11 C	11,000	10,000	Frederick	6,141
Douglas	10 H	37,615	178,408	Omaha	140,452
Dodge	11 C		4,012	Benkelman	
Dodge	11 F	5,014	16,092	Greeley	1,750
Fillmore	11 F	5,165	1,000	Beatrice	404
Franklin	11 D	934	8,497	Stearns	215
Frontier	11 D	6,467	2,800	Denver City	
Frontier	11 G	11,000	10,000	Beatrice	11,800
Garfield	11 G		1,059	Lawson	800
Garfield	11 D	1,673	4,800	Lawson	
Garfield	11 C		4,800	Hopewell	
Greeley	10 F	1,400	1,800	Greeley	
Greeley	11 F	8,000	16,513	Grand Island	
Hamilton	11 F	8,000	11,000	Adrian	
Hamilton	11 F	8,000	8,000	Adrian	
Hamilton	11 C		3,953	Haves Center	
Hitchcock	11 C	1,012	5,790	Frederick	
Hitchcock	11 F	28	13,672	Omaha	1,000
Hitchcock	11 C		4,000	Madison	
Hitchcock	10 F	4,391	9,411	St. Mary	
Jefferson	11 G	8,000	14,800	Frederick	2,600

[illegible]

* | F# | G# | A# | B# | C# | D# | E# | F# |

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Johnson	11-H	7,595	10,333	Tecumseh	1,654
Kearney	11-E	4,072	9,061	Minden	1,380
Keith	10-C	194	2,556	Ogallala	494
Keya Paha†	8-E		3,920	Springview	
Kimball†	10-A		959	Kimball	193
Knock	8-F	3,666	8,582	Niobrara	633
Lancaster	10-G	28,090	76,395	Lincoln	55,154
Lincoln	10-D	3,632	10,441	North Platte	3,055
Logan†	9-D		1,378	Gandy	
Loup†	9-E		1,662	Taylor	
McPherson†	10-C		401	Tryon	
Madison	9-F	5,589	13,669	Madison	930
Merriek	10-F	5,341	8,758	Central City	1,308
Nance	10-F	1,212	5,773	Fullerton	
Nemaha	11-H	10,451	12,930	Auburn	1,537
Nuckolls	11-F	4,235	11,417	Nelson	913
Otoe	11-H	15,727	25,403	Nebraska City	11,494
Pawnee	11-H	6,920	10,340	Pawnee City	1,530
Perkins	10-C		4,364	Grant	315
Phelps	11-E	2,447	9,869	Holdrege	2,001
Pierce	9-F	1,202	4,864	Pierce	563
Platte	10-F	9,511	15,437	Columbus	3,134
Polk	10-F	6,846	10,817	Oseola	947
Red Willow	11-D	3,044	8,837	Indianola	579
Richardson	11-H	15,031	17,574	Falls City	2,102
Rock†	9-E		3,083	Bassett	
Saline	10-G	14,491	20,097	Wilber	1,236
Sarpy	10-H	4,481	6,875	Papillion	600
Saunders	10-G	15,810	21,577	Wahoo	2,006
Scott's Bluff†	9-A		1,888	Gering	
Seward	10-G	11,147	16,140	Seward	2,108
Sheridan†	8-B		8,687	Rushville	484
Sherman	10-E	2,061	6,399	Loup	671
Sioux	8-A	690	2,452	Harrison	111
Stanton	9-G	1,813	4,619	Stanton	857
Thayer	11-G	6,113	12,738	Hebron	1,502
Thomas	9-D		317	Theadford	
Thurston	9-G	109	3,176	Pender	429
Valley	10-E	2,324	7,092	Ord	1,208
Washington	10-H	8,631	11,869	Blair	2,069
Wayne	9-G	813	6,169	Wayne	1,178
Webster	11-F	7,104	11,210	Red Cloud	1,839
Wheeler	9-F	644	1,683	Bartlett	
York	10-G	11,170	17,379	York	3,405
Unorganized		2,913	693		
Totals		452,402	1,058,910		

* Reference for location of counties, see map of Nebraska.

† Formed since census of 1880. ‡ Formed since census of 1890.

N. B.—Arthur County is now part of McPherson County; Thurston County was formerly Blackbird County; Boyd County was organized in 1891 from part of South Dakota.

Principal Cities and Towns, with Population for 1890.—Omaha, 140,452; Lincoln, 55,154; Beatrice, 13,836; Hastings, 13,584; Nebraska City, 11,494; Plattsmouth, 8,392; Kearney, 8,074; South Omaha, 8,062; Grand Island, 7,536; and Fremont, 6,747.

Population and Races.—1860, 28,841; 1870, 122,993; 1880, 452,402; 1890, 1,058,910 (native, 856,368; foreigners, 202,542; males, 572,824; females, 486,086; white, 1,046,888; colored, 12,022, of whom 8,913 were of African descent, 214 Chinese, 2 Japanese, and 2,893 civilized Indians).

Industries and Business Interests.—Nebraska has not yet taken rank as a manufacturing State, but a good beginning has been made. In 1890 there were reported 3,014 manufacturing establishments, which had \$37,569,508 capital, employed 23,876 persons, paid \$12,984,571 for wages and \$67,334,532 for materials, and had products valued at \$93,037,794. The most important industries were smelting at Omaha; pork-packing at Omaha, Lincoln, and Nebraska City; distilling and brewing at Omaha and Nebraska City; limestone-quarrying and the manufacture of beet sugar at Norfolk and Grand Island; linseed oil at Omaha; cotton goods at Kearney; and flour and starch at Nebraska City. The Chicago, Burlington and Quincy Railroad has car-shops near Lincoln, and the Union Pacific at Omaha. In 1892 there were ninety-eight creameries in the State, which yielded butter to the value of \$10,000,000. See LINCOLN and OMAHA.

Valuations.—The assessed valuations of taxable property in 1893 aggregated \$194,733,124, and included 15,289,859 acres of improved land, valued at \$60,299,544; 13,041,457 acres of unimproved land, valued at \$27,051,620; 176,425 improved town and city lots, valued at \$30,888,037; and 355,751 unimproved town and city lots, valued at \$9,833,807.

Banking.—On Dec. 19, 1893, there were 133 national banks with combined capital of \$12,838,100, surplus and profits of \$3,021,528, and deposits of \$19,902,638; and 503 State banks with combined capital of \$10,815,745, surplus and profits of \$2,654,298, and deposits of \$17,178,549.

Post-offices and Periodicals.—On Jan. 1, 1894, there were

1,119 post-offices, of which 95 were presidential (3 first-class, 10 second-class, 82 third-class) and 1,024 fourth-class, 458 money-order offices, and 27 postal-note offices. There were 33 daily, 1 tri-weekly, 8 semi-weekly, 559 weekly, 4 semi-monthly, and 34 monthly periodicals; total, 639.

Libraries.—In 1892 there were 31 libraries of 1,000 volumes and over, which contained 150,668 bound volumes and 13,197 pamphlets. They were classified as follows: General, 6; school, 8; college, 5; college society, 1; law, 1; public institution, 2; State, 1; Y. M. C. A., 1; social, 3; historical, 1; not reported, 2.

Means of Communication.—The following is the mileage of the railways in Nebraska, given by the board of transportation in Mar., 1894: Chicago, Burlington, and Quincy ("B. and M."), 2,253-07; Chicago, St. Paul, Minneapolis, and Omaha, 261-85; Fremont, Elkhorn, and Missouri Valley, 985-19; Sioux City and Pacific, 26-95; Chicago, Rock Island, and Pacific, 248-33; Missouri Pacific, 279-46; Pacific R. R. in Nebraska, 71-22; Union Pacific, 467-48; Omaha and Republican Valley, 414-44; St. Joseph and Grand Island, 112-53; Kearney and Black Hills, 65-72; Kansas City, Wyandotte and Northwestern, 20-10; Nebraska and Western (Pacific Short Line), 129-16; total, 5,529-22.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organiza- tions.	Churches and halls.	Members.	Value of church property.
Roman Catholic	213	220	51,503	\$1,179,160
Methodist Episcopal	649	680	41,086	1,242,200
Lutheran, Synodical Conference	135	93	12,339	168,570
Presb. in the U. S. of America	228	187	12,159	576,210
Baptist	230	234	11,917	514,710
Congregational	172	144	10,145	640,204
Disciples of Christ	100	84	7,715	269,375
Lutheran, General Council	88	83	7,204	206,001
United Brethren in Christ	147	140	5,673	84,950
Lutheran, General Synod	73	73	3,731	320,420
Evangelical Association	81	84	3,458	86,100

Schools.—The system of public education is very complete. From the district schools and city grades, through the high schools to the university, the system is a unity. In addition there are a State normal school, schools for the blind, deaf and dumb, refractory youth and feeble-minded youth, and an efficient system of teachers' institutes and university extension. The management of the State University is vested in a board of regents, two members being elected biennially for the term of six years. The normal school is under the direction of a board of seven members, including the State superintendent of public instruction and the State treasurer.

In the school year 1891-92 there were 343,629 children of school age, of whom 253,909 were attending the public schools; 6,510 school districts; 6,234 school buildings; 9,085 teachers; 316 graded schools; 182 private schools; and a total expenditure in educational work of \$4,434,228.

Charitable, Reformatory, and Penal Institutions.—These comprise the State School for Feeble-minded Youth, at Beatrice; School for the Deaf and Dumb, at Omaha; School for the Blind, at Nebraska City; Industrial School for Boys, at Kearney; Industrial School for Girls, at Geneva; Home for Fallen Women, at Milford; State lunatic asylums, at Lincoln, Norfolk, and Hastings; Home for the Friendless, at Lincoln; Sailors' and Soldiers' Home, at Grand Island; and the State penitentiary, at Lincoln.

Political Organization.—There are few unusual features in the constitution of the State. The State officers are Governor, secretary, auditor, treasurer, attorney-general, Lieutenant-Governor, superintendent of public instruction, and commissioner of public lands and buildings, each elected by the State at large for two years. The clerk of the Supreme Court is the State librarian. Much of the executive work is done by boards, chief among which are those for public lands and buildings, equalization, transportation, school lands and buildings, health, and State printing. The Legislature consisted in 1894 of 33 Senators, elected from 30 districts, and 100 Representatives from 67 districts, each for a term of two years. Sessions are held biennially, beginning on the first Tuesday in January of odd-numbered years, and are limited to 60 days. A three-fifth vote passes a bill over the governor's veto. The judicial department consists of a Supreme Court of three members, district courts in 15 districts, county courts, justices' courts, and in cities police courts.

History.—A Spaniard named Coronado came up from Mexico as far as the south part of Nebraska as early as 1541. Father Marquette mapped out the Platte and Missouri in 1673. Darius, a Frenchman, came into the plains W. of the Missouri in 1719. Twenty years later the Marot brothers explored the Platte country. The fur-trading periods, in the latter part of which the Nebraska country served as trading ground, may be divided as follows: French, 1631-1763; British, 1763-1816; American, 1816-34. In 1810 the American Fur Company located a trading-post at Bellevue, on the high bluffs just N. of the mouth of the Platte river. Lewis and Clarke's expedition had passed up the west bank of the Missouri river in 1804, and other expeditions followed, viz., Major Long, 1819; W. H. Ashley, 1822; Rev. Samuel Parker, 1835; and Gen. Frémont, 1842. The U. S. Government established old Fort Atkinson, afterward called Fort Calhoun, in 1820. It was abandoned in 1828. Missionaries to the Indians began to penetrate the region W. of the Missouri river very early. One of the earliest was Moses Merrill, who preached to the Otoes from 1833 to 1840. The Mormons removed from Illinois in 1846, and their "winter quarters," a few miles N. of where Omaha now is, are said to have contained at one time 15,000 people. Nearly all of them shortly made their way beyond the mountains to Salt Lake City. The next great movement of population to the West, that of the gold-hunters, beginning in 1849, gave to the west bank of the Missouri its first towns, and Nebraska City and Plattsmouth had become towns of some size when the lands were formally thrown open to settlers. The first organization of the country by the famous Kansas-Nebraska Bill in 1854 made one Territory of all the region between parallel 40°, the summit of the Rocky Mountains, the Canada line, and the Missouri river. From 1803 to 1854 the tract was nothing in fact but Indian country, known on the statute-books as Louisiana Territory (1805), or the Territory of Missouri (1812). The Territorial form of government lasted from 1854 to 1867, during which the capital was at Omaha, and settlements grew westward from the Missouri slowly. With statehood in 1867 came also the Union Pacific Railway, and a change of the capital to Lincoln, where it has since remained. With the exception of the controversy over one of the electoral votes at the time of the presidential election of 1876, there have been few important events in the recent history of the State.

GOVERNORS OF NEBRASKA.

Territorial		Robert W. Furness	1873-75
Francis Burt	1854	Salus Garber	1875-79
T. B. Cuming (acting)	1854-55	Albion Noyes	1879-81
Mark W. Izard	1855-58	James W. Dawes	1881-87
Win A. Richardson	1858	John M. Thayer	1887-91
J. S. Morton (acting)	1858-59	James E. Boyd	1891-93
Samuel W. Black	1859-61	Leandro Crouse	1893-95
Alvin Saunders	1861-66	Silas A. Howard	1895
David Butler	1866-67		
State			
David Butler	1867-71		
W. H. James (acting)	1871-73		

Authorities. Publications of the State Board of Agriculture, State Horticultural Society, Bureau of Labor Statistics, reports of State officers, statutes, and publications of the State Historical Society; census of U. S., bulletins and three volumes for 1890; J. A. Barrett, *History and Government of Nebraska* (Lincoln, 1891); Johnson, *History of Nebraska*; *Nebraska State Gazetteer* for 1893.

JAY AMOS BARRETT.

Nebraska City: city; capital of Otoe co., Neb. (for location of county, see map of Nebraska, ref. 11-11); on the Missouri river, and the Burlington and the Mo. Pac. railways; 44 miles S. of Omaha, 57 miles E. of Lincoln; elevation above sea-level, 907 to 972 feet. The river here has two arms, which are crossed by a pontoon bridge that cost \$18,000, and by a steel railway bridge that cost \$1,000,000. The city contains 17 churches, a high school, 10 public-school buildings, the State School for the Blind, Roman Catholic convent, U. S. Government building, public library, hospital, 3 national banks with combined capital of \$200,000, a State bank with a capital of \$50,000, and a refinery, 4 daily, and 5 weekly periodicals. The industrial establishments include two large pork-packing plants, extensive stock-yards, cologne spirits and alcohol distillery, flour and starch mills, vitrified brick-works, several breweries, foundries, and machine-shops, creamery, canning-works, boiler-shops, marble-yards, plow and wagon factories, lumber-

yards, and planing-mills. The city is in the center of a rich corn and fruit belt, and has adequate sewerage, gas, electric-light, water, fire department, and street-railway services. Pop. (1880) 4,183; (1890) 11,494.

Editor of "News."

Nebuchadnezzar [from Heb. *nabuchadnetzar*, appar. the prince of the god Nebu or Mercury; but the form in Jer. xlix. 28 (Nebuchadrezzar) agrees more nearly with that found on the cuneiform monuments, *Nabu-kudurri-usur*, Nebu, defend the crown]: the greatest of the Kings of Babylon, son and successor of Nabopolassar, the founder of the empire; was of marriageable age at the time of his father's revolt against Assyria (B. C. 625), at which time Amuhia, daughter of the Median king, was betrothed to him; is supposed to have commanded the Babylonian auxiliaries in Cyaxares's war against Lydia, and to have brought the hostilities to a close by his mediation on the occasion of the famous eclipse foretold by Thales, B. C. 610; regained Carchemish on the Euphrates from the Egyptian king 605; subjugated Syria and Palestine, carrying the principal Jews into captivity in the same year; succeeded to the throne 604; besieged Tyre 598; completed the reduction of Judæa 586; destroyed Tyre after a siege of thirteen years 585; invaded and ravaged Egypt some years later; rebuilt in a splendid manner all the cities of Upper Babylonia; constructed vast temples, aqueducts, and palaces, the ruins of which still testify to their grandeur. He was, indeed, the most successful and the most powerful monarch who sat on the throne of Babylon. Of his insanity and the events preceding it we have no other account than from the book of Daniel, though numerous inscriptions tell us about his occupations at home. D. about 561. See Rawlinson's *Five Great Monarchies*; also the book of Daniel.

Nebulæ [= Lat., plur. of *nebula*, cloud; cf. Gr. *νεφέλη*, cloud; Sanskr. *nābhas*; O. H. Germ. *nebul*]; a class of celestial objects characterized by a certain cloudy aspect resembling the light of the Milky Way or the Magellanic clouds, or in numerous cases the diffused light of a comet's tail. By means of powerful telescopes many bodies having this nebulous appearance can be shown to be merely clusters of apparently faint stars, but it does not seem at present improper to treat of clusters and nebulae under one general name—nebulae. The nebulae are distinguished from the fixed stars by their apparent diameter, since the latter bodies appear, even under the greatest magnifying powers, without sensible magnitude. They are, on the other hand, distinguished from the planetary and cometary disks, not only by their peculiar luster, but by their immobility, since, as yet, a proper motion has not been demonstrated for any nebula except the trifold (*G. C.* 4355), although changes are known to have occurred within the body of one nebula and perhaps others. (See Holden in Silliman's *Am. Jour.*, May, 1876.) On account, therefore, of their fixity, it has always been considered that the nebulae belong to the regions of space very far removed from our solar system. Knowledge of these celestial bodies has been peculiarly dependent upon the successful construction of large telescopes, and is therefore almost exclusively the result of the labors of modern astronomers, beginning with Sir William Herschel.

The term "cloudy stars" is first found in the catalogue of Ptolemy, but each of the five objects so named by him is now known to be a coarse cluster of stars, easily resolvable into its elements by feeble telescopes. The Arabian astronomer Sufi in the middle of the tenth century makes mention of the Magellanic clouds and of the Andromeda nebula. The first recorded telescopic observation of a true nebula is by Simon Marius, who in 1612 had appropriately described the great nebula in Andromeda as appearing to the naked eye like the flame of a candle seen through a semi-transparent sheet of horn. In 1656 Huyghens recorded the discovery of a similar nebulous body in Orion, which had been discovered without the use of a telescope by Cysat in 1619. The largest general collection of nebulae previous to the time of Sir William Herschel was that published by Messier, whose first catalogue (1771) contained 45 nebulae and clusters; while his second and third catalogues (*Conn. des Temps*, 1783 and 1784), contained 103. Sir William Herschel discovered several thousand new nebulae and clusters, the places of which, with appropriate descriptions, were communicated by him to the Royal Society of London in three successive memoirs—in 1786, 1,000 new nebulae and clusters; in 1789, 1,000 additional nebulae and clusters; and in 1802, a third catalogue of 500 of these bodies. The present catalogue

is due to Sir John F. W. Herschel, son of Sir William, who in 1825 to 1830, with a 20-foot reflector, revised a portion of the work of his father in the northern hemisphere, compiling a catalogue of 2,306 nebulae, of which 500 were new.



FIG. 1.—The nebula in Orion (G. P. Bond).

He then transported his telescope and other apparatus in 1833 to the Cape of Good Hope, and devoted the years 1834 to 1838 inclusive to a "telescopic survey of the whole surface of the heavens." Of the seven portions into which this great work was divided, the first, on the nebulae of the southern heavens, contained a catalogue of 2,049 nebulae, of which about 500 were new. Some of the nebulae in the southern hemisphere observed by Sir John Herschel had also been catalogued by Dunlop, who in 1828 had presented to the Royal Society a catalogue (full of errors, however) of 629 nebulae and clusters observed at Paramatta.

Equally brilliant were the labors of William Parsons, Earl of Rosse, who applied reflecting telescopes of 3 and 6 feet diameter and 30 and 53 feet focal length to the study of the nebulae, and who directed his efforts rather to the minute study of interesting objects than to the discovery of new ones. Besides several earlier smaller papers, he communicated in the *Philosophical Transactions* for 1844 and 1850 the results of his examinations of several of the nebulae observed by Sir John Herschel, and in this paper, among other interesting phenomena, announced the existence of spiral nebulae. Further observations were published by him in 1860 and 1861. The astronomical labors of the Earl of Rosse have been worthily continued by his eldest son. Equally effective were the labors of Lassell, who by the establishment of a magnificent reflector of 4 feet aperture at Malta contributed greatly to this branch of astronomy. The *Memoirs of the Royal Astronomical Society*, vols. xviii., xxxvi., contain his work on this subject, as well as that of his assistant Mr. Marth, who discovered about 600 new nebulae. The great reflectors at Melbourne, Australia, and at Paris and Toulouse, France, are also devoted to the study of nebulae.

While the British observers of nebulae have preferred the use of large reflectors, those of other nations have been slow to adopt them; the most important observations made by others in which reflectors have been used, at least so far as yet published, are contained in the memoir of E. P. Mason, of New Haven, Conn., printed in the seventh volume of the *Transactions of the American Philosophical Society*.

The most comprehensive list of nebulae and clusters that has as yet been published is the General Catalogue of Sir John Herschel in the *Philosophical Transactions* of 1864, in which work he has combined in one catalogue all the observed positions of nebulae accessible to him in 1863, to the number of 5,079, which by a comprehensive system of references and synonyms enables one to recognize by whom a given nebula was first observed, and what is its general appearance. Since the publication of this catalogue a great number of additional nebulae have been observed, which are, however, so faint as to be visible only in the most powerful

telescopes. Herschel classified both nebulae and clusters into orders, defined by their actual shapes. Thus we have first, circular; second, elliptic; third, annular; fourth, long or ray-like; fifth, spiral; and sixth, very irregular nebulae.



FIG. 2.—The spiral nebula 51 M Canum Venaticorum (Earl of Rosse).

Evidences are at hand of slight variations in brightness, size, and form of a few nebulae. The frequent occurrence of double nebulae suggests the classification of these objects in this regard, and we find in the General Catalogue of Sir John Herschel, out of 5,079 objects, of which 4,050 are unresolved or true nebulae, 229 double nebulae, 49 triple, 30 quadruple, and 11 more or less complex multiple nebulae. D'Arrest remarks that among nebulae the double and probably binary nebulae occur more frequently than do similar stellar combinations in comparison with the total number of fixed stars.

The application of spectrum analysis to these bodies affords another system of classification. This difficult branch of observational astronomy we owe to William Huggins, F. R. S., of London, who in Aug., 1864, first turned his delicate spectroscope and moderately powerful refracting telescope upon the planetary nebulae. Secchi, d'Arrest, and, to a less extent, a few others, but especially Bredichin of Moscow and the younger John Herschel, have also contributed to our knowledge of this subject. It is apparent from the observations of these spectroscopists that among the nebulae there are some whose spectra have the characteristics belonging to the spectra of gases, and this almost entirely irrespective of the apparent resolvability or stellar nature of the nebulous mass. Other nebulae have the equally characteristic spectra peculiar to glowing solids. In a third and numerous class of nebulae we place all those whose spectra combine the characteristics of both the preceding classes. The relative motions of the earth and some nebulae are also indicated by Huggins's later observations. Photography has also been applied with success to the study of nebulae, and has revealed peculiarities which were not otherwise observed. Foremost in this branch of research is Isaac Roberts, F. R. S.

The consideration of the imperceptible gradation that exists as we pass from the faintest, most diffuse, and most irregular, by insensible gradations, down to the well-defined, brightest, and smallest of the planetary nebulae, led Sir William Herschel to imagine, most naturally, that the fixed stars, our sun, and the planets of our solar system were but the results of the systematic operations of evolution by means of which inhabitable worlds endowed with warmth, light, and life were brought forth out of primitive and gaseous matter; and, however much of hypothesis may be inherent in such a sys-

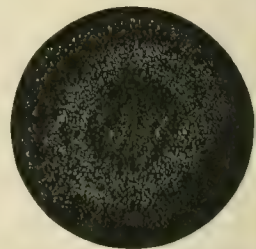


FIG. 3.—The annular nebula 57 M Lyrae (Earl of Rosse).

tem as this, or however little ground there may have been for belief in the nebular hypothesis as first advanced by Herschel, and subsequently elaborated by Laplace, there



FIG. 4. The great nebula in Andromeda (the P. Bonds).

would seem at the present day to be no reason to reject all of its propositions. See NEBULAR HYPOTHESIS.

CLEVELAND ABBE.

Nebular Hypothesis: the modern theory of the formation of stars and planets. The idea that the earth was, in some way, formed or created by the collection and arrangement of matter originally in a chaotic state seems to have been a part of the heritage of our race, being familiar even in prehistoric times. The first verse of the book of Genesis may be cited as an indication of this; but it was impossible to form any scientific basis for such a theory until after the discovery of universal gravitation. Perhaps Swedenborg has as good a right as any other to be regarded as first to suggest the modern theory. The accord of his work with recent ideas, however, was more in his description of the succession of the phenomena than in his reference to the theory of gravitation, for although Sir Isaac Newton published his *Principia* before Swedenborg wrote, it does not appear that gravitation played a prominent part in the speculations of the latter.

The German philosopher Kant is very generally regarded as the actual founder of the nebular hypothesis, because he reached it both inductively, by a study of the structure of the solar system, and deductively, by showing how gravitation could have resulted in the formation of the system from nebulous matter. He was the first to show that the hypothesis explains the fact that the orbits of the planets and satellites are all very nearly in the same plane, and that the revolutions both around the sun and on their axes are all in the same direction. We now know that this is not true of the satellites of Uranus and Neptune, but Kant was not acquainted with those bodies. To explain this common direction of motion, Kant assumes that all the materials out of which the bodies of our solar system were formed were, in the beginning of things, resolved into their original elements, and filled all that region of the universe in which these bodies now move. Kant, however, was too little acquainted with the laws of mechanics to show clearly how this condensation of the original matter would have resulted in the planets performing revolutions both around the central body and on their own axes. He did not confine himself to the solar system, but pointed out that the whole galaxy seemed to be a system somewhat of the same kind, thus assigning to the hypothesis the widest possible scope.

Herschel perceived the same correspondence, independently, in a different way, by the discovery and examination of the nebulae. He found that no sharp line could be drawn between the nebulae properly so called, which seemed to be composed wholly of glowing vapor, and clusters of stars. These two classes of bodies seemed to stand side by side, and to be

ble gradations. He therefore conceived that the stars are formed by the actual condensation of nebulae.

The author to whom the hypothesis has been most frequently referred is Laplace, the fact that he was anticipated by Kant having been very generally overlooked. Like Kant, he concluded that the remarkable uniformity in the directions of the rotation of the planets could not have been the result of chance. He had the great advantage over Kant of being a master of the mathematical theory of the rotation of bodies, and therefore better qualified than his predecessor to show how such rotations might originate. He begins, however, not with an assumed uniform nebulous mass, as Kant and others did, but with the sun itself, surrounded by a fiery atmosphere, which extended beyond the present limits of the solar system. This atmosphere consisted of the elements which now form the planets and satellites; and he showed how, by its gradual cooling and condensation, combined with a slow axial rotation, successive rings would be formed which would themselves gradually condense into planets and satellites. The zone of asteroids between Mars and Jupiter is explained by supposing that, owing to the general uniformity of the particular ring which formed these bodies, it did not condense around a single nucleus, but contracted into a great number of small bodies.

Since then the most eminent writer on the subject is Herbert Spencer, who has made the hypothesis a part of his general theory of evolution, and shown how the process by which nebulous matter condensed into planets was analogous to that which is seen in the generation and growth of animals, and in the whole tendency of progressive natural changes.

The most interesting question suggested by the hypothesis is as to what extent it can be considered as proved. The most we can say is that a number of natural phenomena point to it, or are explained by it, but that no one of them can be considered as actually proving it. It must, however, be admitted that if we are to explain the origin of the solar system otherwise than by the arbitrary fiat of the Creator, this is the only explanation that can be offered. It explains the fact that the EARTH (*q. v.*) is an intensely hot body, only the surface of which has cooled off. It explains also the origin of the sun's supply of heat, and shows why our central luminary did not, like the earth, cease to give off heat ages ago. See ENERGY.

S. NEWCOMB.

Necedah: village; Juneau co., Wis. (for location of county, see map of Wisconsin, ref. 6-D); on the Yellow river, and the Chi., Mil. and St. P. and the Chi. and N. W. railways; 19 miles N. of Manston, the county-seat, and 147 miles N. W. of Milwaukee. It is built up around a high bluff, in an agricultural and lumber region; contains four churches, public, high, and graded schools, and a weekly newspaper; and is engaged in general farming, cranberry cultivation, milling, and the manufacture of pine and hardwood lumber. Pop. (1880) 1,475; (1890) 1,708; (1895) 1,680.

EDITOR OF "RECREMAN."

Necessity [NĒS-Ī-TEE, from Lat. *necessitas*, deriv. of *nece*-*se*, necessary, unavoidable]: in philosophy, the name of a doctrine which treats of the essential relation which a being has toward another. It has importance theologically, morally, and scientifically. On it hinge the questions of God, freedom, and immortality, their solutions being determined affirmatively or negatively according to the type of necessity which is assumed as predominant in the universe. Three kinds or species of necessity may be enumerated as including the manifold distinctions under this head: (a) *Physical or causal necessity*, whereby a somewhat is subject to external constraint, determined to be what it is by another outside it. This necessity is founded on causation, and is known also under such designations as fate (*eiupatēria* of the Stoics), destiny (*necessitas consequentis* of the Schoolmen), natural selection (as understood by the ancient Epicureans and atomists; the Darwinian meaning of this term implies various degrees of self-activity and reaction against the environment, and thus suggests freedom rather than necessity); and such epithets as material, natural, blind, brute are given to it. (b) *Logical or metaphysical necessity*, which is either or formal, absolute, "metaphysical or mathematical" (Leibnitz), *necessitas consequentia* (Schoolmen), is variously defined as "that which can not but be in the nature of things"; "connection between parts of mental or verbal propositions"; "that the opposite of which implies contradiction." This form of necessity is founded on substantiality, "the connec-

tion of existence and essence," and is first a subjective necessity, the opposite of which is inconceivable, and, secondly, the condition also of objective reality. It is exemplified in "necessary truths" or "necessary ideas," the contrary of which can not be conceived. (c) *Moral or teleological necessity* is defined as "connection of end and means," "moral obligation or conscience," "that of motives," "that of rational determination or freedom." It is called in its various phases "categorical imperative" (Kant), "hypothetical necessity" (applied by Leibnitz to the divine predetermination), "overruling Providence" (*πρόνοια* of the Stoics). It is founded on Final Cause, and embraces phases of manifestation within the consciousness of man, as well as those based upon the divine will; hence the wide differences in the above definitions and epithets. Logical necessity, as the distinctive characteristic of *a priori* truth, was first enunciated by Leibnitz (*Nouveaux Essais*), and afterward made the basis of the critical system by Kant. In his *Critic of Pure Reason* Kant places the category of Necessity after those of Possibility and Reality, as forming their identity. A reality which has unrealized possibilities is contingent (this is Kant's thought), while a reality that has realized all of its possibilities is a necessary being, and can not be otherwise, having no other possibilities; this makes the sphere of reality coextensive with the sphere of possibility. They who set up physical or material necessity as the highest principle, if consistent, make God to be a blind force, mind to be an emanation from matter, and deny freedom and immortality. They who make moral or teleological necessity the first principle hold God to be personal, and interpret nature and history as stages in the realization of free, personal beings. Logical necessity is held to be identical with God's moral necessity by some. Psychologically, the perception of necessity marks the entrance into the stage of reflection. Sense-perception perceives no necessity; to it all is contingent. Each individual is to it independent and valid by itself. Without transcending experience one can not perceive necessity (although this is denied by Occam, the great nominalist). Reflection throughout all its stages is dominated by the idea of necessity. Each thing is dependent upon others—upon all others. In this principle are contained antinomies or unavoidable contradictions which it is the object of philosophy to solve. The process of their evolution and solution is called *dialectic*. By it the subsidiary character of physical necessity may be shown. It proves to be only a phase in the process of moral or teleological necessity, which is implied in free will. The following is an outline of the dialectic statement of the attitudes successively assumed by consciousness toward necessity: (a) All things are necessitated; each is necessitated by the totality of conditions; hence whatever is, must be as it is, and under the conditions can not be otherwise. (This is the standpoint of complete fatalism; its incompleteness and inadequateness is seen when applied to explain change.) (b) Things change—something new begins and something old ceases; according to the principle of necessity, the new must be necessitated by the totality of conditions, just as the old was. If the same totality of conditions necessitates both states (the new and the old), it follows that it is adapted to both, and hence indifferent to each; it allows one to pass into the other, and therefore does not absolutely condition or constrain either. Hence there must be two totalities of conditions, or indeed a new one for every change in the world, for the totality of conditions includes the reality of each thing, and therefore changes whenever anything changes. (c) Since every change involves change in the totality of conditions according to the principle of necessity, and inasmuch as all external necessity is included within the totality of conditions, it follows that this totality is its own internal necessity, moves or changes itself, originates its own action, is *causa sui*, spontaneity, freedom. The presupposition lying behind any form of physical necessity is therefore self-determination, which is discovered to be moral necessity (divine or in God) when carefully considered.

WILLIAM T. HARRIS.

Necho, or Neco (Egypt. *Nekau*): the second king of the twenty-sixth Egyptian dynasty; son and successor of Psammetichos I. He ruled from 610 to 594 B. C. Herodotus (ii., 158; iv., 42) relates his attempt to join the Nile with the Red Sea by a canal through the Wadi Tumilat, which apparently followed the line of a previous waterway, natural or artificial, that existed under Seti I. and Ramses II., and coincided generally with the fresh-water canal used during the construction of the Suez Canal. Herodotus (iv.,

42) also tells of the first circumnavigation of Africa during the reign of Necho. Necho continued the internal policy of his father by encouraging Greek colonization and trade. Taking advantage of political complications in the East, he attempted to restore Egyptian power in Asia, and in 608 B. C. he marched through Palestine to Megiddo, where he met the army of Josiah, King of Judah (2 Chron. xxxv., 21-24). He also intervened in the political affairs of the Hebrews (2 Chron. xxxvi., 1-4). With the rise of Babylonian power he saw his sway in Asia threatened and marched to Carchemish, where he met Nebuchadnezzar in 604, and was routed. In spite of subsequent appeals for aid from the Hebrews, he remained in Egypt during the rest of his reign, and there he died in 594 B. C. The threatened invasion of Nebuchadnezzar was deferred till the reign of Hophra (Apries), in 567 B. C.

CHARLES R. GILLET.

Neckar: a river of Germany; rising in the Schwarzwald Mountains, on the frontier of Württemberg and Baden. It flows with a tortuous course of 210 miles through a beautiful tract of land between low, vineclad hills, and joins the Rhine at Mannheim. It receives from the left the Enz and from the right the Jaxt, but it is shallow and difficult of navigation. Its basin contains 4,980 sq. miles.

Necker, JACQUES: French statesman; b. at Geneva, Sept. 30, 1732; went in 1747 to Paris as a clerk in a banking-house; established afterward a business of his own, and accumulated a great fortune during the Seven Years' war. In 1764 he married Suzanne Churchod, by whom he had one daughter, afterward the celebrated Mme. de Staël. Encouraged by his wife to mark out for himself a public career, he retired from his business, secured the position of syndic or director in the French East India Company, and subsequently became the diplomatic representative of Geneva in Paris. He acquired great authority in financial matters by his *Éloge* on Colbert and *Essai sur la Législation et le Commerce des Grains*, the latter work being an attack on the economic policy of the far abler Turgot. After the removal of Turgot in 1776 Necker was called to take part in the administration of the finances, and after the short administration of Clugny he was appointed director-general of the finances in 1777. Under his direction the financial condition was in some respects greatly improved. The administration was systematized; taxation became more equitable and public confidence was restored, though his persistent borrowing added greatly to the national debt. His wife, in the meanwhile, made his home the rendezvous of the political and literary celebrities of the time, and rivaled the famous Mme. Geoffrin as the mistress of a salon. A certain vanity in his bearing, however, made him disliked by the courtiers; he lost the favor of the queen by thwarting her wishes, and after the publication of his *Compte Rendu au Roi sur les Finances de l'État* in 1781, revealing the condition of the treasury, he was suddenly dismissed. He returned to Geneva, and bought Coppet, an estate in its vicinity, where he resided for several years, and wrote his *Administration des Finances*, which was published in 1784. He returned to Paris in 1787, but was soon banished for an attack which he published on the financial policy of Calonne. Meanwhile the administration of Fleury, Calonne, and Loménie de Brienne had brought financial matters in France to a crisis, and in Sept., 1788, Necker was recalled and made comptroller-general and Minister of State. He was regarded as the savior of France, and when the king once more dismissed him, on July 11, 1789, because he declined to participate in a royal measure by which the constitution of the third estate as a national assembly was to be annihilated, Paris rose in insurrection, and he returned to his office in triumph after a brief absence. He was, however, a good banker rather than a great financier, and as a statesman he was wholly unequal to the task set before him. In the National Assembly he was completely outshone, not only in political but even in financial questions, by Mirabeau and others, and when he resigned (Sept. 4, 1790) he had entirely lost not only his popularity as a hero of freedom, but also the respect he enjoyed as a financial authority. He lived afterward at Coppet, half forgotten by the world, and died there Apr. 9, 1804. His *Œuvres Complètes* were published in seventeen volumes in Paris in 1822 (revised ed. 1833). See Mme. de Staël-Holstein, *La Vie privée de M. Necker*, and Auguste de Staël-Holstein, *Notice sur la Vie de M. Necker* in his edition of the collected writings in 1833. See also d'Haussonville, *Le Salon de Mme. Necker* (1882).

Revised by F. M. COLBY.

Necromancy: See **Magic**.

Necro'sis [Med. Lat., from Gr. *nekros*, a making dead, deriv. of *nekros*, make dead, finally, deriv. of *nekros*, corpse] The death of a large mass of bone, or of a whole bone in the living subject, as distinguished from *caries*, the ulceration or molecular death of bone. Necrosis may result from injury, from periostitis, from phosphorus-poisoning, and from syphilis. It may be superficial, central, or total. Necrosis almost always calls for surgical interference for its complete cure. The dead bone has separated as a *sequestrum* from the living bone, and until it is quite detached it is worse than useless to attempt to operate. The sequestrum is usually removed in a case of bone tumor, which must be cut through before the removal can take place. If the patient be young and otherwise healthy, the removal of the sequestrum is usually followed by recovery. In all cases a generous diet, with appropriate tonic treatment, is called for.

The term *nekrosis* is also used to designate a variety of desintegration of tissues of the soft parts, of which *boils*, *abscess*, and *gangrene* are typical examples.

Nectanebo I. (Egypt. *Nef-t-Hor-Het*): the first king of the thirtieth Egyptian dynasty, reigning from 386 to 368 B. C. In spite of the Persian wars he left his name on many monuments and buildings. The extant evidence points to this as a brilliant season in Egyptian history. Greek influence was felt in all departments of life, and the warlike operations of the period were carried on largely by the aid of Greek mercenaries. Early in his reign he assisted the King of Cyprus against the Persians under Artaxerxes II., but upon the failure of the allied arms he was compelled to defend himself against a Persian invasion which was only checked when high Nile flooded the whole country. The conflict was continued under Teos, or Tachos, his successor, and also during the reign of NECTANEBO II. (361-349 B. C.), the last native King of Egypt. Ochus, the Persian king, marched to Pelusium and thence to Memphis after having defeated the allied forces of Cyprus, Phœnicia, and Egypt. Seeing the futility of further resistance, Nectanebo II. gathered what valuables he could and fled, probably to Memphis, some say to Mædion. From his reign we possess evidences of the working of the mines of Hammamat and of considerable architectural activity. The Persian rule, which succeeded, gave place (332 B. C.) to that of Alexander the Great. (C. R. G.)

Nectarine [from Old Fr. *nectarin*]: a tree and its fruit, differing from the peach, from which it is derived, mainly in having a smooth skin instead of a downy one. There are numerous sub-varieties, of which some are freestones. The nectarine is much grown in California, and can be grown wherever the peach thrives. Nectarines have sprung from the peach by bud-variation and from seeds. L. H. B.

Nectariniidae: See **SENIORIA**.

Nedjed: an Arabic word signifying elevated land or plateau. The Arabs use the term in connection with other names, as Nedjed-el-Hedjaz, or Nedjed-el-Oman. By European writers the term is specially applied to the vast, vague interior territory of Northern and Central Arabia. No reliable description of this region exists, but Palgrave's various works concerning it are of interest. E. A. G.

Needle gun [Fr. *sous-marin*; Germ. *Unterwasserkanone*]: a light, fire + *nadel*, needle + *gewehr*, gun]: a form of breech-loading small arms designed for military use, and for a long time the regulation weapon of the German infantry. It is the invention of Nicolaus Dreyse, and was extensively manufactured at Sömmerda, Prussia, his native town. Its efficiency was demonstrated in the war of 1866 between Prussia and Austria. As in the chassepot, the cartridge is exploded by means of a needle thrust into the detonating mass at the base of the bullet. See **SMITH AND WESSLEY**.

Needles and Needle-making [*needle* is from M. Eng. *neðel*, O. Eng. *neðel*, O. H. Germ. *nādan*, *nāden*, *nāden*, *nāden*]. (Cf. Germ. *nāhen*, sew < O. H. Germ. *nājan*): I. **NEEDLES**.—A needle is an instrument used by hand or in machinery for the purpose of carrying the thread in sewing or the making of hosiery. The principal kinds are: (1) The sewing-needle used by hand, which is a small piece of steel wire pointed at one end and pierced at the other so as to receive the thread. (2) Needles used by hand in knitting, crocheting, etc. The former are straight, slender rods with rounded ends, while the latter have a hook at one end. (3) Needles used in knitting-machines and sewing-machines;

they are of a considerable variety of forms. Historically, the needle in its earliest form was doubtless a strong thorn or a sharp splinter of bone, wood, or stone, with which the skins intended to be joined were perforated along their edges, these being afterward laced together by hand. The next step was to make an eye in the splinter, so that one operation should pierce the material and carry the thread through it; and by degrees needles came to be smoothed and finished with much neatness, as is shown by excellent prehistoric specimens to be seen in the British Museum. Many bronze needles have been found, varying in length from 1 to 8 inches, the longest having probably been used for hairpins; those discovered in Egyptian tombs are invariably coarse, though Wilkinson (*Ancient Egyptians*, iii., 384) assures us that finer kinds must have existed.

Judging by the delicate embroidery handed down to us, all through the Middle Ages fine needles must have been used. We read of their manufacture at Nuremberg during the fourteenth century. They were introduced into England under Queen Elizabeth, and the manufacture seems to have flourished, for about 1597 the "Pinners and Needlers" petitioned against the importation of foreign pins and needles. Knitting-needles were first used in the fifteenth century; and about the middle of the nineteenth century the peculiar kind of needles used in machinery were first made.

Knitting and Crochet Needles.—Knitting-needles, for use by hand in pairs or sets of four or five, are made of steel, ivory, bone, or wood; they are of various lengths, and of cylindrical shape with rounded ends. They are of such simple construction and so well known that they need no further description. Much skill has been displayed in the production of hooked needles for crocheting, and much ingeniously constructed machinery and many special appliances have been employed for the purpose. The hand-used needles, however, do not possess the greatest interest in comparison with those used in automatic machines, by which knit goods are produced.

Needles Used on Machinery.—These are chiefly employed in knitting and sewing-machines. (1) **Spring and Latch Needles.**—Spring needles of steel for hosiery or stockinet work are made by reducing the working end on a taper to an approximate point and bending the reduced portion over upon itself so as to form an open loop, a groove having been previously made so as to come opposite the point. In the operation of this needle the point stands out at the proper time for the yarn to be taken, which is to be carried through the loop to form the stitch. As the forward motion continues, the point is depressed into the groove by coming in contact with mechanism arranged for the purpose, and thus the passage through the loop without catching is insured.



FIG. 1.—Latch needle.

In the latch needles, instead of the spring barb, there is a short rigid hook, formed by tapering the working end nearly to a point and bending in combination with the latch. The latter is contained in a groove milled in the body of the needle and pivoted upon a rivet which passes through the walls of the groove. The latch, the walls between which it is riveted, and the diameter of the rivet are each only about one-hundredth part of an inch in thickness, so that extreme delicacy is required in the manufacture of these needles. The latch must work with the utmost freedom, resting at each stitch with its point toward the hooked end and the opposite or shank end alternately. Its office is to prevent the yarn from being caught under the hook except at the proper times, thus aiding in forming and casting off the stitch.

Needles Used on Sewing-Machines.—These are made as to preclude the possibility in limited space of describing each in detail, but broadly they may be described as having either an eye, hook, or barb, at the pointed end, and are used with a single thread in making a single loop-stitch both with eye and with barb. The needle best known to the public is the one with the eye at the pointed end, with a long groove on one side and a short groove on the opposite side. It is used in connection with a shuttle, or other device, for carrying a second thread which is passed through a loop of the thread in the needle, thus forming the double-lock stitch. The grooves are of importance in protecting the thread from wearing or being cut off in passing through the fabric operated upon.

Besides the ordinary needles for use on cloth are the wax-thread needles for use on leather, including many shapes for the different machines. These needles, in place of having an eye, are formed with hooks by which the thread is pulled

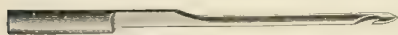


FIG. 2.—Sewing-machine needle.

cases. They are used for difficult leather-work once considered impossible of accomplishment by machinery. Among these is the needle used in the Goodyear welting-machine. It is a segment of a circle in shape. (See Fig. 3.)



FIG. 3.—Welting machine needle.

It puts welts upon boots and shoes with a rapidity and accuracy unapproachable by handwork.

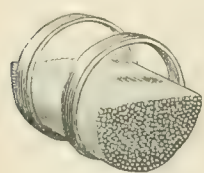


FIG. 4.

each containing several coils. The coils are first cut into two-needle lengths by a guillotine shearing-machine. The cut wires, technically called *blanks*, having been taken from a round coil, are slightly bent; the next process, therefore, is to straighten them. The blanks are inclosed in two strong iron rings (Fig. 4), then heated red in a furnace, and allowed to cool gradually. When cool they are removed to an iron plate and rubbed backward and forward with an instrument called a *smooth file*, consisting either of one broad curved bar which is introduced between the

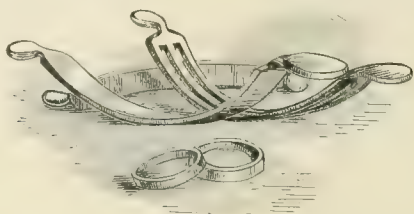


FIG. 5.

two rings or of three narrow bars joined at the ends, into the intervals of which the rings fit (Fig. 5). The blanks are next pointed at both ends, which was formerly done by hand on a grindstone. The blanks are withdrawn, one following another, from a hopper, by a pulley revolving at right angles to the grindstone, and are held to the face of the pulley by an India-rubber band. Between the pulley and the grindstone the blanks revolve on their axes and become pointed at one end, and the process is repeated for the other end. The wire blanks are next fed automatically into a belt-driven machine, in which a punch and dies form the prints for the eyes. Then oval holes are punched through the two prints of each blank by a vertical belt-driven punching-machine (Fig. 6). The needles are now strung or "spitted" upon two fine wires (Fig. 7), the "burrs" or projections caused by stamping are filed off, and the double needles are divided between the eyes by being gently bent to and fro. Each row, still strung on its wire, is grasped by the points in a sort of vise (Fig. 8), and the heads are laid upon a raised plate of metal and filed into shape. Now begin the tempering processes. The needles are heated red in a furnace, then cooled suddenly in cod oil, and so rendered excessively brittle. They are next tempered by exposure to slow heat, during which they are stirred about with a shovel until a blue oxide forms on them, when they are removed and allowed to cool gradually. Each one is next examined by being rolled with the finger on a smooth steel slab, and any that do not roll truly are weeded out. In parcels of about 50,000 they are next washed and scoured with soap, to remove any of the oil which adheres. The eyes are then blued and polished. According to one method

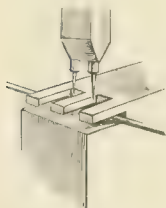


FIG. 6.

the polishing is done by threading the eyes loosely on wires carried by standards fixed to a tray which moves quickly with an alternating motion in a horizontal plane. In about an hour, with the use of a little emery and oil, the swinging of the needles on the wire smooths their eyes so that they may not cut the thread; but the eyes of the best needles are hand-polished with fine emery on flax threads. The heads are next ground and the points set by hand on a revolving stone of fine grain. The shanks are then polished by machinery. The needles, in rows one deep, are fed longitudinally between transverse leather-covered rollers with holding rollers above them. Besides revolving on their axes the rollers have a lateral alternating motion, thus giving a high polish to the needles. The older method of polishing needles is to put several thousands of them, first along with sand and emery-powder, and afterward with oil and putty-powder, in canvas bundles wound round with cords. A number of these then are put in a kind of mangle and rolled backward and forward for at least fifty hours. It is now necessary that the needles should be laid with their heads one way. A gun-metal disk revolving in a vertical plane takes up each needle by a groove in its circumference, and drops it on an inclined glass plate. Owing to their shape the needles describe an arc in falling, so that those with their heads in one direction go to the right, and the others to the left. As the finished needles differ slightly in their lengths, those of one size require to be separated from the others by the sorting process, in which gauges are used. Finally the needles are papered, either by being spitted on cloth pasted to paper or by being made up in packets. There are many sorts and sizes, including large needles used in sail-making, and special kinds employed for upholstery, surgical purposes, etc.

(2) *The Sewing-machine Needle*.—To reduce the blade from the size of the shank to the required size, and at the same time to put in the grooves, the wire was formerly stamped between dies. This threw out the superabundant material at each side as a flash or fin. These fins at the very first were cut off by hand-shears; later, with a die and punch in a press; then the needles were rounded up and pointed by filing. As the demand for sewing-machine needles gradually ran up into millions, step by step the methods changed. Stamping gave way to rolling, grinding, turning, and milling, until a machine was invented by O. L. Hopson and H. P. Brooks, and improved by E. J. Manville. It swages down the wire from the original size so as to produce any size of blade required, and as the reduction is made by compression, it effects a saving of material. The length being increased by the swaging process, in some cases there is a saving of half the material over the old methods.

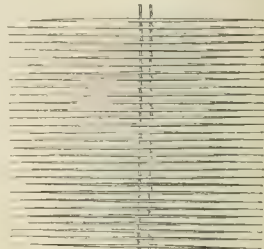


FIG. 7.

The blades are cylindrical and true to the intended size to a degree hitherto unknown. Simultaneously there have been improvements in the methods of grooving. Automatic groovers have come into use, which clamp and hold the needle, start in with the short grooves and withdraw the cutter at the proper time, after having proceeded the right distance, while the cutter on the opposite side goes on until the long groove is completed. Machines also for pointing, polishing the eyes, etc., have been devised to perform automatically what was formerly done by hand.

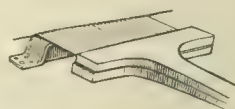


FIG. 8.

S. W. GOODYEAR.

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S. W. GOODYEAR.

Needles. The: a cluster of rocks on the west extremity of the Isle of Wight, which take their name from their pyramidal shape. Five in number, they are composed of chalk, dotted with thin strata of flint. The violent wave-action here is constantly changing the form of these rocks, only three of which now rise to any considerable height above the water. The Needles Light is situated on the outer part of the farthest of these celebrated rocks, which was previously leveled nearly to the water's edge to receive it. The name is applied by British navigators to many similar structures elsewhere.

Revised by M. W. HARRINGTON.

Neenah: city, founded in 1826 as a Government post, Winnebago co., W. S.; (for location of county, see map of Wisconsin, ref. 5-E); on the Fox river, at the outlet of Lake Winnebago, and on the Chi. and N. W., the Chi., Mil. and St. P., and the Wis. Cent. r. r. w. s. 14 miles N. of Oshkosh, the county seat. It contains 15 churches, 5 schools, houses, a commercial college, 3 public parks, 2 national banks with combined capital of \$140,000, 4 distilleries of paper, flour, and stoves, and 2 daily and 4 weekly newspapers. The city has abundant water-power, and has become a popular summer resort. Pop. (1880) 4,292; (1890) 5,984; (1895) 5,781. *Editor of "Times."*

Neesima, 1837-1903, JOSHUA HARVEY, physician and educator; b. in Tokio, Japan, in the year 1843. Anxious for a foreign education, he obtained a passage in a U. S. brig, and finally landed at Boston, where he found a patron in the gentleman whose name he assumed. An academic course at Andover and Amherst was followed by a theological course at Andover. He returned home in 1872 as secretary to Viscount Tanaka, commissioner of education, then at Washington, with whom he visited Europe. Neesima's name is inseparably associated with the founding of the Dōshisha College at Kioto, of which he became president. D. Jan. 23, 1890. He was held in high esteem by all classes of his countrymen. See his *Life and Letters*, edited by ARTHUR S. HARTY (Boston, 1892). J. M. DENON.

Nees von Esenbeck, KASIMIR EISENBCK, CHRISTIAN GOTT-FRIED DANIEL; botanist; b. at Reichenberg, Westphalia, Feb. 14, 1776; studied medicine at Jena, and was Professor of Botany at Leipzig, 1818-30, and at Bonn, 1830-52. His principal works are *Das System der Pflanz. Substanz* (1826); *System der Pflanz. Substanz* (1836); *Die Entwicklung der Pflanzensubstanz* (1819); *Die Naturgeschichte der Pflanz. Substanz* (1841). D. at Bonn, Mar. 16, 1858. Revised by CHARLES E. BESSEY.

Ne Exeat Reg'no [Lat., let him not go out of the kingdom]. **Writ of:** a writ used at present only in legal proceedings to restrain a person from departing from the jurisdiction of the court. The exact date when, and the circumstances under which, this writ was first issued are involved in obscurity, but it is known that according to the rules of early English law the king by virtue of his prerogative might issue a writ prohibiting a subject from going abroad without license; and it has been thought that this was not a rule of the common law. A section of King John's Great Charter allowed subjects to depart from the kingdom at their pleasure. In later charters this provision was not found, and it came to be understood as law that a subject did not possess the right of leaving the realm without the king's license, and writs could be issued to enforce the law. This rule of law has become practically obsolete, subjects being allowed freely to leave the kingdom except in time of war and public danger.

At the present time the writ of *ne exeat* is used simply as a judicial proceeding in the ordinary administration of justice. It is issued by a court of chancery (or equity) to prevent a party to a suit from withdrawing from the jurisdiction of the court, and thus rendering its decree ineffectual. The substance of the matter is that the defendant becomes liable to give bail or security that he will not withdraw himself from the power of the court to compel him by its process to abide its order, in default of which he will be imprisoned. It can only be resorted to for the purpose of enforcing equitable demands, except in the case of alimony and of an action for an account. Alimony in the case of a partial divorce was granted in England by the ecclesiastical court, which had no power of exacting bail, and the courts of equity, to prevent a failure of justice in such a case, aided the plaintiff by means of this writ. In the case of mutual account the court of equity has concurrent jurisdiction with the courts of law, and is thus, having jurisdiction, not debarred from issuing the *ne exeat*, though a court of law also has power over the case. It should be added that the claim must be pecuniary in its nature, and so far mature that present payment or performance can be rightly demanded. All that is necessary to give the court jurisdiction is the presence of the defendant, whether citizen or alien.

In the U. S. the equity courts of the respective States assume the same power over this subject that is exercised by the English courts of chancery, except where their inherent authority has been taken away by statute, or where the writ has been expressly abolished, as in the State of New York.

Where this remedy exists it may be granted in the form of an order as well as of a writ. For further details, see *Beasley, History of the Writ of Ne Exeat* (London, 1812); the works of Daniell and Barbour on *Chancery Practice*; and Story's *Equity Jurisprudence*.

Revised by F. STURGES ALLEN.

Negative Quantity: a quantity taken in a sense opposite to that which we have agreed to call *positive*. The terms *positive* and *negative* are correlative; if we agree to consider a quantity taken in any sense as positive, it will be negative when taken in a contrary sense. Thus if we agree to call distance estimated to the right of some point *positive*, then distance estimated to the left of that point will be *negative*. See IMAGINARY QUANTITIES.

Negaun'nee: city (founded in 1865); Marquette co., Mich. (for location of county, see map of Michigan, ref. 2-F); on the Chi. and N. W., and the Duluth, S. Sh. and Atlantic railways; 12 miles W. of Marquette. It is on Iron Mountain, at an elevation of 900 feet above the level of Lake Superior, and is principally engaged in iron-mining and lumbering. There are 5 churches, graded and convent schools, a national bank with capital of \$50,000, and a weekly newspaper. Pop. (1880) 3,931; (1890) 6,078; (1894) 5,940.

EDITOR OF "IRON HERALD."

Negligence [from O. Fr. < Lat. *negligentia*, deriv. of *negligere*, to neglect; neg, not, + ligere, to bind] is a legal cause of action, has been defined to consist "in the neglect of the use of ordinary care or skill toward a person to whom the defendant owes the duty of observing ordinary care and skill, by which neglect the plaintiff, without contributory negligence on his part, has suffered injury to his person or property." (Brett, Master of Rolls, in *Heaven vs. Pender*, 11 Queen's Bench Division 503.) The elements of the wrong, it will be observed, are (1) a legal duty to use care; (2) the neglect to perform such duty; (3) legal damage caused by such neglect to the person to whom the duty was owed.

(1) **Legal Duty.**—In order that negligence amount to a tort, the duty which has been neglected must be other than a contract duty, although it may arise out of contract. A person who negligently fails to pay his promissory note at maturity, and thereby causes the payee to lose a profitable bargain which he could have obtained had the money been paid, is liable for the breach of his contract, but not to an action in tort for negligence. A common carrier, however, who contracts to transport goods safely, and who negligently injures them, may be sued by the shipper, either in tort or for the breach of contract. In such a case "the contract creates a relation, out of which relation springs a duty independent of the mere contract obligation."

Extent of Duty.—A person's conduct may be very careless on a particular occasion, without subjecting him to an action for negligence on behalf of one damaged by such carelessness. Whether his carelessness is actionable negligence will depend upon whether he was under a duty to the injured party to exercise care. A farmer leaves maple-sirup in uncovered buckets in an open shed. His neighbor's cow wanders from her owner's premises into the shed, and dies from drinking the sirup. He is not liable in damages to the neighbor, for he was under no duty to guard trespassing cattle against a harmful beverage; but had he given his neighbor the legal right to turn the cow into the lot surrounding this shed he would have incurred a duty toward the neighbor to make the place reasonably safe, and his carelessness in dealing with the sirup would have been actionable negligence. (*Bush vs. Brainard*, 1 Cowen (New York) 78.) A trespasser who suffers damage from the mere carelessness of another has no cause of action in negligence, because the other is under no duty to exercise care toward such an one. The only duty is to refrain from willful or wanton misconduct toward him.

The duty to exercise care is at times very broad in its sweep, extending to those with whom the subject of the duty has no contract or personal relation; while at other times it is confined within narrow limits. One who deals in dangerous instruments or poisonous substances, or explosives, is bound to use reasonable exertions to prevent their doing harm to others. This obligation is not confined to his customers, but extends to strangers whose use of these articles is the natural and probable consequence of his parting with them. Hence a wholesale druggist who sends out the extract of belladonna carelessly labeled as the extract of dandelion is liable in damages to one who takes it as a medicine, though the label says "Dandelion."

dealer who bought it from a purchaser of the wholesale druggist. (*Thomas vs. Winchester*, 6 New York 397.) So a tradesman who sells gunpowder to a young child is liable to third persons who are injured by the child's use of it. The tradesman's duty was not confined to his purchaser, but extended to all who, he reasonably might have contemplated, would suffer from his carelessness. The same doctrine has been applied by some courts to the manufacturer of chattels, who carelessly sends them into the trade with defects which render them dangerous to their users. (*Schubert vs. Clark Co.*, 49 Minn. 331.) Other courts have refused to apply it in such cases, declaring that "if a contractor who erects a house, who builds a bridge, or performs any other work; a manufacturer who constructs a boiler, a piece of machinery, or a steamship, owes a duty to the whole world that his work, or his machine, or his steamship, shall contain no hidden defect, it is difficult to measure the extent of his responsibility, and no prudent man would engage in such occupations upon such conditions." These courts confine the duty of the contractor or the manufacturer to the parties with whom he deals. (*Curtin vs. Somerset*, 140 Penn. 70; *Heizer vs. Kingsland, etc., Co.*, 110 Mo. 605.)

Degrees of Care.—After it has been determined that a particular person was under a duty to exercise care toward another, it becomes important to inquire what amount of care was incumbent upon him. Upon this topic various theories have been maintained. One is that the law recognizes three degrees of care: Great care, or that which is usually bestowed upon the matter in hand by the most competent and prudent class of persons. Ordinary care, or that which is usually bestowed upon the matter in hand by the average person. Slight care, or that which is usually bestowed by persons of average prudence, having no special knowledge of or experience in such matters. (*Shearman and Redfield on Negligence*, 4th ed., §47.) According to another theory there are but two degrees of care—that required of one who is not and does not profess to be a good man of business, or an expert in the affairs under consideration, and that required of one who is or professes to be such an expert. (See Wharton on *Negligence*, bk. i., chap. ii.) A third theory, and the one generally accepted at present, recognizes but one legal standard of care for all cases, and that is the care usually exercised by the ordinarily prudent person in like circumstances. Whether an oculist has been negligent in operating upon an eye and whether a carrier has been negligent in transporting a barrel of apples are to be determined by the application of the same test. Each has failed to use ordinary care, and hence has been negligent if he has fallen below the standard of reasonable skill and attention which the ordinary man of his class would exercise in dealing with the like matter in like circumstances. According to this theory the legal standard of care remains constant; but the amount of care which that standard requires in a given case varies with its facts.

Amount of Care.—The manner in which this varies with the circumstances surrounding the one who is bound to use due care is well illustrated by the case of the occupier of land or buildings. We have seen that he is under no duty of care toward a trespasser. His only obligation is to refrain from inflicting willful or wanton injury upon such wrongdoer. Toward licensees (see LICENSES), including guests who are enjoying gratuitous hospitality, his duty does not extend beyond warning them of any secret danger, known to himself, but not reasonably apparent to them. Indeed, one who for his own benefit uses the property of another under a bare permission must take it, as a rule, with all its faults. All that he has a right to expect is that the owner will use reasonable care not to subject him to new perils without notice. In case the occupier of land or buildings invites others to enter or use them in connection with his business, his duty is "to make the place as little dangerous as such a place could reasonably be, having regard to the contrivances necessarily used in carrying on the business." (*Indermaur vs. Dames*, Law Reports, 1 Common Pleas 274.) If the property abuts on a highway, the risk of harm from its defective condition or its improper use is very great; consequently the owner is bound to use an amount of care and skill to protect passers-by from injury which is commensurate with the danger. If he is constructing a building on the line of a city street, he is bound to know that materials will probably fall and injure passers-by unless special safeguards are provided. His failure to take such precautions may well amount to a want of reasonable care—"an omission to do something which a reasonable man, guided upon those considerations

which ordinarily regulate the conduct of human affairs, would do." (*Jager vs. Adams*, 123 Mass. 26.) Similar considerations determine what is reasonable care on the part of passenger-carriers. A railway company, to be free from negligence, must inspect its road-bed and rolling stock more frequently and thoroughly than a stage-coach proprietor is bound to do.

Duty to Insure Safety.—In some cases the English common law requires one who brings upon his land that which exposes his neighbor to extraordinary risk "to insure his neighbor against any consequent harm, not due to some cause beyond human foresight and control." Thus the owner of animals is bound to keep them on his own land at his peril. If they escape and trespass upon a neighbor's land, the owner is liable for the natural consequences of that trespass, without regard to the care he has taken to keep them at home. So the keeper of a mischievous animal, having knowledge of its propensities, is bound to keep it securely. He does not perform his duty by using reasonable care to prevent its doing harm. Again, one who starts a fire on his premises for any purpose is bound to keep it there at his peril. The same doctrine has been applied by the English courts to one who constructs a reservoir on his land. In the leading case on this subject, decided in 1868 (*Rylands vs. Fletcher*, Law Reports, 3 House of Lords 330), it was declared that "the true rule of law is that the person who for his own purposes brings on his land and collects and keeps there anything not naturally there, and likely to do mischief if it escapes, must keep it in at his peril; and if he does not do so, is *prima facie* answerable for all the damage which is the natural consequence of its escape. He can excuse himself by showing that the escape was owing to the plaintiff's default; or perhaps that the escape was the consequence of *vis major*, or the act of God." Later cases have recognized exceptions, where the escape was caused by the act of a stranger; where the source of danger was maintained for the common benefit of the plaintiff and the defendant; and where its existence was authorized by law.

The doctrine of *Rylands vs. Fletcher* has been adopted without qualification in some of the U. S. (see *Baltimore, etc., Co. vs. Ranstead*, 28 Atlantic Reporter 273, Md. Court of Appeals, 1894), but in most jurisdictions it has been repudiated (*Marshall vs. Welwood*, 38 New Jersey Law 339), and the liability of one who constructs a reservoir on his land, or brings upon it a steam-boiler, or kindles a fire, is confined to damages caused by his failure to exercise reasonable care; that is, a care proportioned to the manifest risk to which his use of his land exposes his neighbor. Even in the case of trespassing animals the common-law doctrine has been greatly modified by statute in the various States, or has been declared by the courts inapplicable to the conditions and habits of the people. (*Morris vs. Fraker*, 5 Colorado 425.)

(2) **Breach of Duty.**—In an action for negligence the plaintiff must show not only that the defendant owes to him the duty of exercising reasonable care, but also that the duty has been violated. A person driving along a street must use reasonable care in selecting and controlling his horse. If, however, the animal becomes unmanageable through no fault of the driver, and runs away and injures the person or property of another, the latter has no cause of action for damages against the former. The harm results not from the driver's negligence, but from inevitable accident. Whether a person has failed to use reasonable care in a particular case is generally a question of fact for the jury. At times a positive duty is laid upon him by contract, by statute, or otherwise. Here the only question will be whether he has done the act required, or has abstained from that which was prohibited. Accordingly, if a statute or ordinance forbids the suspension of signs over a street, or of awnings over a sidewalk, or requires boats moving at night to display head-lights, or the owners of buildings having elevator-wells to protect them by rails, a person who inadvertently violates any of these provisions fails to use due diligence. Such positive requirements represent the minimum of reasonable care, but as a rule the question of reasonable care is one of fact. This does not mean that the court is bound to submit every action for negligence to the jury. On the other hand, it may dispose finally of the whole case wherever the only inference that can fairly be drawn by reasonable men from all the evidence is that there was no negligence. The respective functions of the court and jury have been stated briefly as follows: "The judge has to say whether any facts have been established by evi-

dence from which negligence may be reasonably inferred; the jurors have to say whether from these facts, which are admitted to them, negligence ought to be inferred. It is a question of law for the judge whether there is evidence which, if it is believed, and the contrary evidence, if any, not believed, would establish the facts in controversy. It is for the jury to say whether and how far the evidence is to be believed."

The common law does not presume negligence, but requires the one who bases a claim upon it to establish its existence by a fair preponderance of proof. He is not bound to prove it beyond a reasonable doubt, and he makes out a *prima facie* case by showing that the injury done was such as would not have occurred in the ordinary course of things had the defendant used reasonable care. Where one is injured by a building falling into the street without apparent cause, or by a barrel rolling out of a warehouse window to the sidewalk, or by a railway train jumping the track, or by a bridge breaking under an ordinary load, the very circumstances of the injury raise the presumption of negligence, and require an explanation from the defendant. This doctrine has been extended by statute in England and in some of the U. S., so that in certain cases, chiefly those of damages resulting from the operation of railways, proof of injury sustained by the plaintiff makes out a *prima facie* case, which the defendant is required to overcome.

Proximate Cause by the Defendant.—A breach of duty to use care must cause legal damage to the object of that duty in order to amount to actionable negligence. Whether physical suffering consequent upon a nervous shock caused by another's negligence constitutes legal damage is a subject of judicial disagreement. It was carefully considered by the Privy Council in *Victory v. The British Commissioners vs. Charles*, 13 Appeal Cases 222, and the conclusion was reached that no English decision treated such an injury as legal damage. It was thought unwise to extend the liability for negligence to this class of cases, because of the great difficulty that would ensue in determining whether the alleged injuries had been caused by the negligent act, and of the wide field that would be opened to imaginary claims. The same view has been taken by courts in the U. S. (See *Ewing vs. Pittsburg Railway Co.*, 147 Penn. 40.) On the other hand, it has been held that if the fright or nervous shock produced by defendant's negligence causes the victim's person to collide with some object, or even causes nervous convulsions and illness, the defendant is liable. (*Parsons vs. St. Paul Railway Co.*, 48 Minn. 144.) In some jurisdictions mental suffering, although neither an incident nor a producer of physical injury, has been adjudged to constitute legal damage; as when a child has been prevented from attending his parent's funeral by the negligence of a telegraph company in transmitting a message. The weight of authority, however, is against this view. See *Kester vs. Western Union Co.*, 55 Federal Reporter 604.

Not only must the defendant's negligence sustain the relation of cause to plaintiff's harm, but it must be the proximate cause. Between the negligence complained of and the injury there must be an unbroken connection. If a new and independent cause intervenes, this and not the remote cause bears the whole legal responsibility for the harm. "The rule is difficult of application; but it is generally held that, in order to warrant finding that negligence or an act not amounting to wanton wrong is the proximate cause of an injury, it must appear that the injury was the natural and probable consequence of the negligence or wrongful act, and that it ought to have been foreseen in the light of the attending circumstances." In applying this rule it has been held that the proximate cause of the loss of goods, which had been negligently delayed by a common carrier, and destroyed by an extraordinary freshet while thus delayed, was the flood, and not the negligence. (*Railroad Co. vs. Reeve*, 10 Wallace (U. S.) 176.) Consistently with this holding, it has been decided that the negligence of the State in permitting a bridge to remain in an unsafe condition was the proximate cause of the death by drowning of a father, who plunged into the canal to save his child upon the latter's falling into the water by reason of the defect in the bridge. (*Gibney vs. State*, 137 N. Y. 1.) In the former case the destruction of the property by the flood was not the natural and probable consequence of the carrier's delay. In the latter case the father's desperate efforts to save his child were the natural and probable result of the danger to which the defendant's negligence had subjected him.

Concurring Causes.—It is not necessary that the defend-

ant's misconduct be the sole cause of plaintiff's damage. One who is injured by a collision of the trains of two railway companies can maintain an action against either, or both, if both are in fault. If but one was negligent, he must look to that one for redress. Even though it be shown that defendant was negligent at the time of the harm, if such fault was simply a condition of the injury, while its immediate cause was the independent wrongful act of a third person, the latter will be treated as solely responsible therefor. If, however, such act by a stranger might have been foreseen as a reasonably probable result of defendant's negligence, it will not relieve him from liability.

Contributory Negligence.—If one of the concurring causes of plaintiff's injury is his own lack of proper care, he can not recover, although but for defendant's negligence the harm would not have happened. However, it is to be remembered that plaintiff's want of care must be a cause of the injury, in order to defeat his recovery. If it is a condition only, it will have no such result. This is illustrated by a case where the plaintiff was put to work on a platform surrounding the defendant's building, and was warned not to go on a certain part which was not railed, because of the danger of slipping on the ice and falling off. While on the forbidden part he was knocked to the ground by bricks falling from the building by reason of defendant's negligence, and concerning which he had not been warned. It was held that plaintiff's going upon the slippery part of the platform was not the proximate cause of his injury. By passing to that part he took the risk of dangers pointed out, but not the risk of different perils to which he was subjected by defendant's negligence. (*Southwick vs. Hall*, 59 Conn. 261.) Moreover, the plaintiff may have been negligent with respect to the very source of the injury, and yet if the defendant might have avoided inflicting the harm by exercising reasonable care, after the occurrence of plaintiff's negligence, the defendant is liable. While in one sense the carelessness of the plaintiff contributed to the harm, it was not its proximate cause. Hence one who recklessly drove against a donkey, which had been carelessly turned into the highway by its owner with its forefeet fettered, was held liable for the injury. It is the duty of one who has been harmed by the negligence of another to use reasonable efforts to make the damage as small as possible. If he has sustained a personal injury, he is bound to take proper care of himself, and this may include suitable medical treatment. When, however, he uses proper care in selecting a physician, and the latter aggravates the injury by unskillfulness, the original wrongdoer is liable for the increased damages. They are an incident, a natural and probable consequence, of the defendant's wrongful act. *Pullman Palace Car Co. vs. Bluhm*, 109 Ill. 20.

A person is not chargeable with contributory negligence who acts without deliberation, and as the event discloses, unwisely, in the attempt to extricate himself from a peril brought upon him by another's fault. In such a case the defendant must show that the plaintiff's conduct was unreasonable under the circumstances, and reckless. Nor is it contributory negligence for one, in the discharge of duty, to remain in a situation made dangerous by the negligence of another. An engineer who remains at his post in the attempt to save his train from disaster is an example. So a person who, without recklessness, exposes himself to danger to save a human life imperiled by another's negligence, and is injured, may recover damages. *Pennsylvania Co. vs. Langendorff*, 48 Ohio 316.

While contributory negligence is a bar to the plaintiff's action for damages at common law, it is not in ADMIRALTY (*q. v.*), although his willful, gross, or inexcusable fault will defeat him. If both parties are negligent the damages are divided between them, though not always equally. (*The Max Morris*, 137 U. S. 1.) As this doctrine applies to all maritime torts, a person injured by the negligence of another will often find it to his advantage to bring his suit in admiralty rather than in a common-law court.

Imputed Negligence.—The fault of one may be imputable to another when the former occupies the relation of servant to the latter. (See MASTER AND SERVANT.) In some jurisdictions this rule has been extended so as to charge a passenger with the negligence of his carrier, and a child with the negligence of his parent or guardian. The leading case in support of the first view is *Thorogood vs. Bryan* (8 Common Bench Reports 115), which held that a passenger in an omnibus was to be considered so far identified with the owner that negligence on the part of the owner or his serv-

ant was to be deemed the negligence of the passenger. The case has been overruled in England (*The Bernina*, 13 Appeal Cases 1), and is generally repudiated in the U. S. (*Little vs. Hackett*, 116 U. S. 366.) Its doctrine is clearly unsound. Neither the owner nor his servant is under the control of the passenger. If the carrier's negligence is imputable to the passenger so as to defeat his recovery against a negligent third person, it ought to be imputable to him, so as to render him liable to a third person injured by the carrier's negligence. Equally unsound is the doctrine that a parent's negligence is imputable to his infant child. The legal right and duty of the parent to protect the child exist for the infant's benefit, not for his detriment. It is true that the parent's negligence may be the proximate cause of the child's injury in a particular case, and the third party's negligence only the remote cause. When such are the facts, the parent and not the third party is responsible; but if their negligent acts concur to produce the harm, there is no reason why the parent's misconduct should protect the third party from liability to the infant. *Newman vs. Phillipsburg Co.*, 52 N. J. Law 446.

Death by Negligence.—At the common law, if an injury occasioned by negligence caused death, no civil action could be maintained. It is plain that no action could be brought in the name of the person killed. Other persons, it is said, are not pecuniarily damaged, as they could only claim compensation on the ground of loss of service, and the relation of master and servant, whether expressly created or implied from that of husband and wife or parent and child, is at an end. This defect in the law was remedied in England by "Lord Campbell's act" (9 and 10 Vict., c. 93; see also 27 and 28 Vict., c. 95), the provisions of which have been substantially re-enacted in most of the U. S. The substance of the statute is that the action is to be brought by the executor or administrator of the person killed, for the benefit of the husband or wife or next of kin. The amount to be recovered depends upon the pecuniary damages sustained, and is generally limited to a specified amount. It has been held both in England and the U. S. that the rule upon this subject in admiralty is the same as at common law. (*The Harrisburg*, 119 U. S. 199.) In Scotland the surviving lawful children or parents, husband or wife of the deceased, "acquire a claim in their own right to damages and solatium, founded partly on the nearness of relationship, partly on the existence during life of a natural obligation of aliment." *Bell's Principles*, § 2030, 9th ed.

Criminal Negligence.—Where a particular intent is necessary to constitute a crime, as in larceny or perjury, it can not be committed by mere carelessness. Negligence, however, may satisfy the requirements of the law for a general criminal intent, where a person, being under a public or private duty, neglects to perform it, and thus causes an injury to society or to particular persons. Though there is no positive intent to do wrong, there is culpability in the failure to discharge the duty. Thus a public officer, being under a public duty to keep a prisoner safely, is criminally liable if he by neglect permit him to escape. Statutes sometimes declare that official neglect in specified cases shall constitute a crime of a particular grade. The same general rule would be applied to a violation of a private obligation causing a wrong to society. Thus a neglect to scour the bed of a river, whereby adjoining lands are overflowed, may constitute a public nuisance. It is a well-known rule in the law of HOMICIDE (*q. v.*) that an act of neglect causing death may amount to the crime of MANSLAUGHTER (*q. v.*), while a positive intent to kill will constitute MURDER (*q. v.*). In case of criminal homicide by negligence, contributory negligence on the part of the deceased is no defense. The plaintiff in criminal prosecutions is the State, not the injured party nor any one in privity with him. In addition to the authorities cited above, see *Bevans's Principles of the Laws of Negligence* (London, 1889); *Pollock on Torts*; *Bishop's New Criminal Law* (Chicago, 1892). FRANCIS M. BURDICK.

Negotiable Instruments: written contracts which are transferable by indorsement or delivery, so that the transferee can enforce them in his own name, and free from any equities against prior holders, provided he takes them before maturity, for value and without notice. In these respects they differ from an ordinary chose in action. An assignee of such a claim can not maintain a suit upon it in his own name at common law; the assignment does not bind the debtor until notice thereof is given to him, and the assignee gets no better title than that of his assignor. (See

ASSIGNMENT.) If negotiable paper is payable to order, it is regularly transferable by indorsement—that is, by the payee's writing and signing on the back of the instrument a direction for its payment to his transferee, followed by delivery. If it is payable to bearer, it is transferable by delivery only. Even if the paper is payable to order, its transfer by the payee, without indorsement, will pass all his interest in it, and will give the transferee the right to compel an indorsement. By statute, in many of the U. S., he can maintain a suit in his own name on the paper, although only an assignee. In such case, however, even when a purchaser without notice, he gets no better title, until he obtains an indorsement, than his transferrer had; so that if the paper becomes due, or he has notice of equities before the indorsement, he will be subject to all the defenses that existed against his transferrer.

Defenses.—These are of two kinds: (1) legal or real, and (2) equitable or personal. The first class is sometimes called legal defenses, because they rest on fixed legal rules, and exclude all consideration of equities between the parties. They are also termed real defenses, because they attach to the *res*—the instrument—and are thus available against any holder, without regard to his merits or demerits. This class includes the defense that the instrument never had an inception, as when a bill or note fully executed by the defendant is stolen from him before delivery, or when it is obtained from him by an imposition as to the contract he is making; it includes defenses based upon the incapacity to make a binding contract, as in the case of an infant or an insane person; those based on illegality, which by statute renders the instrument absolutely void, as usurious bills and notes in some of the U. S.; and those based on the extinguishment of the contract, by alteration or cancellation. The second class has received the appellation of equitable, because its basis is the equities between the parties. It is also called personal, from the fact that a defense of this class is available only against the party whose conduct renders it inequitable for him to recover, or against one in privity with such person. It includes the case of negotiable paper obtained by ordinary fraud, or by duress, or for which there was no consideration, or which was illegal but not declared void by statute, or which has been paid or discharged but not taken up. This class is not available against a *bonafide* holder—that is one taking the paper before due, for value and without notice of defects.

Forms of Negotiable Instruments.—Negotiable paper ordinarily takes the form of a BILL OF EXCHANGE (*q. v.*), a CHECK (*q. v.*), or a PROMISSORY NOTE (*q. v.*), but is not limited to these. Commercial usage is constantly evolving new forms, many of which have received judicial sanction, and thus have been added to the list of negotiable instruments. The earliest kind of negotiable paper recognized by the English courts was the foreign bill of exchange, that is a bill between an English and a foreign merchant. During the latter part of the seventeenth century, domestic or inland bills between traders gained recognition, followed very soon by inland bills between non-traders. Next came promissory notes, which, after receiving the sanction of several judicial decisions, were held non-negotiable by Lord Holt, only to be declared by act of Parliament "to have the same effect as inland bills of exchange." (3 and 4 Anne, ch. 9, 1704.) Then followed goldsmiths' or bankers' notes, checks, exchequer bills, bonds of corporations, whether public or private, and government scrip. (*Goodwin vs. Roberts*, Law Reports, 10 Exchequer 337; 1 Appeal Cases 476.) It is not necessary that the instrument contain an order or a promise to pay money. In the case just referred to, the writing, called government scrip, bound the Russian Government to deliver a bond in exchange for the scrip; and yet the court held that "the usage of the money-market has solved the question whether scrip should be considered security for and the representative of money by treating it as such."

A promissory note of an individual or of a corporation under seal is held generally non-negotiable, because of the radical differences at common law between an ordinary contract and a Bond (*q. v.*) Corporate bonds, however, are treated in almost every jurisdiction as negotiable, if, containing words of negotiability, they are issued as marketable securities, and are regarded by the mercantile community as such. The Supreme Court of the U. S. has declared: "There is nothing immoral or contrary to good policy in making them negotiable, if the necessities of commerce require that they should be so. A mere technical dogma of the courts or the common law can not prohibit the commercial

has been everywhere prevalent. Woman generally, though not invariably, is little more than a slave, and polygamy is universal. Cannibalism in its most abhorrent forms is still prevalent. Their religions are generally fetichisms, inculcating childish superstitions and cruel rites. During the nineteenth century, however, Mohammedanism has made rapid strides in Central Africa, and has exercised a beneficial effect on the native morals.

Divisions.—1. True Negroes. Tribes of the true Negro type are rarely found in Africa outside of the area bounded on the N. by the tropic of Cancer and on the S. by the equator, and lying between the head-waters of the Nile and the Atlantic Ocean. Within this territory we have in the Central Sudan the important Negro monarchies of Bornu, Bagirmi, and Wadai, the two former located in the fruitful depression which surrounds Lake Tchad. Farther to the W., in the basin of the Niger, are numerous kingdoms and some cities of magnitude, as Sansandig, with 30,000 inhabitants, and the better known Timbuctoo, with about 20,000. In Senegambia are the Mandingoes and Wolofs, the latter especially presenting a very pure instance of the Negro type. On and near the coast of Guinea are the petty kingdoms of Ashantee, Dahomey, and Fanti, which were long the purveyors of the slave-trade to America. 2. The Negroids. Most of the African continent S. of the equator and its eastern shores were and are yet largely peopled by tribes of dark hue, but lacking some of the most prominent traits of the true Negro. In color they are a deep brown, the hair is crisp but not woolly, the nose is straight rather than flat, the features assimilate closer to the European type, and the peculiar odor of the Negro is absent, or but slightly noticeable. In these Negroids we recognize the products of an intermixture of blood between true Negroes and members of the Semitic and Hamitic stocks, an intermixture which has been going on for 10,000 years or more. In the North it has formed the Nubian group, in the South the Bantus. The former embraces the Nubas proper, the Nyam Nyams, the Monbutts, and many tribes of less note. Their occupations are pastoral and agricultural, but as a rule they are in the condition of savagery, and some of them are notorious cannibals. The Bantu group occupies the whole of Africa S. of the equator, except the territory of the Bushmen and Hottentots. It includes the Suahelis and Kaffirs on the east coast, the Sakalavas of Madagascar, the Zulus, the Bechuanas, and the numerous tribes of the Congo basin and east coast. They are generally pastoral and agricultural, and slightly higher in the scale of development than the Sudanese Negroes. 3. The Negrillos. These are the African pygmies, a curious little people, averaging in the adult males about 4½ feet high. Their color is brown, the face prognathic, chin retreating, lips protruding, ears large, nose flat, hair woolly and well distributed over the body, which exhales a strong and offensive odor. They have no settled abodes, do not cultivate the soil nor domesticate animals, and depend on hunting and fishing for a livelihood. They are unerring marksmen, and use poisoned arrows. By many writers the Bushmen and Hottentots of South Africa are believed to be a branch of these Negrillos.

Negroes in America.—The deportation of Negroes from Africa to become slaves in America began early in the sixteenth century, and was continued to such an extent and for so long a time that it is estimated that at present there are on the American continent over 20,000,000 persons of Negro ancestry, about one-third the number being within the area of the U. S. The slaves were chiefly derived from three sources—the coast tribes about the Gulf of Guinea, captives obtained by these from the Mandingoes and other nations of the interior, and from the Bantu tribes of the Congo basin and S. of it. The languages of these mixed masses were soon lost, and English, Spanish, or Portuguese adopted by them. In spite of the rigors to which they were often subjected, the rate of their increase was high and in some instances remarkable, as in the slave population of the U. S. during the twenty years before the civil war, when it far surpassed that of the whites. Where opportunities of education have been afforded them they have often shown considerable capacity for learning, and in some instances Negroes of pure blood have obtained creditable positions in the learned professions. Naturally, there has been in all parts a frequent intermixture of blood, almost invariably between white men and Negro women. This has led to crossings, which have been legally defined into as many as sixteen degrees—mulattoes, quadroons, octoroons, etc. The higher the percentage of white blood the more intelligent as a rule is the individ-

ual; but often this intelligence is accompanied by perversity and indolence, and a feeble physical constitution. Crossings with the American Indian have also been frequent, especially in Spanish countries. These are said to develop a physically powerful variety, combining the best qualities of both the parent races. In Brazil they are known as Cafusos.

D. G. BRINTON.

Negropont: See EUBŒA.

Negro, Rio: See RIO NEGRO.

Negros (in Span. *Isla de Negros*, or Negro island): one of the larger of the Philippine islands; near the center of the group, in lat. 10° N., lon. 123° E.; somewhat rectangular in form, 140 miles long by 40 broad; area, 4,700 sq. miles. It has two or three active volcanoes and many extinct ones. The streams are little else than mountain torrents; the interior is heavily wooded. It was discovered by Goyti in 1565, who gave it the name of Negro island because of the number of negritos seen by him, but in 1848 Arenas found only 3,475. The most of the inhabitants are Visaya Malays, now generally professing Christianity. Pop. (1887) 242,433. M. W. H.

Negruzzi, nā-groot sēē, CONSTANTIN: poet; b. in Jassy, Roumania, about 1809; was taken to Bessarabia by his father in 1821 on the outbreak of the Greek revolt under Ypsilanti, and became acquainted with the poet Pushkin. His writings include translations into Roumanian from Pushkin and Victor Hugo, an historical poem, *Aprode Purice*, and lyric poems published under the title *Sins of Youth*. His works were published in 1873. D. Aug. 25, 1868. E. S. S.

Negruzzi, Iacob: poet; son of Constantin Negruzzi; b. at Jassy, Jan. 11, 1843; was in Berlin 1852–63, afterward becoming professor at Jassy, and in 1880 at Bucharest. In 1867 he established the useful literary periodical *Convorbiri literare*, of which he has since been the editor, and in which his verses were first printed. He is a member of the Roumanian Academy. He has published *Poesii* (1872); the idyl *Miron și Florica*; the novel *Mihail Vereanu*; *Copii după natură* (Copies from Nature); comedies, satirical verse, translations from Schiller, etc. E. S. SHELTON.

Nehemi'ah [from Heb. *Nehemyāh*, liter., whom Jehovah comforts]: the latest of the Jewish leaders in the return from the Babylonian exile. Nehemiah's first administration seems to have extended from 445 to 433 B. C., and his second began after an unknown but not very long interval (Neh. xiii. 6–7). Probably he was a very young man in B. C. 445, and probably in his second administration at Jerusalem he lived to be a very old man. Josephus says: "He came to a great age, and then died" (*Ant.* xi. vi. 8). According to Neh. xii. 26, 23, cf. 2 Mac. i. 23, his "days" extended "to the days of Johanan the son of Eliashib," who became high priest between 380 and 370 B. C., or earlier.

The works attributed to Nehemiah are the fortifying and peopling of Jerusalem, the suppressing of extortion, and the carrying into permanent effect of the reforms that had been previously attempted by Ezra. These reforms mainly consisted in the enforcement of the laws of Moses, the establishment of the temple-worship on a creditable basis, and the breaking up of intermarriages between the Jews and people of other races. Later traditions assign to him two other important works, the collection of a library (2 Mac. ii. 13), and the completion of the books of Chronicles, and thus of the Old Testament (Baba Batra fol. 14, a; cf. 2 Mac. ii. 9–13, where 1 Chronicles is cited, apparently, under the title *The Memoirs according to Nehemiah*). WILLIS J. BEECHER.

Nehemiah, The Book of: one of the canonical books of the Old Testament. It has a title, and by its very form must always have been a separate piece of composition; but Ezra and Nehemiah are counted as one book in the scheme which groups the Old Testament writings into twenty-two books. It is now commonly said that the book was written by some later scribe, in part from memoirs made by Nehemiah. In proof of this, it is alleged, first, that the book mentions events later than Nehemiah's time; and, second, that it is in a confused state, the different parts speaking of Nehemiah sometimes in the first person singular, sometimes in the first person plural, and sometimes in the third person; but no one can prove that the book mentions any event later than the early part of the pontificate of Johanan (xii. 23), when Nehemiah was still living (xii. 26, 2 Mac. i. 23); for Jaddua (xii. 22, 10) may have been registered in his father's lifetime, and the Darius of the same verse, "upon"

whose reign the registration was begun, is most naturally Darius Noturus; and, further, the book, supposing it to have been written by Nehemiah in his old age, is capable of an analysis in which the alleged confusion of the pronouns vanishes.

On this hypothesis, it consists of two parts: first, an account of the first months of Nehemiah's first administration, with supplementary notes (i. 1-xii. 26); and, second, an account of certain events in Nehemiah's second administration (xii. 27-xiii.). The second of these two parts is simply a narrative by Nehemiah, in which he speaks of himself in the first person singular, except in xii. 47, where he uses, officially, the third person. The main portion of the first of the two parts is likewise a narrative written by Nehemiah in the first person (i. 1-vii. 5). In vii. 6-viii. 1 it incorporates matter quoted from Ezra ii. 1-iii. 1. Then follows an official account of the great convocation (viii.-x.). The first sentence of the official account blends curiously with the closing sentence of the passage quoted from Ezra. Then Nehemiah takes up his narrative (xi. 1-2), at the point where he left it in vii. 4, but continues it for these two verses only. He then finishes what he has to say touching his first administration by appending to it the long genealogical note—(xi. 3-xii. 26), which is in part a duplicate of 1 Chron. ix. 2, *seq.*, and covers a period of six generations, from the grandfather to the great-grandson of Eliashib, who was high priest when Nehemiah's first administration closed. With the facts thus accounted for, we must hold Nehemiah to be the author of the book, and not merely of some of its materials.

WILLIS J. BLOCHER.

Neher, BERNHARD, von: painter; b. at Biberach, Württemberg, Germany, Jan. 16, 1806; received his first instruction in painting from his father, and finished his studies in the academies of Stuttgart and Munich and in Rome. The first great work he executed after his return to Munich was the immense fresco on the Isarthor representing the entrance of the Emperor Louis the Bavarian into Munich. In 1841 he went to Weimar, where he decorated the Goethe and Schiller galleries with frescoes. In 1844 he was made director of the art-school in Leipzig, and in 1854 of that in Stuttgart. Besides historical subjects, he painted several of a religious nature. D. at Stuttgart, Jan. 17, 1886.

Neidhart von Reuenthal: a Bavarian knight and poet who lived during the first half of the thirteenth century. He took part in the crusade of Duke Leopold of Austria (1217-19), previous to which he had already gained the reputation of a poet, according to the testimony of Wolfram von Eschenbach. For unknown reasons he incurred the enmity of Duke Ludwig of Bavaria and lost his fief in Bavaria. He married to Austria and was given a house at Melk by Duke Frederic. No further historical traces of him are found after the year 1236. Although Neidhart is classed with the minnesingers in mediæval manuscripts, he can not properly be placed among those poets. His poems may be divided into *Sommerlieder* (*Reigen*), and *Winterlieder* (*Tanzlieder*). While the former were presumably composed for the amusement of the villagers, the latter, which are mostly satirical in contents and ridicule the bragging peasants, were chiefly delivered before the court circles, who seem to have enjoyed their boorish caricatures. In many of Neidhart's poems, especially in the *Sommerlieder*, we notice traces of old popular songs, which he with great skill and excellent effect adapted to his artistic purposes. He found a great many imitators, but most of their imitations are coarse, and lack Neidhart's gracefulness and humor. The fact that Neidhart during the following two centuries became a legendary hero in the popular songs as well as proof of the impress of the medieval courtly poetry. See *Neidhart von Reuenthal*, edited by M. Haupt, 1858, and by Fr. Keinz, 1880; R. M. Meyer, *Chronologie der Gedichte Neidharts von Reuenthal* (1884); *Reuenthal, Gedichte*, ed. D. Neidhart, ed. J. Neidhart (1891); *Die Neidhart-Lieder*, *Zeitschrift f. deutsche Philologie*, xl. 641; J. Grimm.

Neilgherry or Nilgiri Hills: a mountain range of 11,000 feet in the Southern Himalayas, between lat. 10° and 11° 48' N., and long. 76° 30' and 77° 30' E., covering an area of 700 sq. miles. The range is covered with a layer of rich black soil 10 feet deep, and rise in the highest peak, Dodabetta, to the height of 8,760 feet. Their sides are covered with impenetrable jungles of tropical forests, hot, unhealthful, and swarming with wild animals; but at an elevation of about 5,000 feet they form a table-land remarkable for its healthful climate, and on this

account much frequented by Europeans. The native population comprises, besides the Badahars and other Hindu tribes, the Todas, who differ much from all other races in India, being tall and well formed, with strongly marked Semitic features.

Neill, EDWARD DUFFIELD, D. D.: author; b. in Philadelphia, Pa., Aug. 9, 1823; educated at the University of Pennsylvania, Amherst College, and Andover Theological Seminary; was a Presbyterian minister in St. Paul, Minn., 1849-60; chancellor of the University of Minnesota 1858-61; chaplain of the First Minnesota Regiment and hospital chaplain 1861-64; private secretary to President Johnson 1865-69; consul to Dublin 1869-70; president of Macalester College, Minneapolis, 1873-84; Professor of History and Literature there from 1884; and pastor of the Reformed Episcopal church of St. Paul 1884-89. D. there Sept. 26, 1893. Author of *Annals of the Minnesota Historical Society*, 1856; *History of Minnesota* (Philadelphia, 1858); *Tenat Menni, or Thoughts of Man and God* (1867); *The Land-faxes of England and America* (1868); *History of the Virginia Company* (Albany, 1869); *English Colonization of America during the Seventeenth Century* (London, 1871); *Founders of Maryland* (Albany, 1876); *Virginia Velusta* (1885); *Virginia Carolorum* (1886); and *Concise History of Minnesota* (Minneapolis, 1887).

Neillsville: city; capital of Clark co., Wis. (for location of county, see map of Wisconsin, ref. 4-C); on the Black river, and the Chi., St. P., Minn. and Omaha Railway; 60 miles N. E. of La Crosse. It is in an agricultural, dairying, and stock-raising region, with considerable tracts of heavy timber; contains 6 churches, high, ward, and Roman Catholic and Lutheran parochial schools, 2 State banks with combined capital of \$50,000, and 3 weekly newspapers; and has manufactories of furniture, staves, spokes, wagons, flour, and lumber. Pop. (1880) 1,050; (1890) 1,936; (1895) 2,206.

EDITOR OF "TIMES."

Neilson, LILIAN ADELAIDE: actress; b. near Saragossa, Spain, Mar. 3, 1850; went to England when a child and appeared in Margate as Julia in *The Hunchback* in 1865. In July of the same year she played the part of Juliet at the Royalty theater, London, and from this time appeared in various parts with considerable success, but did not arouse much enthusiasm till 1870-71, when her *Amy Robarts* brought her into high favor with the public. She was equally successful in the U. S., where she made a tour in 1872, appearing at Booth's theater in New York as Juliet and elsewhere as Beatrice, Lady Teazle, and her other favorite characters. She was again in the U. S. in 1877 and in 1879, and at each time was received with enthusiasm. In 1872 she married a Mr. Philip Lee, from whom she was divorced in 1877. D. in Paris, Aug. 15, 1880.

Neiva, nā'ee-vāa: a city of the department of Tolima, Colombia; on the right bank of the river Magdalena, above the junction of the Neiva. This point is the head of navigation for light craft, and is sometimes attained by steamers during exceptional floods; much of the commerce of Popayan and the southern departments passes through it. The district is noted for its cacao, and has an active trade in cattle. Formerly large quantities of cinchona were obtained in the neighboring mountains, but most of the trees have been destroyed. Neiva was founded in 1550 at the mouth of the river of that name; after it had been destroyed by Indians it was rebuilt on its present site. It was the capital of Tolima until about 1888. Pop. 9,000; with the district (1892) 15,000.

THOMAS H. SMITH.

Nekra'sov, NIKOLAI ALEKSEEVICH: poet; son of an army officer; b. in a village in Podolia, Russia, Nov. 22, 1822. At sixteen he was sent to St. Petersburg to enter a military academy, but gave it up for the university and a literary career. In 1840 appeared a volume of verses. Five years later he wrote the first of his celebrated poems. In 1847, with A. P. Panayev, he founded the *Sovremennik* (Contemporary), which he conducted until it was suppressed in 1866. To it almost all the great Russian writers of the day contributed. In 1868 he became editor of the *Otechestvennyia Zapiski* (National Annals), which continued the success of his former journal. D. Dec. 27, 1877. Nekrasov belongs to the realistic school. Whether he describes the daily round of the peasant's existence or the dark sides of St. Petersburg, or whether he reveals his own experiences and sentiments, his tone is one of melancholy. Frequently, as in *A Moral Man* (English trans., *Cornhill Magazine*, Mar., 1863),

he lashes the upper classes with savage irony. The form of his verse is at times far from perfect, but the substance often glows with intense feeling and wonderful descriptive power. His two longest poems are *Moroz Krasnyi Nos* (Red-nosed Frost; anon. trans., 2d ed., Boston, 1877), perhaps his masterpiece, and *Komu khorosho zhit v Rossi* (To Whom is Life good in Russia?), which he did not live to finish. There have been several editions of his works (5th complete ed. St. Petersburg, 1890). A few of his pieces have been rendered into English, with scant success in *Russian Lyrics in English Verse*, by C. T. Wilson (1887); rather better in *Rhymes from the Russian*, by J. Pollen (1891). See the chapter on Nekrasov in *Studies in Russian Literature*, C. E. Turner (1882); also an article in the *Revue des Deux Mondes* for Dec. 15, 1858, by M. H. Delaveau, and one in *Regards Historiques et Littéraires*, by F. M. de Vogüé, originally prefixed to the French translations of Nekrasov's works.

A. C. COOLIDGE.

Nélaton, nā'lā'tōn', AUGUSTE: surgeon; b. in Paris, France, June 18, 1807; graduated M.D. from the Paris school in 1836; became Associate Professor of Clinical Surgery in 1839 and professor in 1851; became a fellow of the Academy of Medicine in 1863, a member of the Institute in 1867, and a Senator of the empire in 1868; invented a new method of extracting calculi from the bladder, which he applied with great success. D. Sept. 21, 1873. He wrote *Éléments de Pathologie chirurgicale* (5 vols., 1844-60; 2d ed., 6 vols., 1868-85). Revised by S. T. ARMSTRONG.

Neligh: city; capital of Antelope co., Neb. (for location, see map of Nebraska, ref. 9-F); on the Elkhorn river, and the Fremont, Elkhorn and Mo. Valley Railroad; 33 miles W. by N. of Norfolk, 160 miles N. W. of Omaha. It is the seat of Gates College (Congregational, chartered in 1881), and contains a national bank with capital of \$50,000, a State bank with capital of \$30,000, and four weekly newspapers. Pop. (1880) 326; (1890) 1,209.

Nellore, nēl-lor': town of British India, Presidency of Madras; capital of the district of Nellore; on the Panar, near its mouth, in lat. 14° 27' N. (see map of Southern India, ref. 5-E). It is ill built, but is clean, airy, and healthful. Pop. about 30,000.

Nelson: province of New Zealand. Area, 10,269 sq. miles. Pop. (1891) 34,770. The capital, Nelson, on the northern extremity of Middle island, at the head of Blind Bay, has a good harbor. It is well built, and its surroundings are very fertile and beautiful; pop. (1896) 6,659.

Nelson, DAVID, M. D.: clergyman; b. near Jonesboro, Tenn., Sept. 24, 1793; graduated from Washington College, Virginia; studied medicine in Danville, Ky., and in Philadelphia; was surgeon with a Kentucky regiment in the war of 1812; and after the war was a physician in Jonesboro. In early life he professed Christianity, but relapsed into infidelity; becoming convinced anew of the truth of Christianity, he left a lucrative practice to enter the Presbyterian ministry, and was licensed in 1825. For nearly three years he preached in Tennessee, and was connected with *The Calvinistic Magazine*, published at Rogersville. In 1828 he succeeded his brother in the Presbyterian church at Danville, Ky.; in 1830 removed to Missouri, established Marion College, 12 miles from Palmyra, and was made president; in 1836, being forced by his zeal for emancipation to flee from Missouri, he removed to the vicinity of Quincy, Ill., and established there an institution for the education of young men. D. in Oakland, Ill., Oct. 17, 1844. In addition to articles for the press and the hymn *My Days are gliding swiftly by*, he published the widely used and formerly much admired *Cause and Cure of Infidelity* (New York, 1836; republished in London and elsewhere). C. K. HOYT.

Nelson, HENRY ADDISON, D. D.: professor and editor; b. at Amherst, Mass., Oct. 31, 1820; was educated at Hamilton College (1840) and Auburn Theological Seminary (1846); was a teacher in Eaton and in Homer, N. Y., 1840-43; pastor of the First Presbyterian church of Auburn, N. Y., 1846-56; of the First Presbyterian church of St. Louis 1856-68; Professor of Systematic and Pastoral Theology in Lane Seminary 1868-74; pastor of the First Presbyterian church of Geneva, N. Y., 1874-85; and since 1886 he has been the editor of *The Church at Home and Abroad*. In 1867 he was moderator of the General Assembly at Rochester, N. Y. He has published *Saving Jesus* (1869); *Sin and Salvation* (1881); and *Home Whispers* (Philadelphia), besides contributing to religious papers. C. K. HOYT.

Nelson, HORATIO: Viscount Nelson of the Nile, Duke of Bronté; b. at Burnham Thorpe, Norfolk, England, Sept. 29, 1758; the fourth son of Rev. Edmund Nelson, rector of the parish. He attended school at Norwich and at North Walsham; obtained at the age of twelve an appointment as midshipman; accompanied Capt. Phipps's Arctic expedition 1773; served in the East Indies 1775-76; became lieutenant Apr. 8, 1777, and post-captain in 1779; was given command of a man-of-war, with which he proceeded to San Juan del Norte, Nicaragua; took Fort San Carlos in the San Juan river; cruised in the North Sea 1781-82; served again in the West Indies 1782-87, where he gained much ill-will by his vigorous attempts to prevent smuggling between the U. S. and the British colonies. On the recommendation of Lord Hood he was made captain of the Agamemnon in 1793, and was dispatched to the Mediterranean; commanded a small squadron on the coast of Corsica which co-operated with Paoli, and took Bastia May, 1794; aided in the siege of Calvi, where he lost an eye; participated in Admiral Hotham's victory over the French squadron Mar. 15, 1795; took the island of Elba; blockaded Leghorn Apr. to Oct., 1795; was made commodore 1796; distinguished himself under Admiral Jervis in the naval victory over the Spanish fleet off Cape St. Vincent Feb. 14, 1797; was appointed rear-admiral Apr., 1797; took part in the blockade and attempted bombardment of Cadiz May to July, and in the unsuccessful attack upon Santa Cruz, Teneriffe, July, 1797, where he lost his right arm; was made a Knight of the Bath and received a pension of £1,000. In May, 1798, he took command of the Mediterranean squadron off Toulon; followed Napoleon's expedition to Egypt and destroyed the French fleet at the Bay of Aboukir (generally called the battle of the Nile), being wounded in the engagement, Aug. 1, 1798, for which victory he was made Baron Nelson of the Nile, and received an additional pension of £2,000; proceeded to Naples in September; occupied Leghorn in November; aided the Government of Naples in resisting the French invasion and in recovering the capital after it had been taken, but stained his reputation by violating the capitulation concluded June 23, 1799, and hanging Caraccioli, the insurgent admiral; was made Duke of Bronté (Sicily) by the King of Naples; aided in the siege of Malta; returned to England in company with Sir William and Lady Hamilton Nov., 1800; was received with unbounded popular enthusiasm. He was made vice-admiral Jan., 1801; was second in command of the Baltic fleet in the naval battle of Copenhagen, Apr. 2, for which he was made viscount; took command of the squadron for the defense of England against the contemplated French invasion in July; attacked the French flotilla off Boulogne, Aug. 15; resided with the Hamiltons at their seat in Merton, Surrey, during the Peace of Amiens, 1802-03; was appointed commander of the Mediterranean fleet on the resumption of hostilities May, 1803; blockaded Toulon; unsuccessfully pursued a French fleet to the West Indies May, 1805; returned to England in July; again took command of the Mediterranean fleet, and inflicted a total defeat on the combined French and Spanish squadrons off Cape Trafalgar, losing his life in the engagement, Oct. 21, 1805. Lord Nelson was buried with much pomp in St. Paul's Cathedral, Jan. 8, 1806. He had learned his tactics from Napoleon, "plunging headlong into the enemy's fleet, and doubling upon a part of their line, in the same manner as Napoleon practiced in battles on land." See *Life*, by Southey (2 vols., 1828); his *Letters and Despatches*, edited by Sir N. Harris Nicolas (7 vols., 1844-46); E. de Forges, *Histoire de Nelson* (1860); *Lady Hamilton and Lord Nelson* (2 vols., 1888); and *The Queen of Naples and Lord Nelson* (2 vols., 1889), by J. C. Jeaffreson.

Nelson, SAMUEL, LL. D.: jurist; b. at Hebron, N. Y., Nov. 10, 1792; graduated at Middlebury College in 1813; was admitted to the bar in 1817; became a successful lawyer of Cortland co., N. Y.; judge of the circuit court 1823-31, of the State Supreme Court 1831-37, its chief justice 1837-45; in 1845 was appointed a judge of the U. S. Supreme Court, from which he retired in 1872; was a member of the joint high commission to settle the Alabama claims 1871. D. at Cooperstown, N. Y., Dec. 13, 1873.

Nelson, THOMAS: Governor of Virginia; b. in York co., Va., Dec. 26, 1738; was educated at Trinity College, Cambridge, and before his return, when just twenty-one, was chosen to the house of burgesses of Virginia; was a member of the Williamsburg convention 1774, of the convention of

1775, and of the Virginia constitutional convention of 1776, was in Congress 1776-77 and 1779; signed the Declaration of Independence; served as colonel, and afterward as a general officer, in the army; was Governor of Virginia in 1781; expended his great fortune for the cause of liberty, and at the siege of Yorktown directed the army to play upon his own men, the supposed head-quarters of Cornwallis. He died in comparative poverty in Hanover co., Va., Jan. 4, 1789.

Nelson River, Canada: See SASKATCHEWAN RIVER.

Nelsonville: See COWANSVILLE, Quebec, Canada.

Nelsonville: village; Athens co., O. (for location, see map of Ohio, ref. 7-G); on the Col., Hock, Valley and Toledo Railway; 44 miles N. W. of Athens, 62 miles S. E. of Columbus. It is in the great coal-belt of Ohio, and is principally engaged in coal-mining and shipping. It has 2 private banks and 3 weekly newspapers. Pop., 1880, 3,005; (1890), 4,758.

Nelumbo (the Chinese name): a genus of water-lilies (*Nymphaeaceae*), containing only two or three species. The

Nelumbo speciosa, the Egyptian bean, lotus of Tibet and India) furnishes in China and the East much food. Its seeds, roots, and stalks are cooked, and are very palatable, abounding in starch. This plant is nearly or quite extinct in Egypt, where it was once worshiped. The *N. lutea* of the U. S. has pale-yellow flowers (those of the *N. speciosa* generally are rose-colored). Its roots and seeds (water-chinquapins) are edible. It grows in shallow waters of the Western and



Nelumbo speciosa

Southern States, but is rare in the Middle States.

Revised by CHARLES E. BESSEY.

Nematelmia: same as NEMATHELMINTHES (q. v.).

Nematelmin'thes [from Gr. *nēma*, thread + *thēra*, parasite; worm]: a large group of "worms," most of which are parasitic, and which from their cylindrical shape receive their systematic name as well as the common terms of "roundworms" and "threadworms." They may be recognized by their cylindrical, unjointed bodies. Externally they are covered by a thick cuticle, and no traces of appendages can be found. The peculiarities of internal structure can best be mentioned by treating the two groups of round worms separately.

In the first, the ACANTHOCEPHALI (spine-headed worms), there is no digestive tract, nourishment being absorbed through the skin. The body ends anteriorly with a "proboscis" covered with spines, by means of which the parasite anchors itself to the walls of the intestines of its host. The sexes are separate, and the eggs, passing out, require to be eaten by some arthropod before beginning their development. In the bodies of these new hosts they partially develop, but not until they are again eaten by some fish, bird, or mammal do they complete their history. The order contains but a single genus, *Echinorhynchus*, the adults of which occur only in fishes, birds, and mammals. The pig is quite frequently infested with these parasites, and recent investigations have shown that the intermediate hosts in this instance are the larvae of "June bugs" and similar beetles. The eggs are passed with the droppings of the pigs to the ground, they are eaten by the larvae, and these latter are devoured by the pig as he roots them from the ground.

The second order, NEMATODA, or NEMATOGNATHI (threadworms), contains those in which the body is cylindrical, but

alimentary canal is present, while the proboscis never occurs. In most the sexes are separate, and frequently the male differs in appearance (especially in size) from the female of the same species. A few forms occur either in the water or in moist earth, but most are parasitic, and some attain great importance (e. g. *TRICHINA*, q. v.) from the serious results which follow their invasion of the animal. Space will permit the mention of but few forms. *Tylenchus* injures wheat by boring into the kernel, while the species of *Heterodera* live in turnips and other root crops. *Anguillula* furnishes the "vinegar eels," those small worms which occasionally occur in vinegar or stale paste, and which are introduced with the wort. Most of the species of *Filaria* are injurious to various vertebrates, one, *Filaria medinensis*, being the much-dreaded GUINEA-WORM (q. v.) of the tropics. *Dochmius duodenalis*, occurring in the warmer regions of the Old World, has recently appeared in Brazil. This form lives in the duodenum of man, and sucking the blood, causes the disease known as Egyptian chlorosis, which sometimes results in death. To the genus *Ascaris* belongs the larger roundworm, *Ascaris lumbricoides*, which reaches a length of a foot or more, being the worm most often affecting children. Allied to this is the much smaller *Oxyuris vermicularis*, or "pinworm," which lives in the rectal region of children, causing an intolerable itching.

Differing considerably from the ordinary nematodes are the hairworms (*Gordiacae*), which are frequently regarded as horse hairs turned into worms by soaking in water. In these the body is long and thread-like, and in the adult either the mouth (*Gordius*) or the vent (*Mermis*) is lost. There are yet many unsolved points in the history of these forms. *Gordius* lays its eggs in the water, and from these there hatches out a short larva with spiny proboscis which lives in the body of aquatic insects. When these are eaten by other insects the metamorphosis takes place, and after feeding for a while on the new host the worm bores its way out and lays its eggs. In *Mermis* the history is much the same, except that the eggs are laid in moist earth, and the forms infested by it are moths, crickets, grasshoppers, and beetles.

The principal papers on round worms are European in origin. Among these may be mentioned Diesing, *Systema Helminthum* (Vienna, 1850-51); Leuckart, *Die menschlichen Parasiten* (Leipzig, 1876); Villot, *Monographie des Dragonnaires (Gordius)* (Paris, 1874). J. S. KINGSLEY.

Nematisti'idæ [Mod. Lat., named from *Nematistius*, the typical genus; Gr. *nēma*, thread + *istios*, web, sail]: a family of telecephalous fishes, related to the mackerels and dolphins. The family is represented by a single species, *Nematistius pectoralis*, an inhabitant of the Pacific coast of Mexico. It is especially distinguished as the type of a family by the composition of the ventral, as well as structure of the other fins.

Nematoda, or Nematodes: See NEMATHELMINTHES.

Nematognathi [Mod. Lat.; Gr. *nēma*, thread + *gnathos*, jaw]: the "catfishes," an order of teleost fishes distinguished by many peculiarities of the skeleton and brain. The skull has a nearly rectilinear dorsal outline, there being no anterior geniculation; the supra-occipital is confluent with the parietals; the pterotic bone is simple; no symplectic bone is differential; the intermaxillary bones are attached to the inferior surface of the ethmoid; the supra-maxillaries are styliform, articulated at their bases, and inclosed in filamentous extensions of the skin, developed as the supramaxillary barbels; the suboperculum is wanting; in the branchial apparatus (according to Cope) the third superior pharyngeal bone is wanting or small, and resting on the fourth, the second directed backward; one or two pairs of basibranchials and two pairs of branchials are developed; the branchiae are pectinated; in the scapular arch the coracoid elements are soldered with the proscapula (clavicle of some), and the mesocoracoid is represented by a bridge-like arch; "interclaves" are developed; the post-temporal (supra-scapula of some) is co-ossified with the skull; no postero-temporal or supra-clavicle is represented; the four anterior vertebrae are greatly modified and more or less perfectly coalesced; the brain has an immense cerebellum, which extends forward over the optic lobes; the optic lobes are quite peculiar in their thalami; the heart has no bullus arteriosus; the air-bladder connects by a duct with the roof of the oesophagus. These and other characters unite to distinguish the catfishes and related fishes from all other types of fishes.

order is represented by numerous species, most of which are found in the fresh waters of almost all warm and temperate countries, but some are also marine. Although, apparently, in many respects, an ancient type, no forms that can be certainly referred to it have been found in the older rocks. The order has been differentiated into the families: (1) *Trichomycteridae*, (2) *Siluridae*, (3) *Chacidae*, (4) *Plotosidae*, (5) *Clariidae*, (6) *Callichthyidae*, (7) *Argidae*, (8) *Loricariidae*, (9) *Lisoriidae*, (10) *Hypophthalmidae*, (11) *Aspredinidae*. Of these, the first ten have a well-developed operculum, while in the eleventh the operculum is wanting. The first, sixth, seventh, eighth, tenth, and eleventh families are peculiar to South America; the third, fourth, fifth, and ninth are peculiar to the fresh waters or seas of the tropical parts of the eastern hemisphere; and the second is cosmopolitan. All the North American species belong to the SILURIDÆ (q. v.).

THEODORE GILL.

Nematoi'dea: See NEMATHELMINTHES.

Němčová, nyem'tsō-va, BOŽENA: novelist; b. at Vienna, Feb. 4, 1820; was educated at Skalce; married an official at Kostelec in 1837, and in 1842 settled in Prague. At Kostelec she wrote two stories, *Chudí lidé* (Some Poor People) and *Dobrý člověk* (A Good Man); her first poems appeared in 1843, in the *Květy*. In 1845 she removed to Taus, an ancient Bohemian town, where she wrote her sketches, *Obrazy z okolí Domažlického*, and novels *Karla* (Charlotte) and *Pohorská vesnice* (The Village in the Mountains, Prague, 1856), two pictures of Bohemian country life. *Národní báchorky a pověsti*, a collection of Bohemian folk-tales, was published at Prague 1845-46. It was followed by her masterpiece, *Babička* (The Grandmother, Prague, 1855), a novel of Bohemian country life, since translated into many languages (English by Frances Gregor, Chicago, 1891). She visited Northern Hungary several times, gathering material for her new works: *Slovenské pohádky a pověsti* (Slovak Folk-tales, Prague, 1858), *Uherské město* (A Hungarian City), etc. D. Jan. 21, 1862, at Litomyšl. Her collected works, *Sebrané spisy*, were published in 8 vols. at Prague and Litomyšl in 1862-63.

J. J. KRÁL.

Ne'mea: a valley situated in Argolis, Greece, between the cities of Phlius and Cleonæ, and celebrated in Grecian story as the site where Argos was slain by Mercury, and where the Nemean lion was overcome by Hercules. Nemea owes its later celebrity entirely to the renown of the games held there. It was merely a stretch of pasture-land, measuring about 4 miles by 1, and hemmed in by Mts. Trikaranos, Apesas, and Tretos. On Mt. Apesas Perseus, King of Argos, had sacrificed to Zeus; on Mt. Tretos the cave of the Nemean lion was anciently shown, with its double issue, a feature common to many grottoes now visible on Mt. Tretos. There remain at Nemea three remarkably slender Doric columns and a heap of ruins of the Doric temple of Nemean Zeus, under whose patronage the biennial games were conducted. The structure, to judge by its style, was erected only in the third century B. C., and was early destroyed, presumably by an earthquake. Nemea is now a way station 20 miles distant from Corinth on the Nauplia division of the Peloponnesian Railway, but continues uninhabited. Compare Leake, *Travels in the Morea*, iii., pp. 326-336; Curtius, *Peloponnesos*, ii., pp. 505-510; Baedeker's *Greece*, p. 357.

ALFRED EMERSON.

Ne'mean Games: the third of the Panhellenic or national athletic and musical festivals of ancient Greece, celebrated biennially at Nemea in Argolis. Like other similar Grecian celebrations, they originated as a funeral festival, established in prehistoric times in honor of Opheltas or Archemorus. The death of this young prince, witnessed by the leaders of the Argive expedition against Thebes, and his funeral pomp celebrated by them with games of physical prowess, after the fashion of heroic times, presaged the failure of their expedition. The historic games occurred, alternately in spring and autumn, in the second and fourth year of each Olympiad. The first Nemead was an autumn festival coincident with the fifty-first Olympiad (575 B. C.). The greatest popularity of the Nemean games was from about 500 to 350 B. C. The contests were athletic, equestrian (horse-races), and musical. Probably there was little difference between the athletic system of Nemea and that of Olympia. The only contests recorded, however, are the foot-race or stadion (200 yards dash), wrestling, pentathlon, and pankration (see GRECIAN GAMES), in each case for men and boys; the double course, the long run, and the race in armor also occurred, to which the famous adventure of

Kreugas and Damoxenus at Nemea adds the boxing-match. Damoxenus having intentionally killed his adversary, the judges awarded the victor's wreath to the dead body of Kreugas, amid loud acclamations. Among the winners in chariot-races was Alcibiades of Athens, who allowed himself to be painted seated in the lap of the nymph Nemea. Among the musical contests was one for flute-players. The prize in every case was a wreath of wild celery, on a bed of which plant Archemorus had expired. The twelve judges wore gray robes in sign of mourning for Archemorus. Participants in the games and official embassies enjoyed safe conduct during the sacred month. The conduct and protection of the games lay at first with Cleonæ, after 573 B. C. with Argos. This city refused even to recognize games held at Nemea under the auspices of Cleonæ and the Archæan League, when the fortune of war compelled the Argives to hold their own at Argos. On this occasion Aratus, the Archæan general, sold the contestants in the Argive celebration into slavery, a good illustration of the real necessity for the sacred truce. In Græco-Roman times the Nemean games were regularly held at Argos, and imitations of them, also called Nemean, were instituted elsewhere. It is not known when the festival was abolished. The stadion and theater used in the games are still recognizable. Compare J. H. Krause, *Pythien, Nemeen, und Isthmien*, pp. 119-132, and in Pauly's *Realencyclopädie des klassischen Alterthums* (Stuttgart, 1848), under *Nemeen*.

ALFRED EMERSON.

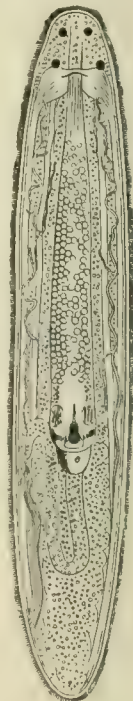
Nemer'tines [Gr. *Νημερτής*, a nereid]: a group of low worms, almost exclusively marine, in which the usually flattened elongate body is without a body-cavity, the mouth is near the anterior end, and the usually sacculated intestine terminates in a posterior vent. In front, above the mouth, is a slit-like opening from which an extremely extensible proboscis can be protruded. This is the means by which the worm obtains its food, the proboscis coiling around the prey. The larger forms live in the mud of the shores, the smaller ones swim freely. It is difficult to say what the size of a large nemertean is, one of the species of the U. S., *Cerebratulus ingens*, measuring about a foot in length in its contracted condition, but yet being able to extend to a dozen feet or more. In some cases the nemertine development is direct, but in others a peculiar larval stage is introduced, inside of which the worm is gradually formed, and from which it later escapes, leaving the old skin. The nemertines are subdivided into four orders: in the first, the *Hoploneurini*, the proboscis bears a couple of spines. In the others these spines are lacking. The *Schizonemertini* have a pair of grooves on the sides of the head which are doubtless sensory (olfactory) in function. In the *Palæonemertini* these grooves are lacking. The last group, the *Malacobdellini* differ from all the rest in having a sucker on the posterior end of the body, and the members live in the gill cavities of certain clams. The presence of this sucker led to their being formerly regarded as leeches.

The literature of the group is small. The various papers of Hubrecht stand first. McIntosh (Ray Society) has described the British species, while Verrill has catalogued those of New England.

J. S. KINGSLEY.

Nemesianus, MARCUS AURELIUS OLYMPIUS: a Latin poet; b. at Carthage in the middle of the third century of our era; flourished at the court of the Emperor Carus, and wrote didactic poems on hunting, fishing, etc. We possess only the first 325 verses of the *Cynegetica* and four eclogues (*Bucolica*), whose author was for a long time identified with Calpurnius. These eclogues are full of reminiscences of Vergil, Ovid, and other poets, and are less correct in form than the seven eclogues of Calpurnius. See Baehrens, *Poet. Lat. Minores*, iii., pp. 174-202 (Leipzig, 1881); H. Schenkl, *Calpurnii et Nemesiani Bucolica* (Leipzig, 1885; also with introduction, commentary, and appendix by C. Keene, London, 1887).

M. WARREN.



A nemertine.

Nem'esis [*Nemesis*, Lat. = Gr. *Némeis*, personification of *reverses*, righteous anger, under highly artificial, and, at all times, derogatory of *peccare*, distribute, all the originally the abstract idea of strict divine retribution, in which sense alone Homer uses the word. In Hesiod she is a goddess, the daughter of Night (*Phaen.* 224), and sister of Furies, I. *Er.* 194, *Aeg.* and *Strife*. Properly speaking, Nemesis deals out to men, according to their deserts, good or ill fortune. She takes cognizance only of man's past deeds, while the Furies are appointed to man before his birth, and spin his fate without reference to his merit or demerit. In the classical period, however, Nemesis has become a goddess who deals out mostly ill-fortune; she avenges pride and chastises the wicked; she brings low the very fortunate and restores to him his proper measure of felicity. She therefore is the goddess who watches over *measure* in the abstract, the *just measure*. In art she is represented as a maiden holding her right fore-arms in front of her breast, so that the fore-arms from elbows to finger-tips gave the just measure of the *ell*. The *bridle* in her left indicates that she keeps man within the just measure of fortune. The Temple of Nemesis at Rhamnus gained importance after the Persian wars. The Persians, the story goes, brought with them to Marathon a block of Parian marble, in order to erect a trophy worthy of their victory, but after their defeat at Marathon carved from the block a colossal statue of Nemesis, which was placed in the temple at Rhamnus. By some the statue was ascribed to Agoracritus, a pupil of Phidias. What is supposed to be the head of this statue is now in the British Museum. See Pashinsky, *Nemesis and Alabaster*, p. 92 ff.; Roscher, *Die Nemesis des Agoracritus in Athen*, *Mythol.* xv. 1. 64 ff.; Bruns, *Archaische Künstler* (Brunswick, 1853) i., p. 240 ff.; see also the article *Nemesis* in Bonhoeffer's *Iconologia*. J. R. S. STEWART.

Nemichthy'ide [Mod. Lat., named from *Nemichthys*, the generic name; Gr. *nēma*, thread + *ichthys*, fish]: a family of fishes of the order *Apodes* or eels, distinguished by its thread-like body and snipe-like bill. The body is extremely elongated and band-like, with the tail tapering into a point, and the anus not far behind the throat, the abdominal cavity, however, extending much farther back; the head is very much elongated, and the jaws extended into a long and slender bill. Several species are known, most of them inhabiting great depths in the ocean.

Nemours, de—DUC DE, LOUIS CHARLES PHILIPPE RAFAËL D'ORLÉANS, Duc de: second son of King Louis Philippe; b. in Paris, Oct. 25, 1814. He served with his elder brother at the siege of Antwerp, and in 1836 and 1837 in the two expeditions against Constantine, in Algeria, in the latter of which he commanded one of the three brigades upon which fell the heaviest part of the short but bloody siege; commanding also the rear-guard on the return march, during which great ravages were made in the ranks by the cholera, the prince endeavored himself to his soldiers by his self-exposure and devotion to the sick. His marriage the year after with a princess of Saxe-Coburg became the cause of the deposition of the Soult ministry, one of the earlier ominous signs of incipient discontent with the reigning family. On the abdication of the king he assumed command of the troops then in the court of the palace of the Tuileries, and protected the widowed Duchess of Orleans and her children. After the fruitless and hazardous appeal by her personal presence in the Chamber of Deputies, he took measures for the safe withdrawal from France of herself and all the members of the royal family, after which he succeeded himself in reaching England. His life of exile in England was passed in great seclusion, and was marked by devotion, during the continuance of their lives, to the ex-king and queen. After the abrogation of the decree of exile he was restored (as likewise the Duc d'Aumale) to his former rank of *général de division* in the French army, but his name was removed from the army list in June, 1896, according to the law excluding from military service the members of once reigning families in France. D. June 25, 1896.

Nencioni, ENRICO: poet and critic; b. in Florence, Italy, in 1840. He was educated in his native place, and early became a member of the group of young men of letters known as *gli amici pedanti*, to which Chiarini, Cavalciochi, and Targioni-Tozzetti also belonged. He engaged in private teaching at first, but in 1869 he began to write critical articles for Bargioni's *Italia Nuova*. In 1878 his first volume of poems, *Poesie*, appeared, and this has been followed by *Medagliani* (Rome, 1885). As a poet he shows everywhere

the influence of Carducci and his school. The volume of his verse, however, is small compared with that of the critical articles he has contributed to the Italian literary periodicals. Well acquainted with English and French literature, as well as Italian, he has served as an interpreter of the chief modern poets of all three nations to his countrymen. Owing to his literary successes, he has been given a professorship in the Istituto Normale Femenile at Florence. A. R. MAY.

Nen'ninus: the supposed author of the *Historia Britonum* or *Eulogium Britannie*, a Latin history of Britain from the arrival of Brutus the Trojan, grandson of Æneas, to A. D. 635. According to several passages of this work, the writer was a monk of Bangor, Wales, but no particulars of his career are known, and it is even disputed whether he belonged to the seventh or the ninth century. Dr. Guest (1849) assigns the work which bears the name of Nennius to the eighth century, but supposes the preface to have been written in the ninth or tenth century. The best edition of the text is that edited for the English Historical Society by Rev. Joseph Stevenson (1838). Bohn's Antiquarian Library (1848) contains a translation by Gunn. See *Monumenta Historica Britannica* (1818) and *L'Histoire de Bretagne*, by de la Borderie (Paris, 1883).

Ne'ocene Period [*Neocene* is from Gr. *neos*, young + *saiaōs*, new]: the division of geologic time following the Eocene period and preceding the Pleistocene; the middle part of the Cenozoic era. The animals and plants of this period include those regarded as the immediate ancestors of existing species, and to a considerable extent are identical with living forms. The greatest differences are found in the vertebrates, especially in the mammals. The strata, as compared with those of other periods, are characterized by the abundance of lacustrine beds.

In the U. S. Neocene rocks occupy a broad belt along the Atlantic and Gulf coasts from New Jersey to the Rio Grande, covering nearly the whole of Florida and Mississippi, approximately half of Delaware, Maryland, South Carolina, Georgia, Alabama, and Louisiana, and smaller portions of Virginia, North Carolina, Tennessee, Arkansas, and Texas. These beds are marine, as is also a fringe of deposits along the coasts of Washington, Northern Oregon, and Southern California. Fresh-water strata, recording the existence of Neocene lakes, cover the Llano Estacado of Texas and New Mexico, broad districts of the great plains in Oklahoma, Kansas, Nebraska, Colorado, and Wyoming, and smaller areas in Utah, Nevada, Montana, Idaho, and Oregon. The beds include many valuable deposits of marl and phosphates. See GEOLOGY and CENOZOIC, and consult *Bulletin No. 84* of the U. S. Geological Survey, by Dall and Harris. G. K. GILBERT.

Neo-Darwinians: See EVOLUTION.

Neodesha, nē-ō-de-shaa': city (founded in 1869); Wilson co., Kan. (for location of county, see map of Kansas, ref. 7-1); at the junction of Fall and Verdigris rivers, and on the St. L. and San Fran. and the Mo. Pac. railways; 14 miles N. of Independence. It has 5 churches, high and graded schools, public hall owned by the city, natural-gas and petroleum wells, railway repair-shops, and 2 weekly newspapers. It is in a fertile agricultural region, has exceptional water-power, and is principally engaged in general farming, stock-raising, and milling. Pop. (1880) 924; (1890) 1,528; (1895) State census, 1,783.

Neodymium: See DYMIUM.

Neo-grammarians: a translation of the German term *Junggrammatiker*, first applied by Friedrich Zarncke to the new school of comparative philologists which arose in Leipzig about 1877-78, and was distinguished by its enunciation of a stricter method of historical tests in linguistic research. This method recognized two leading principles: (1) That the laws of sound operate uniformly, i. e. with like results in like conditioned materials; (2) that the apparent exceptions to the laws of sound are to be explained by the operation of the psychological principle of analogy. The complete statement of these principles may be found in Osthoff-Brugmann, *Morphologische Untersuchungen*, vol. i, introd. (1878), and in Paul, *Prinzipien der Sprachgeschichte* (1st ed. 1880; 2d ed. 1886). BENJ. DE WHEELER.

Neo-Lamarckianism: a term introduced for that school of evolutionists, especially strong in the U. S., which believes with Lamarck that use and disuse are important fac-

tors in the development of new organs, but which differs from Lamarck in admitting that natural selection may also be an efficient element in variation. For the principles involved, see EVOLUTION and HEREDITY.

J. S. K.

Neophytic Flora: See PLANTS, FOSSIL.

Neo-Platonism: in the more limited sense of the word a philosophical school which originated in Alexandria in the third century after Christ, was professedly founded on the doctrines of Plato, but, as has been shown by Hegel, is more indebted to the ideas of Aristotle than to Plato, and denotes the last attempt of the speculative spirit of the Greek civilization to establish a scientific basis for its development. The school was founded by Ammonius Saccas (175-241 A. D.), further developed by Plotinus (205-270), and continued by Porphyrius (233-305), Iamblichus, Proclus (412-485), and others. In a wider sense, the name is applied to the whole speculative tendency which grew up in Alexandria from the amalgamation of Greek philosophy, Oriental theosophy, and Jewish and Christian theology, and of which the above-mentioned philosophical school is only one individual manifestation, while it produced most remarkable intellectual characters in the most different fields of speculation. Thus Philo Judæus (42 A. D.), Clemens Alexandrinus (220), Origen (185-254), and the Gnostics are severally representatives of systems akin to the Neo-Platonic form of speculation. In the celebrated commentary of Alexander of Aphrodisias on Aristotle's psychology there are to be found many of the leading ideas which form the foundation of Neo-Platonism. For the general character of this tendency and the special ideas of the school, see PHILOSOPHY and the special articles PLOTINUS, PROCLUS, etc.

Revised by W. T. HARRIS.

Neo'sho: city (incorporated in 1846, seat of the Legislature which adopted the ordinance of secession in 1861); capital of Newton co., Mo. (for location of county, see map of Missouri, ref. 7-D); on the St. L. and San Fran. and the Kan. City, Pitts. and Gulf railways; 73 miles S. W. of Springfield, 315 miles S. W. of St. Louis. It is in a lead-mining and agricultural region, has a number of valuable mineral springs, and is principally engaged in lead-mining and manufacturing. It is the seat of Scarritt Collegiate Institute (Methodist Episcopal South, chartered 1888), and has a U. S. Fish Commission station, with extensive building and grounds. There are 12 churches, a State bank with capital of \$40,000, a private bank, and 3 weekly newspapers. Pop. (1880) 1,631; (1890) 2,198; (1894) estimated, 2,500.

EDITOR OF "TIMES."

Neosho River: a stream which rises in Morris co., Kan., flows generally S. S. E., enters the Indian Territory, and joins the Arkansas near Fort Gibson. It is some 300 miles long. Its chief tributary, the Cottonwood, is much larger and longer than the Neosho above the junction.

Neotropical Region: See AMERICA, SOUTH.

Nepal, Nepaul, or Nipal: an independent state of Hindustan, situated between Tibet and British India, and between lon. 80° 6' and 88° 14' E. Area, 54,000 sq. miles. Pop. estimated at 2,000,000. The southern part of the country consists of a belt of low land covered with tropical forests, which yield many sorts of valuable timber; the climate is hot, and utterly unhealthy, and wild animals, such as elephants, tigers, and leopards, abound. From this low land the ground gradually rises, first into hills, where rice, maize, millet, sugar, indigo, and coffee are cultivated, mostly on artificial terraces along the hill-sides; then into mountains, in whose elevated valleys wheat, oranges, walnuts, grapes, and other kinds of fruits are grown; and then into alps, among which are the highest peaks of the Himalaya—as, for instance, Mt. Everest—on whose pastures large herds of cattle, sheep, and goats are reared. Iron, copper, lead, tin, zinc, and salt have been found and are mined; cotton cloths and earthenware are manufactured; timber, hides, ivory, fruits, sheep, cattle, and elephants are exported. The inhabitants consist of several tribes, of which the Gurkhas, who are of Rajput descent and faith, form the warrior caste and hold the government, while the Newars, who are of Tibetan origin and are Buddhists, make the artisans of the country. Between the various tribes there exists a great difference, not only in character and religion, but even in language; they all have succumbed to the conquering tribe of the Gurkhas, which invaded the country in the latter half of the eighteenth century. The government is a military oligarchy, with a titular sovereign, who is a mere

figurehead, the real power being in the hands of a prime minister, called the mayor of the palace. Capital, KHAR-MANDU (q. v.).

Revised by M. W. HARRINGTON.

Nepen'thes [Mod. Lat., from Gr. *νηπενθής*, banishing pain or sorrow; *νη-*, not + *πένθος*, suffering, sorrow]: a remarkable genus of pitcher-plants (the sole type of a peculiar family, *Nepenthaceæ*) of over thirty species, all natives of the southern tropical region of which the Indian Archipelago is the center, ranging from Madagascar to New Caledonia. They are all woody climbers, with apetalous and inconspicuous dioecious flowers. Their peculiarity is in the leaves; these are rather long and narrow, traversed by a very strong midrib, which is prolonged into a tendril serving for climbing, the apex of this developed into a tubular or oblong pitcher, closed with a hinged lid. Until the

pitcher is full grown the lid closes the orifice. A watery liquid, having a slight acid reaction, is secreted in the pitcher in small quantities. At maturity the lid opens, and remains so, more or less elevated on its hinge: the watery secretion still continues, especially if animal matter is introduced, but it may now escape by evaporation. About the rim of the pitcher a sweet secretion forms under favorable circumstances, which is attractive to insects; and dead insects are generally found in the pitcher. The



Portion of a plant of *Nepenthes distillatoria* (much reduced).

researches of Dr. Hooker go far to prove that the liquid within possesses digestive properties, and that its powers of dissolving animal matter are augmented by a peculiar secretion which is only poured out in quantity when insects or other animal substances are introduced. *Nepenthes distillatoria* of Ceylon was the earliest known species, and together with *N. phyllamphora* and *N. ampullaria* of the Archipelago has been long known in cultivation. Some species found in Borneo have pitchers a foot or two in length.

Revised by CHARLES E. BESSEY.

Nepheline [from Gr. *νεφέλη*, mist, cloud]: a silicate of alumina, soda, and potash, crystallizing in the hexagonal system and allied to the feldspars. It occurs in volcanic rocks; in some instances so completely taking the place of feldspar as to form a nepheline rock. *Davynne* and *elæolite* are varieties of nepheline.

Nephi: city; capital of Juab co., Utah (for location, see map of Utah, ref. 5-L); on the Union Pac. and the San Pete Valley railways; 90 miles S. of Salt Lake City. It is in an agricultural, sheep-raising, gypsum, marble, and salt region, and has a national bank with capital of \$50,000, an incorporated bank with capital of \$50,000, and a weekly newspaper. Pop. (1880) 1,797; (1890) 2,034; (1895) 2,515.

Nephrid'ia [from dimin. of Gr. *νεφρός*, kidney]: a term introduced by Lankester for those excretory organs which can be reduced to the type of ciliated funnels connecting the body-cavity (coelom) with the exterior. To this category belong the excretory organs of most worms, molluscs, crustacea, and vertebrates. The excretory organs of insects are entirely different.

Neph'rite [from Gr. *νεφρός*, kidney. Named from being formerly worn as a remedy for kidney diseases]: See JADE.

Nephritis: See BRIGHT'S DISEASE.

Nephtys [Egypt. *Neb-hat*, mistress of the house]: an Egyptian goddess, daughter of Seb and Nut (sky) and sister of Osiris, Isis, and Set. She is usually represented as the wife of Set, but also as the mother, by Osiris, of Anubis, the jackal-headed god of the dead. She appears principally as the companion of Isis, with whom she is represented as mourning the dead, being painted on burial-chests at the head of the chest, with wings extended for the protection of the departed. When represented alone, she appears with the signs ("house" and "bowl") which express her name ideographically.

CHARLES R. GILLET.

Nepigon [from Cree *Aminipigon*, deep, clear lake]: a large lake in the Thunder Bay district of Ontario, Canada,

30 or 40 miles N. of Lake Superior, with which it is connected by Nepegon river, emptying into Nepegon Bay of Lake Superior. It measures about 70 miles N. and S. by 50 E. and W., is thickly studded with islands and has many indented shores. It is a much prized region for summer hunting and especially fishing. The January mean temperature is about 7° F., or that of Godhavn in Greenland. In July the mean temperature is that of San Francisco. The region about the lake appears to be as favorable for agriculture as Manitoba or Quebec. M. W. H.

Ne'pomuk, JOHN: a saint of the Roman Catholic Church, and the patron saint of Bohemia; b. at Parnau, Bohemia, about 1330; studied at the University of Prague; became rector of the Church of St. Gall in that city, and was appointed court preacher to the Emperor Wenceslas in 1378. In this position he opposed and reproved with undaunted courage the suspiciousness and cruelty of Wenceslas, who had demanded that John should reveal to him the secret confessions of his wife, the Empress Sophia, daughter of Albert, Duke of Bavaria. On John's refusal, he was imprisoned, cruelly tortured, bound hand and foot, and cast into the Moldau. In 1393. His body was found and buried; many miracles were wrought at his grave; legends gathered around his name, and on Mar. 19, 1729, he was canonized by Pope Benedict XIII. The Cathedral of Prague contains a magnificent monument of marble and silver to his honor. His festival is held on May 16. See Abel, *Die Legende des heiligen Ne'pomuk* (1855); Frick, *Die geschichtliche Bedeutung von Ne'pomuk* (1864); and *Der heilige Johannes von Ne'pomuk* (1879).

Ne'pos, CORNELIUS: a Roman historian from Upper Italy, of whose life nothing is known but that he was a friend of Atticus, Cicero, and Catullus, and that he lived between 99 and 24 B. C.; wrote various works, all of which have been lost with the exception of parts of his *De Viris Illustribus*, which originally contained at least sixteen books. The extant lives of Cato and Atticus were from the book *De latinis historiis*. The work *De excellentibus duabus ceterarum gentium*, now commonly used as a school book, and generally ascribed to Cornelius Nepos, was first printed in 1471 under the name of Emilius Probus, an obscure writer of the fourth century, but in a new edition of 1569 Dionysius Lambinus claimed the authorship of the book for Cornelius Nepos, and identified it as a part of his lost *De Viris Illustribus*, chiefly on the ground that the purity of the language and the simplicity of the style would be impossible with a writer of the fourth century; and this opinion, modified by various hypotheses, has been generally accepted, although Unger (*Der sogenannte Cornelius Nepos*, Munich, 1881) attributes it to Hyginus. Editions and translations are very numerous. Among the most useful editions are those of Van Staveren, revised by Bardili (2 vols., Stuttgart, 1820), of Bremi (Zurich, 1827), of Siebelis (11th ed. 1885), and of Nipperdey (9th ed. 1885), and a larger edition revised by Lupus (Berlin, 1879). Revised by M. WARREN.

Neptune [from Lat. *Neptunus*]: in Roman mythology, the god of the sea. In sharp contrast to the seafaring Greeks, the Romans reveal by their mythology and language very little early familiarity with the sea. Words pertaining to the sea or seafaring are for the most part borrowed from the Greek, and a native sea-god independent of the Greek Poseidon can hardly be said to have existed. The name Neptune was common to Etruscans and Romans, and perhaps originally indicated a god of all water or moisture. There is practically nothing left, however, to indicate the attributes and character of this original god, for at an early date he is completely identified with the Greek sea-god Poseidon. Only one early temple to Neptune is reported. It was located near the Circus Flaminius, and contained a famous marine group by Scopas, representing Neptune and his train. After the defeat of Sextus Pompey and the victory at Actium, the worship of Neptune was revived, and Agrippa erected in his honor the great temple in the Campus Martius, called either by the Greek name, the Poseidonion, or the Basilica Neptunia. G. L. H. S. S. S. S.

Neptune [named from *Neptune*, a Roman deity]: the outermost planet of the solar system. Its discovery is justly regarded as the most remarkable astronomical achievement of the nineteenth century. Up to about the beginning of the century it was found that the motions of all the planets could be perfectly accounted for by the attraction of the sun and their mutual attraction on each other; but when, about 1820, Bouvard proceeded to construct tables of Uranus,

then the outermost known planet, an apparent exception presented itself, and the observations could not be reconciled with the motions computed from the attraction of the sun, Jupiter, and Saturn. Although Uranus was discovered by Sir William Herschel in 1781, it was afterward found that a number of astronomers had actually seen it and observed its position before that time, supposing it to be a fixed star. One of these observations was by Flamsteed as far back as 1695. Bouvard, finding that he could reconcile the observations made after 1781 with the theory, omitted the older ones entirely, leaving it to the future to find why they could not be so reconciled; but it was soon found that the planet began to deviate from the tables far more rapidly than could be accounted for by the necessary uncertainty of the data on which the tables were founded. The cause of this deviation was the subject of consideration among astronomers, and it seems to have occurred to several that it might be due to the action of an unknown planet beyond Uranus; but the problem of finding this planet was one which for some time no one ventured to attack. In 1840, however, the deviations had become so wide, amounting to two minutes of arc, that they attracted more attention than before, and three astronomers took up the problem of tracing them to their cause. The first of these was the illustrious Bessel, of Königsberg, who began work about 1840 by making a critical examination of the correctness of Bouvard's computations, and setting one of his assistants, Fleming, at the work of making a careful reduction of the Greenwich, Paris, and Königsberg observations. The death of Fleming and the ill-health of Bessel prevented the work from being carried further.

John C. Adams was then a student at Cambridge. In the summer of 1841 he became acquainted with the state of this question by reading a report of Mr. Airy. It occurred to him that it ought to be within the power of mathematics to calculate the position and movements of the disturbing planet from the observed deviations of Uranus, and he determined to attack the problem as soon as his studies would permit. In the autumn of 1845 he had so far advanced as to have computed an approximate orbit of the hypothetical planet, and about the end of October of that year he communicated the position of the planet to Prof. Airy, within a degree and a half of the real position of Neptune. Had an expert astronomer pointed a telescope of 6 inches aperture in the direction indicated by Adams, and swept for the planet, he must have recognized it by its disk after a few minutes' examination; but Prof. Airy had so little confidence in the prediction that he did not take the trouble to look for the object.

In the meantime a third person entered the field. This was Urbain J. Leverrier, then a young man of little over thirty, who had proved his mathematical ability by a very important paper on the secular variations of the orbits of the planets. In June, 1846, he presented to the Paris Academy of Sciences a paper in which he assigned an approximate position of the planet, agreeing very nearly with that already found by Adams. When Airy heard of this he began to consider the planet worth looking for, and at his suggestion Prof. Challis, director of the Cambridge Observatory, began a search. Instead, however, of trying to recognize the planet by its disk, he began the work of preparing an extensive catalogue of the stars in a space of several degrees each side of the computed place of the planet, which would necessarily occupy a considerable time. Meanwhile Leverrier was engaged in determining more accurate elements, which he communicated to the Academy about the end of August. Being now entirely confident that the planet must be very near the assigned place, he wrote to Dr. Galle, of Berlin, requesting him to search for it. Galle received the letter on Sept. 23, 1846, and the same evening went to the telescope, and proceeded to compare the stars in the neighborhood of the assigned place with a star-chart of that region which had just been finished. He soon found a star of the seventh or eighth magnitude which was not on the chart, within a degree of the position sent by Leverrier. As it presented a sensible disk, there could be no reasonable doubt that it was the object sought; but, desirous of proceeding with caution, he waited till the following night, when he found that it had actually changed its position among the stars. There was no longer any doubt of the reality of the discovery. After considerable discussion astronomers in general agreed upon the name Neptune for the newly discovered planet.

have been made mostly by astronomers of the U.S. The first one in the field was Sears C. Walker, then astronomer at the Naval Observatory, Washington. He computed an accurate orbit of the planet from all accessible observations, and then proceeded to inquire whether it had not been observed as a star at some former time, as Uranus had been. Computing the place of the planet for those previous years in which its path was known to have been swept over by observers of catalogues of stars, he found that on May 10, 1795, Lalande had observed a star almost exactly on the path of Neptune, which was now missing from the heavens, and which must have been the planet. When the news of this discovery reached Europe, search was made among the original manuscripts of Lalande, and it was found that the planet had also been observed on May 8, but finding the two observations discordant, owing to the motion of the planet during the interval, he had rejected his first observation entirely. He thus missed the great discovery by not investigating the cause of the discordance between his observations. These observations have been very valuable in fixing the orbit of the planet. Neptune moves in an orbit nearly circular, having an eccentricity of only 0.00872; yet on account of the great dimensions of this orbit, the absolute eccentricity in miles exceeds 25,000,000, and the difference of its distances from the sun in aphelion and perihelion is more than 50,000,000. The inclination of the orbit to the ecliptic is $1^{\circ} 47'$, and its mean radius about 2,746,000,000 miles. The period of revolution of the planet is about $164\frac{1}{2}$ years, and its diameter about 37,000 miles. Its bulk is therefore more than 100 times that of the earth, but its density is so much less (one-sixth) that it has only about 17 times as great a mass.

Neptune has a single satellite, discovered in 1847 by Lassell, of Liverpool. Its period is 5d. 21h. 2m. 44s., and its mean distance from the planet about 230,000 miles.

S. NEWCOMB.

Nerbudda: a river of Central India, and next to the Indus the largest river of India, emptying on the west coast. It rises in lat. $22^{\circ} 40'$ N. and lon. $81^{\circ} 52'$ E., crosses the peninsula with a course of 620 miles, flowing a little S. of W., and falls into the Bay of Cambay, forming a large estuary. It is narrow and deep, but serves as a commercial highway only for the last 90 miles of its course, on account of its rapid current and numerous waterfalls. C. C. A.

Ne'reids [from Gr. *Νηρηίδες*, plur. of *Νηρείς*, a Nereid, liter., daughter of Nereus; *Νηρεΐς*, a sea-god + femin. patronymic ending *-is*, *-idos*, descended from]: the fifty daughters of the sea-god Nereus by Doris, his wife. They were genuine Greek goddesses, who lived in the depths of the sea in a grotto resplendent with gold and silver. They were friendly to mariners and often acted as pilots, notably to the Argonauts and the Greek expedition against Troy. They were represented in art as beautiful and youthful maidens, sometimes clothed and sometimes nude. They disported themselves on the waves of the sea along with various sea-monsters, and are often depicted riding on the backs of dolphins or seated in a chariot drawn by Tritons (q. v.). Among the most distinguished of the Nereids were Amphitrite, Thetis (the mother of Achilles), and Galatea. See the article *Nereiden* in Baumeister's *Denkmäler*.

J. R. S. STERRETT.

Nereids: See SEA-MOUSE.

Neri, nā rēe, FILIPPO, dei, known in English as St. PHILIP NERI: saint; b. at Florence, Italy, in July, 1515; was adopted by a wealthy uncle as his heir; secretly went to Rome to study theology and canon law; distributed his property to the poor 1538; devoted himself to the care of pilgrims and the destitute sufferers in hospitals, and in that work was associated with Ignatius Loyola; took holy orders 1551, and founded the order of Priests of the Oratory, approved by Gregory XIII. in 1575. D. at Rome, May 26, 1595; was canonized in 1622. See ORATORY, CONGREGATION OF THE, and Faber's *Spirit and Genius of St. Philip Neri* (1850).

Nerit'idæ [Mod. Lat., name from *Nerita*, the typical genus, from Lat. *nerita* = Gr. *νηρείτης*, sea-mussel, periwinkle, deriv. of *Νηρεΐς*, a sea-god]: a family of Azygobranch mollusks (see GASTEROPODA) containing some 200 species, characterized by having a solid semi-globose shell with a straight columellar lip, which may bear a prominent tooth near its middle. In one species (*Nerita peloronta*) the columella at the base of this tooth has a red blotch, whence the name, which signifies "bleeding tooth." The aperture is closed by a calcareous operculum, which locks

into the columella. Most of the species are marine, but some extend into brackish and others into fresh water.

Ne'ro, LUCIUS DOMITIUS (after his adoption by the Emperor Claudius called NERO CLAUDIUS CÆSAR DRUSUS GERMANICUS): Roman emperor from 54 to 68 A. D.; the son of Cn. Domitius Ahenobarbus and the younger Agrippina, daughter of Germanicus; b. at Antium in 37 A. D. After the marriage of his mother to the Emperor Claudius (49 A. D.) he was adopted by the latter, and a few years later married the emperor's daughter Octavia. As early as his fourteenth year, on the assumption of the toga of manhood, the intrigues of his mother had caused his succession to the imperial dignity to seem assured, in spite of the fact that the emperor had a natural son of great promise, the young Britannicus. In 54 A. D. Claudius died (poisoned, our authorities agree, by Agrippina, in order to insure and hasten her son's succession), and, the claims of Britannicus being ignored, Nero was saluted as emperor first by the prætorian guard and then by the senate. At this time Nero was only seventeen years of age and still under the influence of his tutors, Burrus and the philosopher Seneca, who, during the first years of his reign, practically ruled the empire. The high hopes which had been raised by belief in the ability and noble nature of Nero were not at first disappointed, so long as the influence of Seneca kept the baser qualities of his nature in check; but the jealousy of Agrippina, who saw her influence over her son waning, gave the first impulse to the unparalleled series of crimes which make up the chief history of Nero's reign. His first victim was Britannicus, the son of Claudius, for whom Agrippina had threatened to secure the imperial throne in his stead. In 59 A. D. he caused the death of his mother, and from this time on he abandoned himself to a career of the wildest and most enormous profligacy and crime. Indeed, the record of the remaining years of his life is little more than a tedious enumeration of the victims of his fear and hate. The conflagration in 64 A. D., which swept away the greater part of the city, was attributed to Nero in his own time, and practically all authorities after Tacitus charge him with it; but Tacitus reports the rumor without giving it credence, and its truth may well be questioned. To avert suspicion from himself the deed was charged to the Jews and Christians of Rome, and some of the latter perished for it as the first victims of Roman persecution. The city was rebuilt by Nero in a more durable and better manner, with wider streets and more adequate precautions against fire. The chief feature of the reconstruction was the magnificent palace called "the golden house," which stretched over a vast area of the best portion of the city, from the Palatine across the intervening valley to the Esquiline. (See Middleton, *Remains of Ancient Rome*, London, 1892, vol. ii., pp. 145-153.) In the following year a conspiracy against the life of Nero was disclosed, and the leaders of it, as well as many innocent persons on whom suspicion fell, were punished. Among the latter was his former tutor and friend, the philosopher Seneca, whom he ordered to die. Nero possessed accomplishments as a singer, actor, and athlete of no common kind, and was fond of displaying himself. In the year 64 he appeared thus in public at Naples, and two years later he journeyed through Greece, where he found a more appreciative audience, taking part in the contests of the Greek festivals. On his return to Italy early in 68 he tarried long in Naples, and was finally recalled to Rome by the news of the revolt of Gaul under Julius Vindex. This movement was joined by Spain under the leadership of Galba, who had been saluted as emperor by his soldiers. Virginius, the governor of Upper Germany, lent his support to the insurrection, and the senate proclaimed Nero a public enemy and condemned him to death. At this Nero fled for refuge to the villa of a faithful freedman, but, as he was being overtaken by his pursuers, put an end to his own life. See H. Schiller, *Geschichte des röm. Kaiserreichs unter der Regierung des Nero* (Berlin, 1872).

G. L. HENDRICKSON.

Nero: See CLAUDIUS.

Nertchinsk: town of Eastern Siberia, province of Transbaikalia; 527 miles E. of Irkutsk, on the basin of the Amur; on the Nertcha river, 3 miles from its confluence with the Shilka. The town was founded in 1654. It was removed from the Shilka in 1812 to avoid the frequent inundations of this river, but in 1840 it was seriously injured by floods from the Nertcha. The country around abounds in good pasturage and in rich ores of many minerals, including gold,

silver, and precious stones. The richest mineral district lies between the Stálek and the Argenta and embraces 3,250 sq. miles belonging to the state. P. p. 3,000. M. W. H.

Neruda, KAREL JAN, poet and novelist; b. at Prague, Bohemia, July 10, 1894; studied law and literature at the University of Prague, adopted a literary career, and edited various journals: *Obrazy života* (Pictures of Life, 1859-60); *Radost života* (The Family Circle, 1863-64); *Křesťanství* (1865-66); in 1865 he became the regular feuilletonist to the *Národní Listy* (National Gazette), a position which he held until his death, Aug. 22, 1891. Neruda must be considered the head of the new romantic school of poetry in Bohemia, which originated in the fifties in opposition to the old "national" school. In the production of short, witty discourses on timely topics he has no equal among Slavonic writers. He disseminated free thought, and was therefore persecuted by the priests. His first poems appeared in the *Lumír* (1854) and the almanac *Máj* (May, 1858). He published: poems, *Uhlitovni keři* (Flowers from the Churchyard, Prague, 1858), reflections on contemporary life; *Knihy veršů* (Books of Verse, 1868), epic, lyric, and occasional; *Písni kosmické* (Cosmic Songs, 1878), songs of the universe, largely plagiarized by German editors; *Báňský a románek* (1883); *Poetické odznaky* (Simple Motives, 1884); *Zpěvy páteční* (Friday Songs, left in manuscript), patriotic lyrics. Dramas: *Perseus a královna* (1860), a tragedy, and comedies *Prádelná* (The Sock-Loave, 1879) and three others. Novels, stories, and sketches: *Arabský* (1864; 2d ed. 1880); *Roznášání* (Visiting the People, 1871); *Obrazy ciziny* (Sketches from Foreign Lands, 1872); *Feuilletony* (1876, et seq.); *Malostranské povídky* (Little Side Stories, 1878, 1883), stories of Prague life, his masterpiece. His collected works, edited by Ignat Hermann, were published at Prague (1892-94). J. J. KRAJ.

Ner'va, MARCUS COCCÆIUS: Roman emperor from 96 to 98 A.D. As a member of the senate he had won a good name for prudence and integrity, and after the murder of Domitian he was declared emperor. Though not an administrator of great ability or force, he reformed many of the worst abuses of Domitian's rule, and succeeded in a measure in "blending things once irreconcilable, sovereignty and freedom." Tacitus. Feeling, however, that he was not strong enough alone to withstand the hostility of Domitian's former instrument of servitude, the praetorian guard, he adopted and associated with himself Trajan, then commander of the army on the Rhine. After three months of joint rule Nerva died suddenly (at the age of sixty-six) and was succeeded by Trajan. G. L. HENDRICKSON.

Nerval, GÉRARD DE: See GÉRARD DE Nerval.

Nerves [plur. of *nerve*, viâ O. Fr. from Lat. *ner'vus*, sinew, tendon, fiber, nerve, akin to Gr. *νεῦρον*, sinew, nerve]: the cords of communication between the central nervous system and the peripheral parts—the skin, internal surfaces, muscular apparatus, organs of special sense. These cords vary in diameter from a microscopic dimension to 10 millimeters, their lengths also vary widely, from a few lines to 2 feet and more. Every nerve, whether microscopic or larger in size, is a compound structure made up of nervous and connective tissue. For the structural details, see HISTOLOGY (*Nerves and Nerve-centers*). The functions of nerves are general and special. As general functions or properties are recognized—(1) conductivity, (2) excitability. By the former, sensory impressions are conveyed from peripheral parts through nerve-fibers centripetally to the nervous centers; the spinal cord and brain are thus affected by the external world. Again, conduction takes place in a centrifugal direction, motor excitations being sent from the nervous centers to peripheral apparatus; the activity of the organism is made externally manifest. Excitability is the property which nerves have of reacting to impressions independently of the nervous centers—a property which, after section of a nerve, survives for about three days in the distal portion. The special functions of nerves are treated of under other headings. (See SENSATION, EYE, EAR, TASTE, etc.) A very important function of certain nerve-fibers is that relating to nutrition. It is known that when certain fibers of a nerve are cut atrophy and degeneration take place in the parts supplied by this nerve. These fibers, known as *trophic fibers*, are probably present in most nerves, but especially in certain ones. Another highly important set of nerves are those which govern the blood-vessels and regulate their state of contraction or distention. In this way these nerves are also closely concerned with nutrition. Nerves

are liable to various diseases, such as inflammation (neuritis), or tumors (neuroma), and often receive injuries. See HISTOLOGY.

Revised by WILLIAM PEPPER.

Ner'vil: an ancient Belgic race, probably of Germanic or Dutch stock, who desperately opposed Caesar in several bloody wars (57-52 B.C.). Their chief towns were *Bagacum* (Bavay) and *Camaracum* (Cambrai).

Nervous Diseases: affections of the nervous system—that is, of the brain, spinal cord, or external nerves. They may be either functional or organic. By functional nervous diseases are meant such as present no anatomical alteration of nerve structure to the naked eye or to other means of examination at our command. Though this group has been materially lessened in number by the more accurate methods of study recently acquired, there is reason to believe that there will always be left a certain number in which the disorder of nerve action is possibly rather of a chemical than of a structural origin. Whether this be true or not, for the present there are certain nervous diseases in which structural changes are not discoverable. These are often spoken of as *neuroses*. Many vague conditions are included in this group, and in the course of many organic diseases of other parts of the body nervous disorders of a functional, probably often toxic, nature are developed. The term *nervousness* is applied loosely to many distinct conditions; but there is a form of unstable nervous equilibrium which has occupied much attention of late, and which is variously known as nervous exhaustion, nervous break-down, and neurasthenia. This disorder assumes many forms, according to the part of the nervous system involved and the causes at work. It is of immense importance to recognize it as a distinct affection as well as its influence in furthering other and organic diseases. Overwork, excesses, and disease are at the bottom of this, which is really a condition of wasted nerve force. Epilepsy, hysteria, certain forms of insanity, and neuralgia are among the more serious nerve disorders of the functional kind. In all of them heredity plays a part—not necessarily in every case, but in many. The vices as well as the diseases of the ancestor are visited upon the offspring: the child of a drunken father may be an epileptic; the child of an epileptic insane. Alternately, from generation to generation, one and another functional nervous disease crops out in families with this neuropathic taint, slight exciting causes sufficing to upset the originally weak nervous organization. On the other hand, the most stable nervous system may succumb to unusual and improper strains.

The organic affections of the nervous system may be classified, as are the diseases of other organs, by the nature of the structural changes. These may be anæmia, congestion, inflammation, degenerative changes, malignant growths, and the like, as elsewhere. An ideal system of classification would take these changes alone into consideration. Unfortunately, however, the knowledge of the physiology and pathology of the nervous system has not yet reached the point where this is possible. We are constrained to consider nervous diseases from the clinical standpoint, grouping together diseases whose external manifestations or symptoms are the same when in reality their essential nature is probably widely different. Thus we recognize St. Vitus's dance by certain symptoms, yet it is probable that this is not essentially a disease, but a form of expression of various diseases, just as dropsy may result from heart disease or disease of the kidneys. The individual diseases of the nervous system are considered under the names of the diseases themselves.

WILLIAM PEPPER.

Nervous System: See HISTOLOGY, NERVES, and ANATOMY, COMPARATIVE.

Nes'selrode, KARL ROBERT, Count von: Russian diplomatist; b. at Lisbon, Dec. 14, 1780, where his father was Russian ambassador; entered very early on a diplomatic career; gained the confidence of the Emperor Alexander; was made Minister of Foreign Affairs in 1812, and took a prominent part in all the important negotiations with France and the allies at the close of the Napoleonic wars. He represented Russia at the Congress of Vienna, and afterward at the congresses of the Holy Alliance, usually favoring a peaceful and moderate policy. At Aix-la-Chapelle in 1818 he showed great zeal in the interest of France, urging that the occupation of that country by the allies should cease. For this he was rewarded by the French Government, which added enormously to his wealth. He became vice-chancellor of the empire in 1829, chancellor in 1844,

and governed the relations of Russia with foreign powers to 1856, when, after signing the Peace of Paris, he retired into private life, and died at St. Petersburg, Mar. 23, 1862. His relation to Alexander I. and Nicholas depended partly upon hypocrisy; he had a great talent for concealing his own superiority and making others embrace his ideas, in the belief that they themselves had produced them. His *Autobiography*, written in French, and somewhat disappointing as to its contents, was published after his death.

Nessler, VICTOR: opera-composer; b. in Alsace, Jan. 28, 1841; was a pupil of Theophil Stern at Strassburg; studied theology, but gave it up for music; conducted several singing societies in Leipzig, and also at the theater from 1870 to 1879. He lives at Strassburg. His operas are popular, and include *Dornröschens Brautfahrt* (1867); *Irmgard* (1876); *Der Rattenfänger von Hameln* (1879); *Der Wilde Jäger* (1881); *Der Trompeter von Säckingen* (1884). He has also composed several operettas, cantatas, etc. D. E. H.

Ness, Loch: a lake in the county of Inverness, Scotland; in the valley of Glenmore; 23 miles long and 1½ miles broad. It communicates with the Moray Firth by the river Ness.

Nestor, The Chronicle of: nearly, if not quite, the oldest chronicle we possess of the early history of Russia. It is supposed, on no very good evidence, to have been written, or at least compiled, by a monk named Nestor, who was born at Kiev in 1066 and died in 1113. However that may be, it is a document of the greatest importance for our knowledge of the time it describes. Although it has the faults of other mediæval histories, with little pretense to literary merit or critical insight, the wide knowledge of the chronicle and the general trustworthiness of his facts put the work above most others of its class. It begins with the creation, and comes down to the year 1113, describing many events that occurred during the lifetime of the writer or were related to him by older eyewitnesses. The language is one of transition from the old Church Slavonic to Old Russian. The most ancient manuscript extant, the so-called Laurentian (*Laurentinskii Spisok*, facsimile, St. Petersburg, 1870), dates from 1377, and was not known to the editors of the first printed text (1767). A revised edition was published at Vienna in 1860. The chronicle has been translated into Bohemian, Polish, German, and French. The last French version is by L. Leger (1884). See the works of Schlözer (5 vols., Göttingen, 1802-09), Miklosich (1855), Sukholimov, and others. Nestor also left a story of the lives of certain saints, called the *Puterikon*. A. C. COOLIDGE.

Nestor [= Lat. = Gr. *Νέστωρ*]: son of Neleus and Chloris and King of Pylus in Messenia. When Heracles captured Pylus and slew all the other sons of Neleus, Nestor escaped death because he was absent at Gerenia. For this reason he bears the epithet of *Gerenian* in Homer. In his youth he fought against the Epeans of Elis, against the Arcadians, and on the side of the Lapithæ against the Centaurs. He also took part in the Calydonian boar-hunt, and in the Argonautic expedition. When, as an old man, he was ruling over the third generation of his subjects, it became necessary for him to join the expedition against Troy because his son Antilochus had been a suitor of Helen. At Troy he was one of the foremost of the heroes both in the council and the fray, being distinguished for his wisdom, justice, and eloquence. After the Trojan war he resumed the reins of government at Pylus, where Telemachus, when on his way to Sparta, found him enjoying a peaceful and happy old age. His house at Pylus was shown as late as the time of Pausanias. His name is still applied to the oldest and wisest counselor of a class—e. g. the Nestor of Philologists. J. R. S. STERRETT.

Nestorians: a portion of the Oriental Church, adherents of Nestorianism (dioprosopism, two-person-ism), a Christological theory which takes its name from Nestorius, who was not its first nor ablest, but became its most renowned, representative. I. Nestorius was a native of Germanicia in Syria, became a pupil of Theodorus of Mopsuestia (393-428), and from him received the views characteristic of the school of Antioch with which his own name was to be identified. First a monk, then a presbyter in Antioch, his ascetic piety and gifts as a preacher caused him to be chosen Patriarch of Constantinople, the great calamity of his life (428-431). Like no few of the great heresiarchs, he began as a zealot of orthodoxy and as a persecutor of heretics. The new patriarch and his presbyter, Anastasius, whom he had brought

with him, heard in Constantinople on every hand the darling phrase of the school of Alexandria, "Mary, mother of God"—a phrase which, except with explanations and limitations which totally changed its meaning, the extreme wing of the school of Antioch would not tolerate. The presbyter (428) assailed this phrase and the theology it represented. Proclus, the unsuccessful rival of Nestorius for the patriarchate, eagerly caught at the opportunity of assailing Nestorius through his presbyter. Nestorius stood by Anastasius. Dorotheus, the court bishop, pronounced an anathema against those who should style Mary the mother of God. At the festival of the Annunciation (429) Nestorius and Proclus preached in the same church against each other. The monks and people rose, in fury, renounced fellowship with the patriarch ("We have an emperor, but no bishop," they said), and treated him with such insolence that in his anger he had the monks scourged, and at a local synod convened in 429 anathematized his opponents as Manichæans.

II. There entered now into the conflict the most formidable foe encountered by Nestorius. This was Cyril, Bishop of Alexandria (412-444). His theology was antagonistic to that of Antioch, and his see was the rival of Constantinople. Nestorius afforded him the opening for dealing one decisive blow against both the objects of his dislike. It was a contest between a great theologian and a shallow popular orator, between a sagacious, unscrupulous man of the world and a monk whose excellences and defects showed the traces of the passiveness and the narrowness of the cloister. Worst of all for Nestorius, there was a statement, necessarily crude in certain aspects, yet in the main strong and sharply defined, of the logical result of the dominant movement of the mind of the Church for ages, over against a set of clumsy propositions, which never touch the real question in discussion, but persistently misstate it, and whose precise force in various respects is an object of dispute to this hour. Cyril charged Nestorius with making two persons, of two natures, and thus denying the proper personal deity of Christ, making him in one person God, in another person man, and not, as he was in truth, in one person, the God-man, so that every act and every passion was personal, though it were according to one or the other nature. Nestorius was charged with teaching a moral, ideal, voluntary *connection* (*συνάφεια*) of two persons, instead of the natural, real, and inseparable *union* (*ἕνωσις*) of two natures into one person. At the synod of Alexandria (430) Cyril issued twelve anathemas, to which Nestorius replied in the same form.

III. The third Œcumenical Council was convened by the desire of both parties at Ephesus (431). The Emperor Theodosius II., who called it, was friendly to Nestorius. After a delay of fifteen days, in consequence of the involuntary detention of John and the other Syrian bishops, the council proceeded in their absence, in a very hurried way, to condemn and depose Nestorius and fifty bishops who sympathized with him. It acknowledged the anathemas of Cyril as the true doctrine of the Church. The delayed bishops held a separate council, and made decisions reversing all that had been done by the other. Nestorius voluntarily retired to his old cloister. The emperor attempted to unite the parties at the Council of Chalcedon (432), but without success. The deposition of Cyril, Memnon, and Nestorius had been pronounced in form by the emperor, but only in the case of Nestorius did it take effect. The overthrow of Nestorius made it safe for Cyril to accept the advances of the emperor toward a settlement of the controversy. A formula was prepared by Theodoret (433) which confessed that there is, without confusion, such a union of the two natures in the one Christ as to justify the language that Mary is the mother of God. This was signed by Cyril on the one side, and on the other side John of Antioch concurred in the anathema pronounced on Nestorius. Many of the earnest men on both sides, but especially those of the school of Antioch, were dissatisfied with the compromise. The emperor urged it. Theodoret yielded on condition that he should not be required to sign the condemnation of Nestorius. Meletius and Alexander continued their resistance, and were deposed. Nestorius had now lost all favor with the emperor. Even the poor shelter of the cloister was denied him, and he was hunted from one place of exile to another until his death.

IV. The Nestorian party did not, however, become extinct. Their school at Edessa, a daughter of the school at Antioch, trained men for the priesthood of the Church in

Persia. Ibas, Bishop of Edessa (436-457), was one of its great names. Thomas Barsumas, Bishop of Nisibis, 445-490, labored to secure a permanent place for Nestorianism in Persia. He established a patriarchate in Seleucia, and when the school at Edessa was destroyed by order of Zoroaster (480) he founded a school at Nisibis. It was the policy of the Persian kings to foster the division between their own Christian subjects and the Christians of the Roman empire. The Nestorians established a distinct church government, and called themselves not Nestorians, which was the title by which their enemies stigmatized them—but Oriental Christians, with reference to their earlier home and the language which they employed in their church service. At the Council of Seleucia-Ctesiphon (498-99), a statement of their doctrine and of its divergency from what claimed to be orthodox was made, and the Church of Persia was formally separated, making its doctrinal basis the assertion that Christ consists of two substances, two natures, and of two persons or hypostases, in one "partsupo" of filiation, the natures continuing to subsist unchanged, and the persons also. The term "partsupo" (parsopa) has been the subject of a good deal of dispute, as more than any other determining the orthodoxy or heterodoxy of the Nestorians. There is no reason to doubt that it is formed from the Greek *πρόσωπον*. The Peshitto-Syriac uses it to render that word in its sense of face, appearance, outward appearance, manifestation of presence, person (in the popular sense), and in the Nestorian usage it often corresponds with Asseman's definition of it, "nature manifested to the senses;" but in connection with "filiation" it seems to correspond very nearly with what is called "hypostatical relation," and would mean that though there are two persons in Christ, there are not two sonships, but that the human derivative sonship coincides so far with the divine essential Sonship as to stand in the unity of the relation of the Son, though not in the unity of his person—in unity of the partsupo, but not in unity of the qitomo (chauma-hypostasis). The metaphysical difficulty running through the entire Christological controversies of the ancient Church connected itself with the identification or distinction of the ideas of nature and person. Nestorianism affirmed the concrete identity of the two. (See *CHRISTOLOGY, MONOPHYTES, and MONOTHEISM*. See Weismann, *H. N. J. I.*, 632; Schröckh, *K. G.*, xviii, 311; Badger, *Nestorians and their Rituals* (1852), ii, ch. vi.

V. In the sixth century Nestorianism spread into Egypt and Arabia, into India, and in the eighth in China. At the beginning of the eleventh century there were Nestorians in Tartary. (See PRESTER JOHN.) The Nestorian patriarch Zesuzabab entered into a formal compact first with Mohammed, and subsequently with Omar. During the Arabian domination the high places of state were open to them. In the tenth century they were oppressed, and from that time there has been a decline in their intellectual and theological activity.

VI. The Nestorians remained under one ecclesiastical head until the sixteenth century. In the thirteenth Innocent IV, and Nicholas IV, had made attempts, which were not successful, to bring about a union of the Nestorians with the see of Rome. The influence of Rome, however, was sufficient to divide them in the choice of their iazlich (the catholic—their name for their patriarch) in 1551. One party favored Sulakas, who, under the name of John, had been consecrated by Julius III. The others adhered to Simeon Barmas. The partisans of John went over to the Church of Rome, and form the United Nestorians, or, as they are frequently named, giving them the title of the ancient undivided body, Chaldee Christians. They number about 90,000 souls, acknowledge the primacy of the pope and the seven sacraments, and observe the ritual of the Greek Church. Their priests are called *Deacons*. The Nestorians

Nestorians acknowledge three sacraments only—baptism, the Lord's Supper (in both kinds and without solitary masses), and ordination. They have been styled for these and other reasons "the Protestants of the East." They have no pictures or images. Their clergy are allowed to marry. They have a population of about 70,000. The internal energy which once marked the Nestorian churches has almost vanished. The Nestorians of India are called the Christians of St. Thomas, or Syrian Christians. Those on the coast were brought into nominal union with the see of Rome in 1599. These have nearly 100 churches, a population of about 150,000, and a theological seminary at Pulingunna. The Christians of St. Thomas in the interior declined the union with the pope, and when a renewed effort was made in 1653 to bring them into it they fled to the Ghauts, and placed them-

selves under the protection of the rajah. They have between sixty and seventy churches, and number about 70,000. The Nestorian monks and nuns observe the rule of St. Anthony. Their center is the cloister of Hormoz. Their vows are not strict. It is possible to be freed from them and to marry. In addition to their religious duties, the monks occupy themselves with manual labor; lay sisters provide their support. Some of the cloisters have the monks and nuns in separate cells, under one roof. Flesh, butter, and milk are forbidden. The costume of the brethren and sisters consists of a black upper robe and skirt. The brethren wear a blue turban, the sisters a black veil.

VII. Missionaries from the U. S. have labored among the Nestorians in Turkey and Persia. The most distinguished has been Rev. Dr. Justin Perkins, who began work in 1834. The Kurds and Turks waged a war of extermination against the Nestorians of the mountains in 1843, and as a result the Protestant missions were swept away in 1846. Mission efforts have since been renewed with success.

VIII. The older literature is given in Walch, *Bibl. Theol. Sel.*; Winer, *Handb.*; and Danz, *Univ. W. B.* See Smith and Dwight, *Researches* (1833); Grant's *Nestorians* (1841); Wiggers, *Statistik* (1842); Perkins (1843; also in 1861); Wingard, *Pres. State of the Church* (from the Swedish, 1845); Layard, *Nineveh* (1848); *Christian Year-book* (1868); R. Anderson, *History of Missions to the Oriental Churches* (1873); Laurie, *Woman and her Saviour in Persia* (1863); Dr. Grant and the *Mountain Nestorians* (1874); German, *Die Kirche der Thomas-Nestor* (1877); L. 227. *Nestorian Monuments in China* (1888). Revised by S. M. JACKSON.

Nests of Birds [O. Eng. *nest*; Germ. *nest* < *Nest*, *nest*. Indo-Eur. *nisdos* > Sanskr. *nida-*; Lat. *ni dus*]: While nest-building species are found among all classes of animals, there is no other group whose members so universally construct nests and are such adepts at the art as birds. There are, however, many species which build no nest whatever. Some, like the murre (*Uria*) and razorbill (*Alca torda*), deposit their eggs on the rocky shelves of sea-washed cliffs; others, like some goatsuckers, lay their eggs directly on the ground; others occupy deserted nests or those from which they have driven away the rightful owners; while a few, including the European cuckoo and the cowbird (*Molothrus*) of the U. S., drop their eggs in the nests of other birds, and leave their young to the care of these adopted parents.

While the ends attained by building a nest are various, it may be said that primarily the object is to furnish a safe receptacle for eggs and young, a place where the former can be kept together in small compass, so that they can be readily covered by the parent, and where the latter will be measurably secure from accident until old enough to shift for themselves. Protection from enemies, either by concealment or inaccessible location, protection from the weather, and retention of heat are also among the advantages of a nest.

Attempts, more or less formal, have been made to group birds according to the structure or location of their nests, but such artificial systems have failed; birds nearly related often differ in their mode of nidification, while even one and the same species may, under varying conditions, alter the manner of building its nest.

In spite of these variations we may, however, keeping in mind that the division is largely artificial, divide birds roughly into two groups—tree-builders and ground-builders.*

The "ground-building birds," including all that occupy its surface or penetrate within it, and those that resort to high cliffs and to remote islands, comprise not far from one-half of all the species, including all the diving birds, nearly all the swimmers, and a large proportion of the shore-birds and waders. The ground-breeding birds that build within the earth are separated into a group by themselves, known as "miners." The latter include both those which dig out their own burrow and those that make use of natural cavities or of holes made by other animals. Prominent among the true "miners" is the common bank-swallow (*Circicola riparia*). This familiar species, abundant in both the old and the new hemispheres, is found in large colonies, and excavates its burrow on the steep face of a sandbank or a gravel-bed. Its hole is usually not more than 2½ or 3 feet in depth, yet where its excavation has been dug through a

10 feet deep; but this apparently inconsistent action is ac-

* *See also the article on "Birds" in the same volume.*

counted for by the supposition that the swallow digs on until it finds a locality sufficiently safe for its nest, which is not the case where the gravel is large and coarse, and liable to fall down upon and break the eggs. Where the firmness of the sand permits, these holes are as circular as if planned with a pair of compasses. The galleries are usually more or less tortuous, and are at their termination enlarged into a chamber in which is placed a loose but soft and warm nest. The kingfisher (*Ceryle alcyon*), another typical miner, mines a long tortuous gallery about 5 feet in length, which is sometimes wholly in one direction, but usually turns at a right angle, to the left or right, when at the depth of 3 feet; at the end of the gallery it excavates a small chamber, in which it deposits its eggs on the bare earth. Occasionally, if the earth is damp, it makes a small floor of miscellaneous materials. The European kingfisher (*Alcedo ispida*) very commonly makes a nest of fish-bones, which, being indigestible, are rejected in good-sized pellets. The common fork-tailed petrel (*Thalassidroma leachii*) of the coast of the U. S. is a very interesting "miner" of peculiar habits. It digs a winding and sometimes intricately tortuous burrow, often of great length, at last causing its channel to descend and to double directly under its first gallery, and makes a large chamber at its terminus, which frequently is directly under the opening, though separated from it by the intervening floor of earth. It makes no nest, but lays its single egg on the bare soil.

The burrowing owl of North and South America (*Speotyto cunicularia*), though able to dig for itself when necessity compels, is usually a parasitic miner. There are two or three races, but their habits are identical. The northern sub-species is found W. of the Missouri valley from California to Mexico. It lives in communities, and is often very abundant. It takes possession of the burrows of several species of small quadrupeds where these offer, chiefly occupying those of the prairie-dog. The story that owl and prairie-dog dwell harmoniously together is a myth, the truth being that a large portion of the food of the owl is formed of young prairie-dogs, even the adults sometimes falling victims. In Texas it dwells in deserted rat-holes, and in Northern California in the burrows made by two large species of ground-squirrel. In South America, wherever the viscacha is found, this owl makes use of its burrows. In the Banda Oriental, according to Darwin, it depends upon its own labor, and excavates its own burrow on any level spot of sandy soil.

Another marked group of birds which occupy the ground are those which usually construct no nest. In this may be included birds of very different forms and habits. The whippoorwill (*Antrostomus vociferus*) and all the kindred genera, so far as is known, deposit their eggs on dry beds of leaves in the dark recesses of the forests; the more common nighthawk usually leaves its eggs, that resemble pebble-stones, on the bare rock, to which in color they are closely assimilated. In the vicinity of cities it sometimes deposits its eggs on the flat roofs of stores and dwellings. The loon (*Colymbus torquatus*) chooses a receptacle for its egg on the edges of islands in fresh-water lakes, so near the water that if disturbed it can plunge from its nest directly into and under it. Other divers, as the auks and the guillemots, nest in communities, using the bare surface of rocky cliffs or crevices in the rocks, but make no nest. The peculiar, pear-shaped egg of these birds has a direct relation to the places on which it is deposited, since, by virtue of its peg-top form, the egg when disturbed rolls about in a circle instead of rolling off the rock. The gannet, which also breeds on rocky ledges and lays an elliptical egg, builds just enough of a nest to keep the egg in place. A few of the *Alcide*, like the puffins, burrow into the ground in sandy places to shelter themselves and their eggs from birds of prey and gulls. The penguins breed in great colonies on low rocky or sandy islets, constructing a slight nest of pebbles, barnacles, seaweed, bits of wood, or almost anything that may offer. The gulls and terns nest on the ground, but differ in regard to nest, some building an elaborate one, and others having hardly more than a hollow in the bare sand. Nearly all the waders make their nests on the ground, and all or nearly all of these are usually a mere depression. They are usually situated near marshy grounds or water, though the plovers and a few other kinds prefer higher and dry situations. The grebes construct the foundation of their nests of fresh aquatic plants, which they obtain by diving, and finish with dead weeds, building quite a bulky structure. The nest is placed in marshes, sometimes on a mass of plants growing so low in the water that the nest is floated off by a

flood. This has caused the impression that they purposely build floating nests, but this is not the fact. With very few exceptions nearly all the North American sparrows breed on the ground. All the species of the several genera of *Ammodramus*, *Junco*, *Plectrophenax*, *Zonotrichia*, *Melospiza*, etc., with only individual exceptions, nest on the ground, as also do nearly all the titlarks, true larks, buntings, and similar forms, the world over. The common house-sparrow and all its congeners nest in various manners, but not on the ground. Some species exhibit the singular peculiarity of always nesting on the ground in certain localities, and in other regions as invariably building in bushes or trees high above it. Thus the prairie lark-finch in Illinois and Wisconsin always nests on the ground. On the Pacific coast the same species usually nests in trees. The same is noticed in the black-throated bunting, which in the E. of the U. S. nests on the ground, but in the Mississippi valley usually a few feet above it. All the *Spizellæ*, with one marked exception, nest in trees or bushes. *S. monticola*, although known as the tree-sparrow, nests in bushes or on the ground.

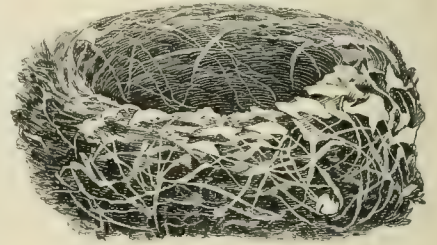


FIG. 1.—Tree-sparrow (*Spizella monticola*).

A few of the slender-billed oscines always build on the ground, but some nest indifferently on the ground or in different situations. The common brown thrush of North America (*Harporhynchus rufus*) is a remarkable instance of this, in some localities usually nesting upon the ground, and in other districts always above it. The gray-cheeked thrush (*Turdus alicea*) nests sometimes on the ground, but occasionally in more or less elevated situations. The robin redbreast (*Erithacus rubecula*) of Europe nests naturally on the ground, but there are many instances recorded of striking deviations from these selections.

Among the American thrushes, *Turdus fuscescens*, *T. pallasi*, *Cinclus mexicanus* always nest on the ground. All the species of the genera *Myiodiodes*, *Oporornis*, *Seiurus*, *Mniotilta*, *Geothlypis*, *Helminthus*, and *Helminthophaga*, except *H. lucia*, build with rare exceptions on the ground. The large group of *Dendroica*, except *D. palmarum*, nest in elevated situations so far as is known. Many ground-building birds resort to ingenious means of concealment. The common quail, the meadow-lark, and other species sink their nests by the side of a high tussock of grass, and form an archway over the nest with the natural growth. The common snow-bird and the savanna-sparrow often build their nests on the steep side of an excavation under a projecting sod. The song-sparrow and the grass-finch often construct a covered approach to the nest, which is hidden in high grass or by bushes. The Canada fly-catcher, so far as is known, always selects a large tussock of grass in the midst of boggy and almost impassable ground.

The sea-ducks, swans, geese, the gulls, terns, albatrosses—in short, the marine birds in general—resort to the ground to construct their nests. A very few build in trees, either exceptionally as individuals or as species, and in the former class may be mentioned the North American herring-gull (*Larus argentatus smithsonianus*), which sometimes resorts to trees in localities where its nest on the ground has been repeatedly plundered. Wood-ducks of all kinds, and several of those that frequent lakes and rivers, nest in hollow trees. A few, like the dusky duck, nest indifferently on trees or on the ground, usually selecting the latter. Several kinds of sea-ducks are noted for adding to their nests a warm lining of the softest down plucked from their own breast. This is done by the long-tailed duck, by the smew, by the king-duck, the Pacific eider (*Somateria V-nigra*), and by the common eider. Of these, however, the smew always nests in hollow trees. Owing to the commercial value and importance of its down, the eider (*Somateria mollissima*) is cherished and protected in Iceland and on the northwestern coast of Europe. It usually constructs in the first place a rough platform nest of various marine plants, both sexes working in concert, piling up a rude foundation of drift. Over this rough mattress the female spreads a bed of the finest down, freely taken from her own breast.

Sometimes two females make use of the same nest, each contributing an equal share of down and five eggs. Birds of very different species sometimes make a common use of the same nest.

Very many shore-birds, waders, etc., and also birds which nest on the ground in swampy places, construct large and elaborate nests of reeds, rushes, and other water-plants in a moist and decaying state, less on account of their pliable condition, and not because a moist nest is desired. On the contrary, notwithstanding the prevalent error, these nests are not used until they are dry, and are abandoned when, owing to rains or floods, they become so damp that they can no longer be occupied. Such nests as those of the willet and the bitterns are of this description. Very many of the land-birds of the U. S., as the song-thrush, the robin, etc., use moist materials in building their nest, but occupy it only when it has become dry. The robin, *Meroputator*, works from preference in rainy weather. All or nearly all the *Gallinæ* occupy nests on the ground, some making a rude nest, others only using a hollow in the earth. The wild-turkey uses great precaution to conceal her nest alike from birds of prey and prowling animals, and from her own mate, hostile to his own progeny. When forced to leave them in search of food, she covers her eggs with leaves, and if approached when on the nest the mother will die sooner than leave her charge.

By far the most remarkable group of ground-nesting birds are the "mound-builders" of Australia and the eastern archipelagoes of Asia, known as the brush-turkey in Australia. All the species of this group belong to the family MEGALOPIDÆ (*q. v.*), and are all somewhat remarkable for the manner in which the hatching of their eggs is effected. The *Talegalla lathamii* when about to deposit her eggs collects a large heap of decaying vegetable matter as their depository, and trusts entirely to the heat engendered by the process of decomposition for the development of her offspring. The *Megaloptilus tumulus* constructs large mounds of earth, varying from 20 to 60 feet in circumference and from 5 to 15 feet in height. In these the eggs are carefully buried to the depth of 6 feet. Of the other species of this singular family, some merely deposit their eggs in holes excavated on the seashore to the depth of 3 feet, but nearly all the members of this family are more unequivocally mound-builders.

Several species belonging to different genera have been grouped together in some systems as "masons," so called because they knead together, in the manner of the house-builder, a rude mortar of tempered earth or clay. It is not a well-marked group, and all its members might claim a place in other connections. The cliff-swallow (*Petrochelidon lunifrons*) of North America is a typical "mason," building a remarkably symmetrical nest of plastic earth or clay by the united efforts of several working in concert where they are in societies, sometimes by only the solitary pair. The normal shape of the nest is that of an inverted retort, the larger portion being attached to the cliff or side of a building. It is arched over at the top, and extends down in front in a covered passageway open at the bottom. In the wild state on the sides of high cliffs the nest is an elaborate and ingenious structure, sheltering its inmates from the weather and from their enemies. Under the shelter of man all this protection is needless, and under the eaves of barns and other buildings these birds build a simpler and equally safe nest, but always of kneaded earth. The barn-swallow of

in caves or under overhanging cliffs, now attaches its elaborately wrought nest to the sides of rafters in barns, under the protection of their roofs, and even to the porches of dwellings. These are made of the finest mason-work, and put together in the most artistic manner, piece by piece, with an order and a regularity quite curious. Attached to the nest there is often an equally elaborate extra platform designed for the use of the mate, on which it can sit when not collecting food, and where, when the young no longer require the cover of a parent, the latter may stay and keep them company.

The term carpenters is applied to the members of a small but noteworthy group of birds, from the fact that with their chisel-like bills they hew for themselves holes in the trunks or limbs of trees. At the bottom of these holes, which may be more than 3 feet in depth, the eggs are laid without other nest than the few fine chips which have been left. The woodpeckers are typical carpenters, and conspicuous among them is the great ivory-billed woodpecker of the Southern U. S., a species now become very rare. This bird digs into some of the largest and hardest trees of the forests, being particularly partial to the cypress, and a pair have been known to cut into the living wood to a depth of 5 feet. The wrynecks (*Iunx*), the nuthatches, and some of the titmice are carpenters on a smaller scale.

Among birds which breed in holes of trees, but do not excavate these dwellings themselves, are the blue-bird, the tree-swallow, some of the titmice, owls, parrots (with one exception), and the great hornbills of the Old World.

Certain classes of birds build what are styled "platform nests." These are found among only a few families, and their character varies very essentially, some being remarkably large structures, others being of a frail description. Of the one kind are the huge platform structures of eagles; of the other, the slight nests of the doves and the American cuckoos. All or nearly all the eagles are true platform-builders, the only exceptions being those that use cliffs as substitutes for platforms and add little to their natural advantages. Others, like the white-headed eagle of the U. S., when they build in trees, construct large and massive structures of 5 or 6 cubic feet, and almost as solid as the natural rock platform of the golden eagle. In striking contrast with these are the slight nests of nearly all the *Columbide*, the cuckoos, etc. These are platforms of the frailest description, made of a few sticks loosely laid together, and as loosely crossed with other



FIG. 3.—Carolina dove (*Zenaidura macroura*).

sticks, the whole rudely made and apparently not strong enough to hold together and preserve the egg from falling to the ground. An example is the nest of the Carolina dove. More substantial than these are the platform nests of nearly all the species of true herons, but not equal to those of birds of prey in size or strength, though like them having no cavity or depression in the center. The herons known as bitterns, however, are exceptional, and usually nest on the ground.

A large group of nest-makers are classed together by Prof. Rennie as "basket-makers." It is not very well marked, and its members are not always distinguishable from other

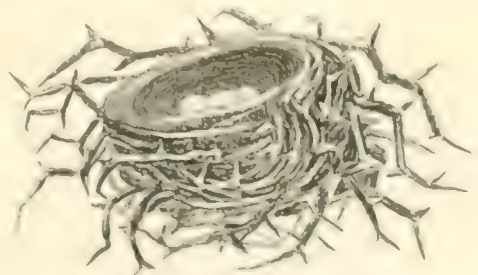


FIG. 4.—Mockingbird (*Mimus polyglottos*).

groups known as "weavers," "tailors," and "felt-makers," but it is designed to include birds which, like the common mocking-bird of the U. S., the cedar-bird, the Bohemian chatterer, the European bullfinch, and others, construct a rude basketwork of sticks, resembling the common baskets of wicker. In these are placed some of the eggs of

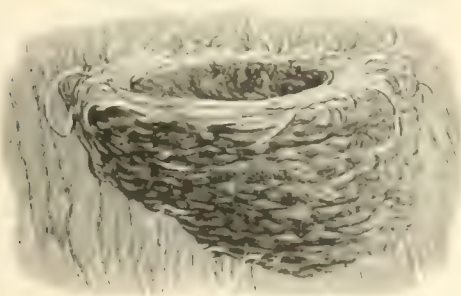


FIG. 2.—Barn-swallow (*Hirundo lunifrons*).

North America, the house-swallow of Europe, and several other species of *Hirundines* are also true masons. The barn-swallow (*Hirundo lunifrons*) of North America, the house-swallow of Europe, and several other species of *Hirundines* are also true masons. The barn-swallow (*Hirundo lunifrons*) of North America, the house-swallow of Europe, and several other species of *Hirundines* are also true masons.

softer materials. Some of these are mere open baskets placed on a flat limb; others are interwoven with the smaller twigs of a branch. The mocking-bird builds as an outer framework for its nest a strong barricade of brambles and

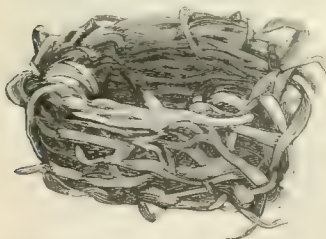


FIG. 5.—Yellow-headed blackbird (*Xanthocephalus xanthocephalus*).

thorns, and places within this rude basket an elaborately woven structure made of the finest roots. The common bullfinch (*Pyrrhula vulgaris*) of Europe builds a typical open basket placed on a platform of her own rearing of birch-twigs, or on a flat branch of a spruce-tree she weaves a loose basket of flexible, fibrous roots. The yellow-headed blackbird (*Xanthocephalus xanthocephalus*) exhibits great ingenuity, variety, and skill in the construction of elaborate basket-like structures. The *Turdus bicolor* of Southern Africa unite in communities to build a huge basket-like structure, with numerous cells or apartments for the nests of different pairs. These are like an aggregation of smaller baskets, each a separate nest with a tubular gallery leading into it from the outer side. The number of these cells varies from six to twenty, and over all is woven an inverted basket for a roof, wrought of twigs. We include among basket-makers the remarkable nest of the Mexican fly-catcher (*Pitangus derbianus*), more striking for the use made of it by other and smaller species than for its own peculiarity of structure and disproportionate size. This bird, not larger than the king-bird, builds a structure sometimes 3 or 4 feet in length and about 2 in breadth. The cavity is on the side. The structure is loosely made of coarse materials, twigs, dried plants, leaves, etc. In its chinks and cavities smaller



FIG. 6.—Magpie (*Pica caudata*).

birds seek shelter, and are permitted to build their own nests in peace and safety, the warlike proprietor of the whole keeping all birds of prey at a distance. The magpies, both of Europe and America, build a curious basket barricade around their nest, evidently as shelter against birds of prey.

The "weaving" birds construct nests, for the most part, somewhat pensile, but of very various styles and shapes. Among the most familiar of these may be mentioned the orchard oriole and the Baltimore oriole of Eastern North America, and Bullock's oriole of the Pacific coast. All the orioles are first-class weavers, and their nests partake somewhat of the peculiarities of the basket-makers and the so-called tailor-birds, and are all conspicuous for the wonderful skill with which they are wrought, their beauty of design, and the strength with which the materials are intricately woven together. The vireos, of which there are in North America sixteen different species, all, so far as we know, construct a curious pensile nest, hemispherical in shape

and peculiar to the genus. Simpler in design than the nests of the *Icteri*, they are still structures of remarkable beauty and ingenuity. They are wrought into the shape



FIG. 7.—Solitary vireo (*Vireo solitarius*).

of a deep cup, and are usually suspended from the fork of two twigs, around and over which the upper margin of the nest forms a continuous covering.

Working down from this fold, the materials are neatly woven into a hemisphere truncated at the top. The pensile grosbeak of Africa (*Ploceus oryx*) suspends a very curious basket, woven of straw and reeds, from the end of a branch, usually over a stream of water. This is in shape like an oblong bag, with the entrance from below. Within and on one side of this is the real nest. These birds build in communities; Pringle, the African traveler, mentions seeing twenty together. Their obvious design is to secure the offspring from the dangers of



FIG. 8.—Bottle-sparrow (*Ploceus bengalensis*).

the weather and from various enemies. The entrance, always from below, is through a cylindrical gallery 15 inches in length, that hangs from the spherical nest like the tube of a chemist's retort. The bottle-nest sparrows of India have nests constructed with equal ingenuity. These are made pendent to branches of trees by small loops, and are formed of a peculiar kind of long grass woven together in the shape of a bottle. These swing from the ends of long flexible branches, and effectually secure their inmates from harm. Their entrance is from below. Besides this curiously pensile nest, the male bird also constructs an elaborate covered roost, which is wrought of the same kind of grass. This is a bottle-shaped basket, having a thatched roof, which covers a perch open at the bottom and is suspended from the small end or neck of the bottle. This roost is occupied by the male, and hangs by the side of the real nest, in which are his mate and family. The object is protection from sun and rain, and from various kinds of enemies. Another remarkable species of the weaving grosbeaks (*Loxia socia* of Linnæus) greatly excel the remainder

of the family, at least in the extent of their workmanship. They build an enormous structure, in shape resembling an open umbrella, wrought, in the manner of a thatched roof,



FIG. 11. Social Weaver (*Ploceus socialis*).

of Bushman's grass without any intermixture, and so completely woven as to be impervious to rain. Under the shelter of this canopy each pair builds its own particular nest, placed under the eaves. Each nest is 3 or 4 inches in diameter; they are all in contact with one another around the eaves, and each nest has its own individual aperture forming the entrance.

The tailor bird of India, which enjoys a somewhat exaggerated reputation for ingenuity and skill, is at least known to bend over one end of a leaf and to sew it securely to the stem-end, and to place its tiny nest in the hollow thus created. The parula warbler (*Compothlypis americana*) constructs its nest of the long, very flexible stems of the northern forests of the U. S., gathering up and fastening together in a loop the long hanging branches of this

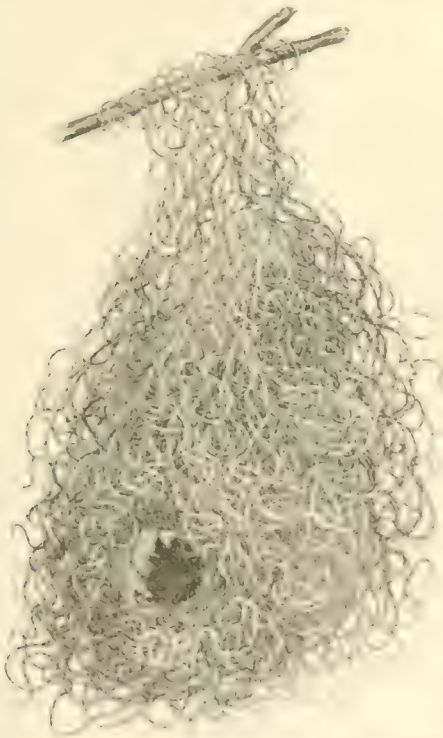


FIG. 12. Parula Warbler (*Compothlypis americana*).

moss to make its nest, often using no other material, and in this manner creating a beautiful structure, the entrance to the cavity being usually on one side. Even more strikingly beautiful is the nest of the yellow-throated vireo of the

southern parts of the U. S. (*Dendroica dominica*), of which the cut presents a remarkable illustration. Here the long pendulous stems of the swampy is carried up and fastened in loops, in such a way that the stems 3 feet in length are fastened together into a woven bag of half the original length. In the construction of this curious structure, the natural appearance of which is unchanged, is hidden the tiny nest which is fastened vegetable down.



FIG. 13. Dendroica dominica nest.

Another interesting group, styled by Prof. Rennie the "felt-makers," is distinguished not so much by the architectural peculiarities of the nests as by the remarkable changes made in the character of the materials used. These are included in only a few families, but the latter are individually very numerous. The group includes two kinds, the true felt-makers, who make a composite felt, and those that use only a single material. There is, however, very little difference in the appearance of the product, and many species indifferently use a single or a composite felting. The finches of both the Old and the New World are typical felt-makers. Of these the canary, the several goldfinches, and the chaffinches may be mentioned as examples. Fine wool, of either vegetable or animal origin, serves as the base of this felting, and with this various other substances, such as mosses, lichens, spiders' webs, bits of cotton, bark, etc., are intermingled, and with wonderful skill the materials are felted and compacted together into a texture apparently homogeneous and uniform. With some, these felted nests are wholly composed of this single material, as in the nests of various humming-birds, where, besides an external covering of lichens, a means of concealment rather than an essential part of the nest, the whole is made of this one material. In the nests of the finches there is always an external framework, filled out and lined with felting. In these greater strength is given to the fabric by binding the whole with strong wiry grasses, fibrous roots, etc., and especially by binding the nest firmly into the fork by twining among the twigs bands of strong felting. The nest of the goldfinch (*Spinus tristis*) of the U. S. is a striking illustration. All the *Poliophtila* of North America and the

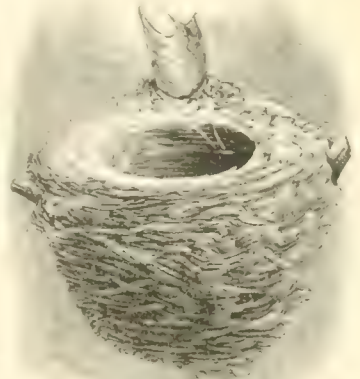


FIG. 14. Goldfinch (*Spinus tristis*).

West Indies are superior felt-makers. Their nests are large for the birds, remarkably deep, and have thick soft walls composed of felted material, and are usually placed in the

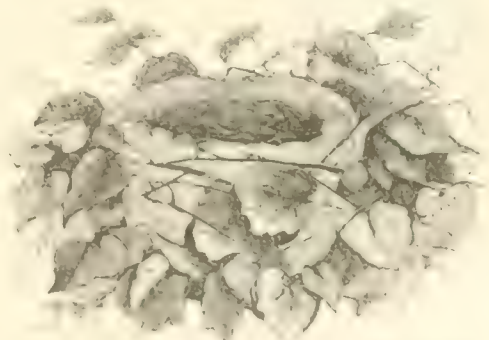


FIG. 15. West Indian Goldfinch nest.

West Indies are superior felt-makers. Their nests are large for the birds, remarkably deep, and have thick soft walls composed of felted material, and are usually placed in the

cupants, which are among the smallest American species. The nests are models of architectural beauty and ingenuity of design. They are deep and purse-like in shape, not pensile, but interwoven with small upright twigs, and usually are placed near the tree-top, swaying with every breeze, the depth of the cavity and the small diameter at the opening preventing the eggs from rolling out. The black-capped species of St. Lucas (*Poliophtila californica*) uses the living tendrils of a wild vine as the framework of its nest, which is interwoven with the vine so intricately as to be rendered inseparable.

Prof. Rennie recognizes as a distinct group what he calls "dome-builders," but nearly all might easily be ranged in one of the other groups. They consist of a great number of species and belong to a variety of families, and either occasionally or uniformly construct covered nests entered by holes in their sides. With many species the domed cover of their nest is not a uniform feature. The Carolina wren at times builds a domed nest, and quite as frequently constructs one open at the top. The golden-crowned thrush and the black and white creeper have almost always a covered nest, yet both occasionally build without any cover. The house-sparrow usually has an open nest, but also occasionally builds one with an arched covering. In the West Indies, and in tropical countries generally, domed nests are a predominating feature, and are undoubtedly an instinctive provision against the violence of tropical rains. Travelers in South America describe the nest of a common species known locally as the baker-bird, or oven-bird (*Furnarius*), so called because it constructs a nest in the form of a baker's oven. This is placed in the most exposed situations, but at a considerable height. The nest is described as made of tempered clay, and as having a lateral opening twice as high as wide, and in the interior divided into two chambers by a partition beginning at the entrance.

The North American water-ouzel, or dipper (*Cinclus mexicanus*) builds a domed nest of a very peculiar character. It is hemispherical in shape, of uniform contour, and usually built on a rock on the edge of a mountain-stream. Externally, it is composed of green moss in a living state, having within a strong, compactly built apartment arched over and supported by twigs, with a cup-like depression at the bottom composed of fine roots and twigs firmly bound together. These structures are a little less than a foot in diameter and from 6 to 8 inches in height. Both species of cactus-wrens of California and Cape St. Lucas build curious domed nests of great size and purse-like in shape. These are composed of long flexible grasses, and are lined with feathers. Both species of *Cistothorus* build circular domed nests, that of *C. stellaris* ingeniously interwoven, externally of long wiry grasses and finer sedges, lined with soft vegetable down. That of *C. palustris* is a stronger structure, built in higher situations, of coarse sedges firmly interwoven and cemented with mud.

Another singular peculiarity, found only in species belonging to a few genera, is the employment of cement-like secretions in the construction of their nests, and these are grouped together as "cementers" in certain systems. In some cases it is difficult to determine whether the birds generate their own cement or



FIG. 14. Marsh-wren (*Cistothorus palustris*).

make use of adhesive substances that exist in nature. We find the nests of humming-birds and of several other kinds of birds covered over with a coating of lichens and mosses, and thus made to resemble the moss-covered bark of the trees on which they are built, and apparently this covering is made to adhere by means of some adhesive cement; but that this is secreted by the bird itself we do not know. We infer, rather than know, that certain swallows temper the earth of which they construct their nests with their own adhesive secretions. In regard to other cases our knowledge is more positive. The chimney-swallow fastens its simple cradle of twigs against the inner walls of a

hollow tree or the inside of the chimney, and glues together, twig by twig, the nest itself, by means of a powerful cement which it secretes from its own throat. The famous edible nests of the little Bornean swift (*Collocalia fuciphaga*), formerly supposed to be made of partly digested seaweed, are now known to be constructed entirely of mucus. These nests, which are placed against the rocky sides of caves, are shaped something like a section of a shallow, thin cup, and when new are white and translucent. They darken and deteriorate with age, nests which have been used bringing a much smaller price than those which are perfectly fresh. For other nests, see BUNTING, DICEUM, CAPE TITMOUSE, etc.; and for further information, see Rennie, *The Architecture of Birds* (London, 1831); Wood, *Homes without Hands* (London, 1865); Davie, *Nests and Eggs of North American Birds* (Columbus, 1889); Bendire, *Life Histories of North American Birds* (Washington, 1892); Newton, *A Dictionary of Birds* (London, 1893-94). Revised by F. A. LUCAS.

Netherlands, The (Dutch, *De Nederlanden*, Fr. *Les Pays-Bas*): a kingdom of Western Europe; situated between lats. 50° 45' and 53° 35' N. and lons. 3° 24' and 7° 12' E.; bounded E. by Germany, S. by Belgium, and W. and N. by the North Sea, which indents the coast with two large inlets, the Zuyder Zee and the Dollart; area, 12,656 sq. miles. The country is also known as *Holland*, but *The Netherlands* is its official designation. It has a number of colonies, which are divided into two groups, the Dutch East Indies and the Dutch West Indies. The former includes Java, Madura, Bali, Lombok, Banca, Billiton, the Moluccas, Timor, Sumatra, Celebes, and parts of Borneo and New Guinea; area, 719,674 sq. miles; pop. 31,614,000. The Dutch West Indies include Dutch Guiana, or Surinam (see GUIANA), and Curaçao; area, 46,463 sq. miles; pop. 120,000. All these colonies are treated separately; see JAVA, MADURA, etc.

Physical Features.—As the name indicates, the Netherlands are low and flat, and form the delta of the rivers Rhine, Maas, and Scheldt; there are no mountains, but the naturally formed sandbanks or dunes on some parts of the seacoast attain a considerable height. The country is intersected by the rivers mentioned and their branches, the Waal, Yssel, Leek, and Vecht. Where these are bordered by cities they are called *gracht*, or *haven*, and serve for internal navigation. Along some parts of the seacoast and along all the rivers there have been constructed for protection against inundation huge dikes, 30 feet high, 70 feet broad at the base, some of Norwegian granite, but the majority of clay or peat, strengthened by timber structures. Among the canals, of which there are 1,907,170 miles, serving partly for drainage, partly for communication, the most important are the NORTH HOLLAND CANAL, the NORTH SEA CANAL (q. v.), and the New Waterway, built 1870-85, connecting Rotterdam with the North Sea. A few lakes are found in the province of North Holland, but HAARLEM LAKE (q. v.), formerly the largest of them, was drained in 1839-52.

Geology.—The greater part of the country is of alluvial origin; minerals are nowhere found, except a kind of clay well adapted for tiles, brick, and pottery, and a little coal in the province of Limburg, where the mines belong to the state.

Fauna.—All the animals found in Western Europe are indigenous in the Netherlands; wolves appear sometimes, but only during winter and in the sparsely inhabited districts; foxes are plentiful; rabbits abound in the sandy regions, and often do great damage by burrowing through the dunes. Among domestic animals the cattle rank very high, both as milk producers and for their excellent meat. The horses are big and strong; the Frisian horse, of the Percheron type, is much sought for by breeders, as are also the trotters of the northern provinces.

Climate.—The climate is temperate but variable, and generally far from pleasant. Fevers of a malarial character, colds, and bronchial and pulmonary affections are apt to follow on the sudden changes in winds and temperature. The country is fairly healthful, however, except in districts where the soil is marshy, as in much of the province of Zealand.

Soil.—A careful estimate shows that 34 per cent. of the surface consists of good and 2 per cent. of inferior clay land; 45 per cent. is poor and partially reclaimed sand, and fully 18.5 per cent. is covered with heath or other growths without value. Considering the uses to which the soil has been put,

we find that 27.1 per cent. is arable land, 35.4 pastures, 1.7 gardens and orchards, 6 per cent. occupied by water and roads, 7 per cent. woodland, and 0.7 per cent. covered with buildings, the remainder being uncultivated. The cultivated tracts are becoming less in area through irrigation and the introduction of better fertilizers; but much remains to be done in this direction, especially in the provinces of Gelderland and Drenthe.

Divisions.—The country is divided into eleven provinces, as follows, with area in square miles and population, Dec. 31, 1892:

PROVINCES	Area	Population	Capital	Climate
North Brabant....	1,680	1,150,000	Bois-le-duc.....	7-F
Gelderland.....	1,564	1,210,000	Arnhem.....	6-G
South Holland.....	1,300	1,800,000	Harlem.....	5-E
North Holland.....	1,300	1,000,000	Amsterdam.....	6-E
Zeeland.....	1,300	1,000,000	Brussels.....	8-C
Utrecht.....	1,300	1,000,000	Utrecht.....	7-G
Overijssel.....	1,300	1,000,000	Deventer.....	4-H
Guelders.....	1,300	1,000,000	Roermond.....	4-I
Limburg.....	1,300	1,000,000	Maastricht.....	10-G
Totals	12,000	4,600,000		

* Reference for climate, see map of Holland and Belgium, vol. iv.

Principal Towns, with Population.—Amsterdam (437,892) is the capital; The Hague (169,828) is the seat of the government and the residence of the royal family. The other towns of greatest population and importance are Rotterdam, 222,345; Groningen, 88,136; Zwolle, 57,297; Haarlem, 55,411; Arnhem, 51,687; and Leiden, 44,198 (see the separate articles on these and other Dutch towns).

Population.—The people form the Dutch and Friesian branch of the Teutonic race. They are characterized especially by industry, perseverance, cautiousness, frugality, scrupulous cleanliness, and a certain sedateness of manners; they are prosperous and contented, and their wealth is quite generally distributed. On Dec. 31, 1892, the population was 4,600,576 (2,297,568 males and 2,302,008 females). The average density per square mile was 359; it was greatest in the province of South Holland (859.5) and least in Drenthe (131.5). In 1880 the population was distributed as follows: Roman Catholics, 2,728,876; Protestants, 1,604,179; Roman Catholics, 97,274; Hebrews, and 81,092 of other denominations. In the same year the number of foreigners in the Netherlands was 48,884, of whom 28,767 were Germans, 13,697 Belgians, 1,398 French, 1,339 British, and 788 Swiss.

Industry and Products.—Agriculture flourishes most in Friesland (where the finest cattle are reared), North Holland, and parts of Gelderland and Limburg. Rye, barley, and wheat are the chief cereals produced, but fruit and vegetables form a large item of export, especially to England. Potatoes, tobacco, hemp, flax, and beetroot are also staple products. The raising of flower-bulbs has been carried on for centuries, and is still the leading branch of floriculture in the Netherlands. Haarlem is the center of this industry, and in its vicinity may be seen miles of flower-beds containing all varieties of the tulip, crocus, hyacinth, etc. In 1634 and 1636 the "tulipomania," an insane speculation in rare varieties of the tulip, made its appearance in the Netherlands; in all the large cities regular tulip exchanges were established, where bulbs were dealt in at fabulous prices, and where thousands of persons ruined themselves in their efforts to secure some special specimens. Gardening has reached a high degree of perfection, and even in the cities fine garden plots are often found attached to the residences of the well-to-do.

Of manufactures, the most important are in Holland, Hoorn, and North Holland generally, gin (Schiedam, Rotterdam), chocolate and cocoa (Weesp, Utrecht, Rotterdam), pottery (Delft, Maastricht), linens (Bois-le-duc, Helmond), carpets (Deventer), refined sugar (Amsterdam, Rotterdam), long-stemmed clay pipes (Gouda), beet-sugar, potato-starch (Groningen), and cotton goods (Hengelo, Twente).

The fisheries have somewhat declined, but contribute still a large amount to the national wealth; herring, cod, salmon, turbot, and anchovies are taken on the coast, and oysters are found in the waters surrounding and intersecting the province of Zeeland. Over 25,000,000 herrings are annually taken in the Zuider Zee alone, and the total number of oysters produced in 1892 was 12,700,000.

Commerce.—In the principal seaports (Amsterdam, Rotterdam, Harlingen, and the Helder), a large part of the

population follows the sea for a livelihood. The commerce of the country, at one time the most important in the world, has declined considerably, but is still extensive and active. It is principally carried on with the Dutch colonies. Great Britain and Germany are the chief foreign markets. The value of imports amounted to 1,282,100,000 florins or guilders and the exports to 1,133,900,000, the imports from the U. S. being worth 148,900,000 florins and the exports to the U. S. 23,300,000 (1 florin = \$0.40). In that year 1,365 sailing vessels, of which 491 were Dutch, and 7,364 steamers, of which 2,045 were Dutch, entered the Dutch ports, while 1,121 sailing vessels (Dutch, 565) and 5,243 steamers (Dutch, 1,888) cleared. This is not counting the vessels going or coming in ballast. The merchant marine at the end of 1892 included 447 sailing vessels, with 349,000 cubic meters tonnage, and 150 steamers, of 479,000 cubic meters.

Education.—Four universities, those of Leyden (founded in 1575), Groningen (1614), Utrecht (1636), and Amsterdam (1632), all conferring degrees in law, medicine, philosophy, and letters, are attended by about 3,000 students, and are favorably known abroad. The medium and lower grade of instruction is provided on a very liberal scale, and all the schools are unsectarian. In 1891-92 there were, besides professional and technical institutions, 38 secondary schools, with 4,835 pupils, 4,292 elementary schools (2,976 public, with 458,739 pupils, and 1,316 private, with 200,363 pupils), and 993 infant schools, of which 130 were public, with 23,421 pupils, and 863 private, with 79,187 pupils.

Government.—The government is a constitutional and hereditary monarchy. The reigning dynasty is the House of Orange-Nassau, now extinct in the direct male line. The national legislature consists of two branches, the First and Second Chamber of the States-General. The First Chamber, of fifty deputies, is chosen by the provincial states; the term of office is nine years, about one-third retiring every third year. The Second Chamber, of 100 deputies, is chosen directly by males over thirty years of age, who pay a certain amount in taxes; the term is four years, all retiring together. The executive power vests solely in the sovereign; the legislative, jointly on the sovereign and the legislature; but the First Chamber lacks the right of introducing or amending bills. The presidents of both chambers are appointed by the sovereign from among the members. The cabinet consists of the following departments: (1) Foreign Affairs, (2) Interior, (3) Justice, (4) Marine, (5) Finances, (6) War, (7) Waterways, Commerce, and Industry, (8) Colonies; the ministers are appointed by the sovereign; they may, but usually do not, belong to either of the chambers. The provinces are governed by royal commissaries, appointed by the sovereign; and each province has its provincial legislature (*provinciale staten*), elected by the same electors who have the right to elect the members of the Second Chamber. The government of the cities is vested in a mayor (*Burgemeester*), a board of assessors (*Wethouders*), and a common council (*Gemeenteraad*), the members of the last-named body being elected by a class of electors paying less taxes than the electors for the Second Chamber.

There is a standing army of 75,000 men; the navy consisted in 1893 of 7,438 men, and 109 steam-vessels with a tonnage of 81,950 tons. In that year the public debt amounted to 1,098,966,950 florins; the budget was: receipts, 127,343,890 florins, and expenditures, 137,860,022.

History.—The Netherlands or Low Countries denoted, when first spoken of in history, the whole plain extending from the foot of the Vosges and the Ardennes to the North Sea, and comprised not only the present kingdom of the Netherlands, but also Belgium and the northernmost parts of France. It was inhabited by three distinct though kindred tribes—the FRISIANS (q. v.) to the N., the BATAVIANS, of German stock, in the center, and the BELGÆ, of Gallic stock, to the S. The Belgæ were subjugated by Cæsar; the Batavians were at first allies of Rome, but after the unsuccessful attempt of Claudius Civilis in 67 A.D. to unite the Batavian communities into an organized empire, they too were conquered by the Romans; the Frisians submitted after repeated defeats and rebellions. In 357 the Batavians are spoken of as forming part of the Roman army in the battle of Strassburg against the Germans, and as displaying great valor; but after this time their name disappears from history. The Belgæ gave way to the Franks; the Saxons pushed onward from the E., and in alliance with the Frisians opposed the encroachments of the Franks. On the establishment of the great Frankish empire under the Carlovingians the whole plain was incorporated and the popula-

tion Christianized; but by the division of the empire of Charlemagne the country was divided, the southern part falling to France, the central to Lothringia, and the northern to Germany, and for centuries the different parts followed the different destinies of the main bodies to which they belonged. Meanwhile, the feudal system got a foothold in the country. Dukedoms, Brabant, Limburg, Luxembourg; countships, Artois, Flanders, Holland; bishoprics, Mechlin, Utrecht, etc., were formed, and the remote position of the country made the feudal lords more independent of the royal or imperial power here than anywhere else. On the other hand, the situation on the ocean and the mouths of three great rivers invited to commerce, and flourishing cities grew up and surrounded themselves with strong fortifications. By a marriage the countship of Flanders became united to Burgundy in 1384, and subsequently the Burgundian dukes succeeded, partly by force, partly by craft, in gaining possession of the whole country, which they governed well. By another marriage the Netherlands, with the other Burgundian dominions, came into the possession of the house of Hapsburg in 1477. By the division of Charles V.'s empire between Austria and Spain the Netherlands fell to Spain, and it was a good consequence of this combination, so fatal in other respects, that the Dutch retained their full share in the new commerce which was opened up by the discovery of America and the establishment of the Spaniards in the East Indies. On the whole, it was not so much the interests of the two countries which clashed as the different character of the people and its ruler. THE REFORMATION (*q.v.*) had made a deep impression and spread widely in the Netherlands, and Philip II. determined to root it out. In 1566 war broke out. The salient points of the struggle were the formation at Utrecht (Jan. 23, 1579) of a union between the seven northern provinces, Holland, Zealand, Utrecht, Friesland, Groningen, Overijssel, and Gelderland, and the recognition by Spain of this union by the armistice of twelve years concluded in 1609. (For further details, see the articles on MARGARET OF PARMA, ALVA (DUKE OF), JOHN (DON) OF AUSTRIA, FARNESE, the Spanish governors, and WILLIAM OF NASSAU and MAURICE, COUNT OF NASSAU, the Dutch leaders.) By the Peace of Westphalia (1648) the independence of the republic of the United Provinces was formally acknowledged, while the southern provinces, nearly corresponding to the present kingdom of Belgium, remained with Spain and within the Roman Catholic Church. The prosperity of the young state was prodigious, and in maritime affairs it shared with England the supremacy of the world. It crushed the Spaniards and acquired possessions in America and the East Indies. It checked the Portuguese and several times defeated the English. After the battle of Goodwin Sands (Nov. 29, 1652) its admiral, Van Tromp, paraded a broom at his masthead along the English coast as a token that he had swept the Channel, and in June, 1667, De Ruyter sailed up the Thames and blockaded the port of London. In the Baltic also the Netherlands became perfect masters by the Peace of Copenhagen (1660), which kept the Baltic waters open for Dutch trade; and at the same time that they actually held in their hands the commerce of the world, their achievements in philology, theology, natural philosophy, and art gained the admiration of all Europe. Their resistance to the arrogance of Louis XIV. was their greatest glory. (Details of this contest will be found in the articles on LOUIS XIV., WILLIAM OF NASSAU, TURENNE, etc.) After that period the importance of the republic gradually decreased, not because its activity and prosperity really declined, but simply because it was superseded by England; and when in 1782, led by jealousy and considering the opportunity good on account of the American Revolution, it declared war against England, its maritime power received a blow from which it never recovered. Meanwhile, two parties had developed in the interior politics of the state—one aiming to raise the office of the stadtholder into royalty and make it hereditary in the family of Orange-Nassau, while the other, the so-called "patriots," strove to abolish it altogether and establish a pure republic. When in the winter of 1794-95 the French army, after conquering the Spanish Netherlands, entered the territory of the United Provinces, it was hailed by the patriots; the stadtholder, William V., fled to England, and the Batavian republic was proclaimed May 16, 1795. The country paid dear, however, for its new constitution, which, moreover, was changed several times according to the whims of Napoleon. In 1806 the Netherlands was made a kingdom under Louis Bonaparte (the kingdom

of Holland); in 1810 it was incorporated with France. Meanwhile the state of its finances had become nearly desperate. The Congress of Vienna established the kingdom of Holland once more, gave the crown to the house of Orange-Nassau, and joined the former Spanish Netherlands with it. This last measure proved a new source of trouble. The southern provinces were agricultural, Roman Catholic, and French or Flemish speaking. The discrepancy between the two parts of the new state, both in political interests and in national character, was so palpable that when in 1830 the southern provinces rose into rebellion the great powers of Europe immediately consented to the separation, and the kingdom of BELGIUM (*q.v.*) was erected, though not until much blood and more money were squandered by the attempts of the King of Holland at maintaining his government. The revolutionary movement of 1848 finally occasioned some change in a liberal direction in the constitution, under the leadership of J. R. Thorbecke (1798-1872), and since that time further progress has been made in all directions toward a more enlightened policy. The franchise has been considerably extended, existing laws have been amended in a more liberal spirit, and many material improvements (railways, canals, etc.) have been made. In 1872 a conflict arose with the Sultan of Atjih, on the island of Sumatra, who grew uneasy under the Dutch supremacy. This seemingly insignificant revolt developed into a tedious war, which cost the mother country vast sums of money and many lives.

For the language and literature of the Netherlands, see DUTCH LANGUAGE and DUTCH LITERATURE.

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Nets and Netting: textures made by threads or cords crossing one another and knotted at the points of intersection so as to keep the shape and size of their open meshes. Fishing-nets are the most common instance of the stouter kinds of net, although these are made of many degrees of fineness, and of many different materials. In the decorative arts and in costume net has been used, in Europe and in the East, for fabrics of colored thread and of elaborate design, and as a ground upon which can be sewn sprigs and flowers cut from lace. It is, however, more commonly used for the making of fringes, edgings, bags, coverings for the hair, and "tidies" or "antimacassars." For these purposes a strong and fine cord is commonly used, often of silk. The net is often of very elaborate pattern, and darning or simple forms of embroidery are used to make it still more decorative.

The term is much used also for open-mesh fabrics, which are not true net, because not knotted where the threads cross. Thus mosquito-net is merely a very coarse and open gauze. In ornamental art, too, the work done by pulling out threads and stitching back others in cambric or lawn, so as to produce *drawn work* or *cut work*, is sometimes called net.

RUSSELL STURGIS.

Netsuke: the name given in Japan to the elaborately carved buttons or knobs of metal, wood, or ivory used in attaching the tobacco-pouch or other light article to the belt. Artists formerly vied with each other in the minute pains they took to make these *netsukes* marvels of intricate workmanship. Europeans apply the name to all miniature carvings in ivory of Japanese or Eastern workmanship.

Nettement, ALFRED FRANÇOIS: journalist and historian; b. in Paris, France, July 22, 1805. After completing his education at the Collège Rollin, he began in 1829 to publish *critiques* in the journal *L'Universel*, and for many years he wrote for that and other periodicals. He was an ardent Catholic and legitimist, and throughout the troubled years from 1830 to 1850 he resolutely maintained this position. After the Revolution of 1848 he founded *L'Opinion Publique*, a journal intended to help the restoration of the grandson of Charles X. After the *coup d'état* of Dec. 2, 1851, this was suppressed, and Nettement was thrown into prison. After his release he wrote for a time for the *Revue*

kee, but was soon back again in New York. Since then he has occupied many positions as conductor, including one year with the Philharmonic Society. He introduced Wachtel and Madame Pappenheim to New York, and conducted a series of Wagner's operas in 1877. He has composed several operas, which have been successfully performed. D. E. H.

Neufchâtel: See NEUCHÂTEL.

Neuilly, nō'yee': town; in the department of Seine, France; $1\frac{1}{2}$ miles from the western extremity of Paris, on the right bank of the river Seine, which is here crossed, on the prolongation of the avenue through the Champs Elysées, by the noble stone bridge built by Perronet. (See BRIDGES.) It was the favorite summer residence of Louis Philippe, who occupied the royal château erected in the reign of Louis XV., which was destroyed by the mob Feb. 25, 1848, the right wing alone being saved, which yet forms an object of interest to visitors. The beautiful grounds about Neuilly, once the favorite resort of Parisians, are now laid out in walks skirted by charming villas. Neuilly has a varied manufacturing industry, comprising starch, chemicals, straw goods, porcelain, etc. Pop. (1891) 29,444.

Neumann, noi'mān, KARL FRIEDRICH: Orientalist; b. at Reichmannsdorf, Bavaria, Dec. 22, 1798, of Jewish parents; studied at Heidelberg, Munich, and Göttingen, and was converted to Lutheranism; went in 1827 to Venice to study Armenian in the convent of San Lazaro, thence to Paris and London; made a journey to India and China in 1829-30; brought back a large collection of Chinese and Hindu books, which are now partly in Berlin and partly in Munich; was appointed Professor of Oriental Languages at Munich in 1831, but dismissed in 1852 on account of his liberal views in politics; removed in 1863 to Berlin, and died there Mar. 17, 1870. He was a very prolific writer on various topics. His principal works are *Mémoires sur la Vie et les Œuvres de David, Philosophe Arménien* (1829); *Lehrsaal des Mittelreichs* (1836); *Geschichte der armenischen Litteratur* (1836); *Asiatische Studien* (1837); *Die Völker des südlichen Russland* (1847); *Ostasiatische Geschichte* (1840-60); *History of Vartan by Elisæus, and Chronicle of the Armenian Kingdom in Cilicia, by Vahram* (1830), translated from the Armenian. He also wrote *Geschichte der Vereinigten Staaten von Nordamerika* (3 vols., 1863-66), and *Hoein Schein, or the Discovery of America by Buddhist Monks* (1874). Revised by F. M. COLBY.

Neumayer, noi'mī-er, GEORG B., Ph. D.: magnetician and meteorologist; b. at Kirchheim-Bolander, Pfalz-am-Rhein, Germany, June 21, 1826; was educated in the Polytechnic School, University, and Observatory, at Munich. He was in Australia for many years, where he served as director of the Flagstaff Observatory at Melbourne, and director of the Magnetic Survey of Queensland. On his return he became successively hydrographer of the Admiralty at Berlin and director of the Deutsche Seewarte at Hamburg. He has received the honorable title of *Geheimer Admiralitätsrath*. Among his numerous works, both in German and English, are *Results at Flagstaff Observatory* (1860) and in Victoria (1866-69); his *Discussions* of these observations (1862); *Anleitung zu wissensch. Beobachtungen auf Reisen* (1874; 2d ed. 1888); *Die internationale Polarforschung, Die deutschen Expeditionen und ihre Ergebnisse* (2 vols., 1890-91); *Atlas des Erdmagnetismus* (in Berghaus's *Physikalischer Atlas*, 1891); and (with Prof. Dr. C. Börgen) *Die Beobachtungsergebnisse der deutschen Stationen im Systeme der intern. Polarforschung* (2 vols., 1874-88). MARK W. HARRINGTON.

Neumünster, noi'mün-ster: town; in the duchy of Holstein, Prussia; on the Schwale river; 20 miles by rail S. W. of Kiel (see map of German Empire, ref. 2-E); has large breweries, dye-works, tanneries, and manufactories of woolen and linen fabrics. Pop. (1890) 17,539.

Neu-Pommern, noi pō'mōrn: See NEW POMERANIA.

Neuquen, nā-oo-kān': a territory of the Argentine Republic on the eastern slope of the Andes, S. of the province of Mendoza, between the rivers Limay (a branch of the Negro) and the Colorado. Area officially stated at 42,116 sq. miles, but the limits are not well determined; population about 30,000. In the mountainous western portion there are many fertile valleys; much of the eastern part, except in the river valleys, is arid; and there is an immense bed of shingle, said to be the largest in the world, extending for 600 miles through this territory and Rio Negro; its average thickness is 50 feet. The principal industry, confined

to the fertile lands along the rivers, is cattle and sheep raising; the cattle are driven over the mountains to the Chilian markets. Gold, silver, coal, etc., are reported. Until 1879 this region was held by the Ranqueles Indians. Capital, the village of General Achá, with about 2,000 inhabitants. HERBERT H. SMITH.

Neuralgia [Mod. Lat.; Gr. *νεῦρον*, nerve + *ἄλγος*, pain]: pain in a nerve due to functional disturbance either in its central or peripheral extremity. If inflammation be present in the nerve-trunk, NEURITIS (*q. v.*) is a more proper designation. It is, however, often difficult to distinguish between the two conditions, and many authors use the term neuralgia even if inflammation be present, provided pain be the predominant symptom. The disease is rarely met with in children, and is more frequent in women than in men. The causes are debility, exposure to cold, anæmia, reflex irritation, as in facial neuralgia from a decayed tooth, rheumatism, gout, diabetes, malaria, and lead-poisoning. The pain is localized in the distribution of a certain nerve or nerves, and rarely occurs on both sides at once. It is paroxysmal, lasting from a few minutes to many hours, and is deep-seated, sharp, burning or boring, and darting. In the intervals there may be a dull ache. It may recur at regular intervals even when not due to malaria. The skin, especially at certain points on the affected nerve, is extremely sensitive to pressure. Local œdema, sweating, or redness may occur. The hair may become gray in spots, or even fall out. Neuralgias are classified according to the part affected. The following are the principal varieties: Facial (see FACIAL NEURALGIA); intercostal; brachial (involving the arm); crural (involving the front of the thigh); sciatica; coccygodynia (causing intense pain at the end of the spine, made much worse by sitting); erythromelalgia (in which there is great pain in the heel or sole, with hyperæmia or cyanosis). There are also neuralgias of the internal organs, of which gastralgia (neuralgia of the stomach) and nephralgia (neuralgia of the kidney) are examples. In *epileptiform neuralgia* the attack comes on suddenly with extreme severity, lasts only a few seconds, and recurs many times daily. The pain is felt only in the fifth nerve, and may be accompanied by spasm. In the *neuralgia of stumps* the patient, at a greater or less time, usually several months, after amputation of an arm or leg, begins to feel pain, not in the scar, but in the amputated extremity. The apparent position of the removed member is plainly felt, and he often feels the fingers violently flexed or extended. Later the pain appears in the retained part of the member. Sometimes there is violent twitching of the stump. The affection is caused by pressure of the contracting scar upon the ends of the nerves. WILLIAM PEPPER and C. W. BURR.

Neurasthenia: See NERVOUS DISEASES.

Neurilemma: See HISTOLOGY (*Nerves*).

Neurine [from Gr. *νεῦρον*, nerve], or **Cho'line** [from Gr. *χόλος*, gall, bile]: the tri-methyl-oxethyl-ammonium-hydrate, (CH₃)₃(C₂H₅OH)NOH. It is obtained from the bile, from the brain, from LECITHIN (*q. v.*), from PROTAGON (*q. v.*), and is prepared synthetically. Lecithin, which occurs in the brain, nerves, yolk of eggs, blood-corpuscles, etc., is now known to be the di-stearyl-glycerin-phosphate of neurine.

Neuri'tis [Gr. *νεῦρον*, nerve + Mod. Lat. suffix *-itis*, denoting a disease of the part to the name of which it is added]: inflammation of a nerve. The nerve is red and swollen. The inflammation may be confined to the fibrous sheath (perineuritis), or invade the deeper connective tissue (interstitial neuritis), or the nerve-fibers may be primarily affected (parenchymatous neuritis). The changes in the last are similar to those in Wallerian degeneration following cutting of a nerve. The medullary substance becomes segmented and divides into globules and granules. The axis cylinders break up, become granular, and finally disappear. The nuclei of the sheath of Schwann increase in number. In the former the internodal nuclei are swollen, those of the sheath of Schwann proliferate, and the nerve-fibers may be completely replaced by fibrous tissue. The following are the chief varieties of neuritis: *Localized neuritis*, due to cold, wounds, and extension of disease from neighboring parts. "Crutch palsy," in which the head of the crutch pressing against the musculo-spiral nerve bruises it and causes palsy in the muscles supplied, is quite common. The hand hangs from the wrist and can not be extended, the forearm is supinated with difficulty, and there is numbness and tingling. In the idiopathic form and in that from wounds there is

great pain, numbness, diminution of the tactile sense, impairment or absolute loss of motion in the muscles, and finally muscular wasting. There may be muscular contraction, redness and glossiness of the skin, oedema, and herpes. *Myiophthiriasis* may be idiopathic or caused by the poisons of acute infectious diseases, as, for example, diphtheria, typhoid and scarlet fevers, and smallpox; certain poisons, among which are alcohol, lead, and mercury; and, finally, some chronic constitutional diseases, such as cancer, tuberculosis, and diabetes. In the acute form the onset is rapid. Fever, backache, headache, and limb-ache appear first, and are followed by a more or less complete palsy of the legs and arms, and sometimes of the intercostal muscles, so that respiration becomes purely diaphragmatic. There is a characteristic drop of the hands and feet. Sensory disturbances may be slight or severe. There is muscular wasting. The course of the disease varies greatly. The patient may die in a few days or may recover after a prolonged convalescence. In the alcoholic form the onset is apt to be gradual, and there may be neuralgic pains in the arms and legs for months before palsy develops. Fever is rare. The type of the palsy is similar to that already described. There is often delirium, with convulsions and hallucinations of grandeur. Occasionally the mental symptoms are the same as those met with in delirium tremens. The disease is most frequent in women. Steady, quiet drinking is more apt to cause it than occasional drunkenness. *Endemic myiophthiriasis* is common in Japan, New Zealand, India, Brazil, and the West Indies. It was formerly prevalent in China. Its cause has not been positively determined, but it is probably infectious. The onset may be sudden or gradual. The symptoms are fever, anaemia, ascending palsy, including sometimes the diaphragm and larynx, muscular wasting, oedema beginning in the legs and becoming general, and anæsthesia to touch but not to pain. Death results from cardiac failure. The mortality-rate varies from 3 to 50 per cent. in different epidemics. In all forms of neuritis there is reaction of degeneration in the muscles.

WILLIAM PEPPER and C. W. BURK.

Neuropt'era [Mod. Lat.: Gr. *νεῦρον*, nerve + *πτερόν*, wing]: a name applied with different limitations by different authors to a group of insects. By some it is used to include the day-flies (Ephemeroidea), dragon flies (Libellulæ), stone-flies (Plecoptera), white ants (Isoptera), book-lice (Corrodentia), scorpion-flies (Panorpata, or Mecoptera), caddis-flies (Trichoptera), and the hellgrammites and ant-lions. By others its use is limited to the last-named forms. With its wider signification it is difficult of definition, but it may be said to include those forms of insects in which the



FIG. 1. Eggs larva and adult of *Chrysopa* sp.

mouth-parts, like those of grasshoppers, are fitted for biting and in which the gauzy wings are provided with numerous cross-veins. Such a definition, however, brings together a heterogeneous assemblage of forms, some having a complete, others an imperfect metamorphosis, as well as some in which the mouth-parts are as well adapted for sucking as for biting. (See EXTOMOLOGY.) The Neuroptera proper have a complete metamorphosis, passing through larval and pupal stages before becoming adult; the mouth-parts are fitted for biting, and the wings, four in number, are membranous, and are furnished with numerous veins. The group or order contains but two American families. The first, the *Stratiotidae*, contains the hellgrammite flies, *Corydalus*, the aquatic larvae of which, under the name of "dobsons," are familiar to fishermen. When ready to pupate the larvae leave the water and make a cavity in the earth, in which the pupa remains inactive for four or five weeks. The other family, *Hemeroptidae*, contains the ant-lions, aphid-lions, and a few other forms. Of these the ant-lions are best known. They dig funnel-shaped pitfalls, at the bottom of which the strong-jawed larva lies buried. Any ant or other insect venturing within the mouth of the funnel tumbles down, and is seized by the larva at the bottom of the pit. The ant-lions spin silken cocoons in which to pass the pupal stage. The pupæ

lions (*Chrysopa*) lay their eggs on stalks so as to place them above danger. The larva hunt for their prey, which consists of other insects; their silken cocoons are spun for the pupal stage. The adults are frequently called golden-eyed flies on account of the color of the eyes in the living insects. Some species emit a most nauseous odor on being disturbed. See ENTOMOLOGY.

J. S. KINGSLEY.

Neuro'sis [from Gr. *νεῦρον*, nerve]: the generic name applied to disorders of the nervous system in which no structural change is discoverable. The number of such affections has materially decreased with improved methods of research. Doubtless some of them are of toxic nature, the disturbed action of the nervous system being due to the altered physiology under the influence of poisons, as we know to be the case in instances of alcoholic or opium poisoning. The long continu-



FIG. 2. *Libellula* sp.

ance of intoxication or chronic disturbance of the nervous system of a purely functional nature may doubtless lead to organic changes, so that in the end a functional disease may become organic. Among the neuroses are generally considered neuralgia, chorea, epilepsy, paralysis agitans, neurasthenia, and others. The causes which are operative to induce these conditions are considered under the heading NERVOUS DISEASES.

An interesting group are the so-called *occupation neuroses*, such as writer's or scrivener's cramp or palsy, telegrapher's cramp, sempstress's cramp, and the like. In these affections the habitual overuse of certain groups of muscles in finely co-ordinated movements occasionally leads to a condition in which every attempt to perform the accustomed work leads to painful spasm or cramp of the muscles involved. Sometimes there is simply palsy, at other times only pain or cramp; but, as a rule, cramp and pain are associated. In the treatment of neuroses the first indication, as a general thing, is to secure rest of the entire nervous system or of the parts involved. In addition, general tonic treatment is required for the underlying loss of tone, which is the predisposing factor. WILLIAM PEPPER.

In *psychology*, the word *neurosis* is used to indicate a condition of the central nervous system which is correlative to a particular condition or function in consciousness. Every *neurosis* has its *psychosis*. For example, emotion is a psychosis, which is supposed to involve a certain kind of nervous process or neurosis. The distinction in terms was suggested by Huxley, and has been generally adopted.

J. M. ELLIOTT.

Neurot'ics [from Gr. *νεῦρον*, nerve]: in medicine, such drugs as are capable of primarily affecting the functions of intellection, sensibility, or motility. Alcohol, the ethers, chloral, potassium bromide, amyl nitrite, the drugs of the opium type, quinine, strychnine, hemlock, Calabar bean, aconite, digitalis, etc., are neurotics.

Neusiedl, lake of (German, *Neusiedler See*): a body of water in Hungary; near the northwestern frontier; 23 miles long and 7 miles broad. Its water contains various salts in solution, and has a brackish taste. The lake sometimes dries up entirely, as was the case in 1693, 1738, and 1865; but in 1870 the basin again became filled with water through the Hanság marsh, and the farms and plantations which Archduke Albrecht had laid out under the name of New Mexico were all submerged. Under sudden risings of the water a canal conducts it to the river Rábitz.

Neustadt (German, *Wiener Neustadt*): of Lower Austria; at the beginning of the canal of same

name, and on the Vienna and Gratz Railway; 26 miles S. of Vienna (see map of Austria-Hungary, ref. 5-E). It is surrounded by a wall and a deep ditch. In 1834 the town was nearly destroyed by fire. It has since been handsomely rebuilt, and is the seat of a Cistercian abbey and of a military academy founded by Maria Theresa. Its manufactures are important, and include locomotives, machinery, tacks, clocks, leather, etc.; and it has a good trade in horses and agricultural products. Pop. (1890) 24,780.

Neu-Strelitz, *noí'strá'lits*: capital of the grand duchy of Mecklenburg-Strelitz, Germany; situated between two lakes, 62 miles N. N. W. of Berlin (see map of German Empire, ref. 2-G). It was founded in 1733, is built in the form of an eight-pointed star, and contains a fine palace with a library, a theater, educational and benevolent institutions, and a fine park. Pop. (1890) 9,481.

Neuter Nation: See IROQUOIAN INDIANS.

Neutral Axis: the line in a cross-section of a beam which is neither extended nor compressed when the beam is deflected by a load. This line passes through the center of gravity of the cross-section, provided the elastic limit of the material be not exceeded. See ELASTIC CURVE and FLEXURE. M. M.

Neutrality: the state of peace which a nation observes while some of its friends are at war. Anciently, such a condition can hardly be said to have existed, for wars were general and every state was either the ally or the enemy of every other. In nothing can the progress of society be so clearly seen as in the increasing growth and importance of the neutral status.

Neutrality is not only a privilege to be free, so far as is possible, from the losses and evils of war; it is also a duty to avoid aiding either belligerent, remembering that the other is a friend. The position which a state intends to take in view of a war between its neighbors should be clearly defined. It is accordingly customary to issue a proclamation of neutrality, laying down the rules which are to govern its intercourse with both belligerents alike; the privileges, if any, which they may expect; the obligations which it will itself recognize, and the duties thereby devolving upon its subjects.

Besides such proclamations in view of a particular war, it is also customary for a state to put on its statute-books general laws regulating the actions of its citizens with reference to foreign wars. These are neutrality acts. They are only municipal laws, it is true, yet their violation by the subjects of a state may be ground for damages against it in favor of an injured belligerent, as was proved in the Alabama case. The non-existence or insufficiency of such laws is no excuse for a failure to observe a strict neutrality, but may rather be a cause of complaint. For a full discussion of this subject, the rights and duties of neutral states, and the effects upon neutral trade, the reader is referred to the general article INTERNATIONAL LAW.

The following proclamation of neutrality, issued by the King of Spain at the outbreak of the civil war in the U. S., June 17, 1861, affords an illustration:

"Taking into consideration the relations which exist between Spain and the United States of America, and the desirability that the reciprocal sentiments of good understanding should not be changed by reason of the grave events which have taken place in that republic, I have resolved to maintain the most strict neutrality in the contest begun between the Federal States of the Union and the States confederated at the South; and in order to avoid the damage which might accrue to my subjects and to navigation and commerce from the want of clear provisions to which to adjust their conduct, I do decree the following:

"ART. 1. It is forbidden in all the ports of the monarchy to arm, provide, or equip any privateer vessel, whatever may be the flag she displays.

"ART. 2. It is forbidden in like manner to the owners, masters, or captains of merchant vessels to accept letters of marque, or contribute in any way whatsoever to the armament or equipment of vessels of war or privateers.

"ART. 3. It is forbidden to vessels of war or privateers with their prizes to enter or to remain for more than twenty-four hours in the ports of the monarchy, except in case of stress of weather. Whenever this last shall occur, the authorities will keep watch over the vessel, and oblige her to go out to sea as soon as possible without permitting her to take in any stores except those strictly necessary for the moment, but in no cases arms or supplies for war.

"ART. 4. Articles proceeding from prizes shall not be sold in the ports of the monarchy.

"ART. 5. The transportation under the Spanish flag of all articles of commerce is guaranteed, except when they are directed to blockaded ports. The transportation of effects of war is forbidden, as well as the carrying of papers or communications for belligerents. Transgressors shall be responsible for their acts, and shall have no right to the protection of my Government.

"ART. 6. It is forbidden to all Spaniards to enlist in the belligerent armies or take service on board of vessels of war or privateers.

"ART. 7. My subjects will abstain from every act which, in violation of the laws of the kingdom, can be considered as contrary to neutrality.

"ART. 8. Those who violate the foregoing provisions shall have no right to the protection of my Government, shall suffer the consequences of the measures which the belligerents may dictate, and shall be punished according to the laws of Spain."

This is a fair sample of proclamations of neutrality, yet it is liable to misconception. For in point of fact the conveyance of contraband, blockade-running, enlistment in a foreign army, or service on a foreign ship would probably not be punished by the laws of Spain or any other country while neutral. It is simply intended to give warning that such acts are illegal, and that if penalties are incurred at the hands of either belligerent for committing them—e. g. confiscation of contraband goods—no remedy can be furnished by their own Government. On the other hand, certain other acts forbidden by the proclamation, such as arming a privateer or ship of war, would probably be prevented under penalty by the Government. This somewhat curious and illogical distinction between acts apparently of equal criminality rests upon usage, a usage acquiesced in by belligerent as well as neutral, and founded upon the principles that (1) neutral trade shall be as little disturbed as possible in time of war; that (2) anything resembling the fitting out of an armed expedition on neutral ground to operate against a friendly state is not a mere act of trade, but a direct act of war and unnatural, and likely to involve the neutral state in difficulties and make it responsible for damage thereby inflicted. See CONTRABAND and INTERNATIONAL LAW.

T. S. WOOLSEY.

Neville, *nō'veel'*, ALPHONSE MARIE, de: military painter; b. at St.-Omer, Pas-de-Calais, France, May 31, 1836. He was a pupil of Picot; was awarded medals at the Salons of 1859 and 1861; was made an officer of the Legion of Honor 1881. He began life as a lawyer, but abandoning the law to take up the study of art, he soon achieved a reputation, and with his pictures of episodes of the Franco-German war of 1870 reached the highest rank among modern battle-painters. His compositions are notable for action and vigorous draughtsmanship. One of the best and most important is *The Defense of Le Bourget*, painted in 1879, in the collection of Mrs. W. H. Vanderbilt, New York. D. in Paris, May 20, 1885. WILLIAM A. COFFIN.

Neva: a river of the government of St. Petersburg, Russia. It connects Lake Ladoga with the Gulf of Finland; is 35 miles long; has a curved and sinuous course, with many bars and other obstructions to navigation at its head and mouth, and a series of rapids about midway of its length. It is broad and deep, and the obstructions to navigation have been measurably overcome by engineering works. St. Petersburg occupies the islands of its delta. M. W. H.

Nevada, *nēe-vaa'da*: one of the U. S. of North America (Western group); twenty-third in order of admission into the Union; ranked in 1891 fifth in production of gold, fifth in silver, and sixth in aggregate value of both.

Location and Area.—It lies between 35° and 42° N. lat., and 114° and 120° W. lon.; bounded N. by Oregon and Idaho, E. by Utah and Arizona, S. W. and W. by California; extreme length from N. to S., 483 miles; greatest breadth from E. to W., 423 miles; area, 110,700 sq. miles.

Physical Features.—The greater part of Nevada is included in the Great American Basin, which has for its walls the Sierra Nevada on the W. and the Wahsatch Mountains on the E. It is bounded N. and S. by cross-ranges, and has no outlet for its waters. This vast basin is a table-land about 4,000 feet above the sea, and mountains rise from 1,000 to 8,000 feet above its level. About 12,000 sq. miles in the S. E. of the State are outside of this basin, and belong to the Colorado river basin. The Sierra Neva-



da Mountains constitute the west boundary of the State. They throw out one spur, however, the Washoe Mountains, which have a N. E. direction. Most of the mountain chains are parallel to each other, and have a general course from N. W. to S. E.



Seal of Nevada

The principal chains, beginning at the W. are the Virginia Mountains, W. of Pyramid Lake; the Lake range, between Pyramid and Winnemucca Lakes; the Truckee Mountains, E. of Winnemucca Lake; the Trinity and Antelope Mountains, which form the west boundary of the Lower Humboldt river and Lake valley; the West Humboldt Mountains; and, separated from these by a broad valley, the East Humboldt Mountains; S. of the Humboldts are the Toyabe Mountains, and a parallel range, the Santa Rosa. The Pah-Ute and Coyote Mountains, also outliers of the Toyabe range on the W., extend northward toward the Humboldt river and lake. E. and S. E. of the East Humboldt range are the Edwards Creek Mountains, the New Pass range, the Shoshone and Reese River ranges, the Hot Creek, Nevada, and Smoky ranges, the Diamond, Egan, Ungoweah, and Goshoot Mountains, parallel ranges, with valleys between. In the S. W. is an isolated range, the White Mountains. The Colorado valley has numerous abrupt ranges rising from its plateaus, and three peaks of considerable height—viz., Ten Piute, Pahrnegat, and Picacho. The most important ranges of the Colorado region are the Muddy, Vegas, Spring Mountain, and Kingston Mountains. Some of the peaks of the West Humboldt and South Toyabe ranges rise to the height of 10,000 to 12,000 feet. The eastern slope of the Sierra Nevada and the Humboldt, East Humboldt, and Toyabe ranges have a considerable number of streams, which, however, disappear very suddenly from the surface, and reappear as lakes or pools farther on. The principal rivers are the Truckee, which rises in Tahoe Lake and flows N. E. and N. W. into Pyramid Lake; the Humboldt, which is formed by the confluence of several small streams in the N. E. of the State, and after a general southwest course falls into Humboldt Lake; Walker river, in the S. W., which, after a circuitous course, falls into Walker Lake; Carson river, discharging into Carson Lake; Quinn's river, in the N. W.; Reese river, in the central portion of the State; the Rio Virgin, in the S. E.; and the Colorado, which forms for a considerable distance a part of the southeast boundary. The principal lakes are Pyramid, 33 miles long and 14 wide; Walker, nearly as large; Carson, 12 miles in diameter; Humboldt, somewhat smaller; Winnemucca, 18 miles long, 8 wide; and Lake Tahoe, one-third of which is in Nevada, 1,500 feet deep, 6,000 feet above the sea. There are also numerous shallow lakes of large extent in the rainy season, but dry or nearly so in the dry season.

Mineral Resources. Gold is not an abundant metal in Nevada, but some of the argentiferous ores contain a large amount of gold in combination. The percentage of gold in these ores varies from 21 to 52 per cent. of the entire metallic product. Silver is, however, the staple mineral product of Nevada. The silver lodes are found in almost every part of the State, some yielding from \$65 to \$100 to the ton, others ranging from \$450 to \$2,500 or more to the ton. Of these the mines on the Comstock vein or lode have proved the most valuable. The product of the mines for the year ending Sept. 30, 1891, was 375,798 troy ounces, the gross value, \$5,948,563. The yield of the Comstock lode for 1890 was over \$1,000,000. The number of mines reported that July was 1,500. The director of the U. S. mint reported the product of Nevada gold mines in 1892 as 76,021 fine ounces, valued at \$1,571,500, and of Nevada silver mines as 2,454,000 fine ounces, with a coining value of \$3,173,495. There has been a distinct falling off in the output of precious metals in Nevada since 1891, the calendar year 1893 showing 46,367

fine ounces of gold, valued at \$958,500, and 1,150,000 fine ounces of silver, of a coining value of \$2,018,651. The other minerals of Nevada are lead, copper in various forms, the production of which decreased from 288,077 lb. in 1883 to 20,000 lb. in 1893, iron in numerous forms, as magnetite, spathic, specular, common iron pyrites, arsenical and magnetic pyrites, etc.; it is not as yet mined to any extent; antimony, arsenic, possibly quicksilver, manganese, sulphate of zinc, graphite or plumbago, sulphur (pure), gypsum, rock-salt, nitrate of potassa, carbonate of soda in immense quantities, borax, lignite or brown coal, kaolin, sulphate of magnesia, agates, amethyst, epidote, tourmaline, chalcedony, jasper, carnelian, fluorspar, selenite, granite, and mica, of which 1,500 lb. from a single mine were shipped to Syracuse, N. Y., and Hamburg, Germany, in 1894 to be cut. There are numerous mineral springs and some geysers.

Soil and Productions.—While the State will never be largely agricultural, it possesses a sufficiency of arable lands to supply with the aid of irrigation, and possibly without, the needs of such a population as it is destined to have, and its mountain-slopes and some of its valleys will prove to be among the best grazing-lands of the Pacific region. In 1889 there were 1,167 irrigated farms in the State, covering an area of 224,403 acres. The average value of products per acre from these irrigated lands was \$12.92. Only 7 per cent. of the land under irrigation was devoted to the cultivation of cereals, the remainder being given up to forage. Its timber-lands proper, those on which grow the lofty pines of the sierras, are of very moderate extent. A part of the lower portions of the mountain regions and some of the valleys along which the rivers flow are covered with a smaller growth of piñon or nut-pine, cottonwood, birch, willow, dwarf cedar, etc. Of the sixty-five natural families of plants catalogued, many are represented by a large number of genera and species. Lupines, clovers, vetches, and nutritious grasses are the most characteristic plants.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.
Total number of farms	1,404	1,377	97.9
Total acreage of farms	539,802	1,661,416	307.9
Value of farms, including buildings and fences	\$9,408,325	\$12,400,410	132.2
* Decrease		† Increase	

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1893:

CROPS.	Acreage.	Yield.	Value.
Wheat	5,613	82,711 bush.	\$8,700
Barley	1,800	280,000 "	9,800
Potatoes	1,112	178,064 "	71,386
Hay	135,931	61,466 tons	3,615,760
Totals	150,765		\$4,794,646

On Jan. 1, 1894, the farm animals comprised 55,793 horses, value \$1,316,764; 1,604 mules, value \$62,965; 18,196 milch-cows, value \$533,143; 259,078 oxen and other cattle, value \$3,360,732; 544,077 sheep, value \$1,164,162; and 11,590 swine, value \$101,366; total head, 890,338; total value, \$6,539,132.

Climate.—This is characterized by great extremes. In winter snow falls upon the summits of the mountains, though there is not much in the valleys. The air is dry, the winds are strong, and, though the sunshine is bright and pleasant at midday, the nights are often intensely cold. In January the mercury falls to from 10° to 16° below zero in the valleys, and much lower in the mountains. Spring comes in about the end of February, though there may be piercing winds and sharp frosts, chilling rain and snow in March, or even in April. Thunder-storms of great severity occur in April and May and into June. When these have passed away, the dry season prevails until October. The temperature rises occasionally to 100° or 105°. It falls every night to between 70° and 80°, and does not average in July and August more than 90° at midday. In the eastern part there are frequent thunder-storms in summer and till Sept. 15, and the heat is longer continued and more oppressive. There is less intense cold, very little snow or frost in winter in Southeastern Nevada, and the culture of cotton and sugarcane has been attempted there. The climate is remarkably healthful and invigorating.

Divisions.—For administrative purposes the State is divided into fourteen counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Churchill.....	5-F	479	703	Stillwater.....	64
Douglas.....	6-E	1,581	1,551	Genoa.....	434
Elko.....	3 I	5,716	4,794	Elko.....	766
Esmeralda.....	6 F	3,220	2,118	Hawthorne.....	337
Eureka.....	4-H	7,086	3,275	Eureka.....	1,609
Humboldt.....	3 G	3,480	3,434	Winnemucca.....	1,037
Lander.....	4 H	3,624	2,266	Austin.....	1,215
Lincoln.....	8-J	2,637	2,406	Pioche.....	676
Lyon.....	5 E	2,409	1,987	Dayton.....	576
Nye.....	6-H	1,875	1,290	Belmont.....	213
Ormsby.....	5-E	5,412	4,883	Carson City.....	3,950
Roose.....	4 E	286			
Storey.....	5-F	16,115	8,806	Virginia City.....	8,511
Washoe.....	4-E	5,664	6,457	Reno.....	3,563
White Pine.....	5-J	2,682	1,721	Hamilton.....	284
Totals.....		62,266	45,761		

* Reference for location of counties, see map of Nevada.
† Now a part of Washoe County.

Principal Cities and Towns, with Population for 1890.—Virginia City, 8,511; Carson City, 3,950; Reno, 3,563; Eureka, 1,609; Austin, 1,215; Tuscarora, 1,156; and Winnemucca, 1,037.

Population and Races.—1860, 6,857; 1870, 42,491; 1880, 62,266; 1890, 45,761 (native, 31,055; foreign, 14,706; males, 29,214; females, 16,547; white, 39,084; colored, 6,677, of whom 242 were of African descent, 2,833 Chinese, 3 Japanese, and 3,599 civilized Indians).

Industries and Business Interests.—Exclusive of the mining and milling industries, there were reported in 1890 95 manufacturing establishments, which had a combined capital of \$1,211,269, employed 620 persons, paid \$445,503 for wages and \$439,058 for materials, and had products valued at \$1,105,063. There were 118 quartz-crushing mills, 13 smelting-furnaces, 10 borax-works, 11 grist-mills, and 11 sawmills.

Finance.—The total debt, exclusive of an irredeemable bond of \$380,000, on Jan. 1, 1894, was \$201,946; cash in treasury, \$190,306; net debt, \$11,460. The assessed valuations in 1893 were—real, \$18,029,819; personal, \$8,148,241; net proceeds of mines, \$157,514; total, \$26,335,574; and the State tax-rate was \$9 per \$1,000.

Banking.—In 1894 there were 2 national banks, with combined capital of \$282,000, surplus and profits of \$146,986, and individual deposits of \$403,401; and 6 State banks, 2 private banks, and 2 collection agencies.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 171 post-offices, of which 5 were presidential (1 second-class, 4 third-class) and 166 fourth-class, 34 money-order offices, and 1 postal-note office. There were 9 daily, 1 semi-weekly, 17 weekly, and 1 semi-monthly periodicals; total, 28.

Libraries.—In 1892 there were reported 8 public libraries of 1,000 volumes and over, which together contained 40,215 bound volumes and 1,970 pamphlets. They were classified as general, college, public institution, State, social, scientific, Masonic, and not reporting, one each.

Means of Communication.—Nevada had in operation, Jan. 1, 1892, 923 miles of railway, costing \$16,570,715, with net earnings of \$833,918, and paying in interest and dividends \$687,750. The Central Pacific is the principal trunk line, running for 450 miles of its course through the State.

Churches.—The Methodist Episcopal denomination has (1893) 28 churches, 13 ministers, and 895 full members; Protestant Episcopal, 11 churches, 535 members; Roman Catholic, 17 churches, 8 priests, and about 5,000 adherents; Presbyterians, 8 churches, 190 members; Baptists, 3 churches, 52 members; Congregationalists, 1 church, 52 members; Jews, 1 synagogue.

Schools.—In 1890 the number of children of school age (six to eighteen years) was 10,022, of whom 7,387 were enrolled in public schools, with average daily attendance of 5,064. Total expenditure for public schools in 1890, \$161,481, of which teachers' salaries amounted to \$135,800. Nevada has a State university, which had 137 students in 1890.

History.—Nevada is a part of the territory ceded to the U. S. by Mexico by the Treaty of Guadalupe Hidalgo, Feb. 2, 1848. It was at first a part of California Territory, and was subsequently attached to Utah; it was constituted a Territory Mar. 2, 1861, with somewhat smaller boundaries than at present. The constitution was ratified, and Nevada

admitted into the Union as a State, Oct. 31, 1864. Additions were made to its territory by congressional enactment in 1866.

GOVERNORS OF NEVADA.

Territorial.		
James W. Nye.....	1861-64	Jewett D. Adams..... 1883-87
		C. C. Stevenson..... 1887-91
		R. K. Colcord..... 1891-95
		John E. Jones*..... 1895-96
		Reinhold Sadler..... 1896-
State.		
Henry G. Blaisdell.....	1864-71	
Louis R. Bradley.....	1871-79	
John H. Kinkead.....	1879-83	

* D. Apr. 10, 1896.

Revised by C. K. ADAMS.

Nevada: town (located in 1853); capital of Story co., Ia. (for location of county, see map of Iowa, ref. 4-G); on the Chi. and N. W. Railway; 35 miles N. N. E. of Des Moines. It is in an agricultural and stock-raising region; contains 6 churches, graded schools, a national bank with capital of \$50,000, a private bank, and a quarterly and 2 weekly periodicals; and has flour and grist mills, 2 grain elevators, foundry and machine-shop, planing-mill, 2 tile-works, creamery, and wagon-factory. The State Agricultural College is 9 miles W. of the town. Pop. (1880) 1,541; (1890) 1,662; (1895) 2,107.

EDITOR OF "STORY COUNTY WATCHMAN."

Nevada: city; capital of Vernon co., Mo. (for location of county, see map of Missouri, ref. 6-E); on the Mo., Kan. and Tex. and the Mo. Pac. railways; 90 miles S. W. of Sedalia. It is the seat of Christian University (Christian), of Cottery College (non-sectarian), and of State Insane Asylum No. 3; has a beautiful lake and park, gas and electric lights, street-railway, artesian well, 2 State banks with combined capital of \$150,000, a national bank with capital of \$100,000, a private bank, public-school library, and a monthly, 2 daily, and 4 weekly periodicals; and contains a large zinc-smelter, foundry, ice plant, mills, and other manufacturing establishments. Pop. (1880) 1,913; (1890) 7,262.

EDITOR OF "SOUTHWEST MAIL."

Nevada. EMMA WIXOM: opera-singer; b. in Nevada City, Cal., in 1861. She was educated in Austin, Tex., and in San Francisco; studied singing in Vienna under Madame Marchesi. She made her *début* at her Majesty's theater, London, in 1880, adopting the name of Nevada. She sang afterward with much success in the chief capitals of Europe. Returning to the U. S., she made her first appearance in New York in 1884 in *La Sonnambula*. Her favorite rôles are Lucia, Amina, and Mignon.

Nevada City: city; capital of Nevada co., Cal. (for location, see map of California, ref. 5-D); on Deer creek, and the Nevada County N. G. Railroad; 65 miles N. E. of Sacramento. It is in a mining and a fruit and vine growing region, and has several quartz-mills, a weekly and two daily newspapers, and a State bank with capital of \$50,000. Pop. (1880) 4,022; (1890) 2,524.

Névé: See GLACIERS.

Nevers, ne-vâr (anc. *Noviodunum*, or *Nevirum*): capital of the department of Nièvre, France; on the Loire, at the influx of the Nièvre; 159 miles by rail S. S. E. of Paris (see map of France, ref. 5-F). The town is old and ill-built, with narrow, crooked streets, but it has beautiful promenades, extensive manufactures of iron and copper ware, chemicals, porcelain, cloth, and linens, and large tanneries, breweries, and cannon-foundries. It has been the see of a bishop since 506; its cathedral, restored in 1879, dates from the thirteenth and fourteenth centuries; and there is a fine stone bridge of fifteen arches over the Loire. It contains several good educational institutions—a college, a female seminary, and a polytechnic school. Pop. (1891) 25,062.

Nevin, JOHN WILLIAMSON, D. D., LL. D.: theologian; b. in Shippensburg, Franklin co., Pa., Feb. 20, 1803; graduated at Union College, 1821, and at Princeton Theological Seminary, 1826, where he remained as tutor, and wrote his *Biblical Antiquities* (2 vols., Philadelphia, 1828). He was Professor of Hebrew and Biblical Literature in the Presbyterian Theological Seminary at Allegheny City (1829-39), where he edited a weekly literary journal entitled *The Friend* (1833-34); became president of the Mercersburg Theological Seminary 1840, and was president also of Marshall College 1841-53. He published in 1843, at Chambersburg, *The Anxious Bench*, which occasioned much controversy on the subject of revivals; and in 1844 a translation (with an introduction) of Dr. Schaff's inaugural address, *The Principle of Protestantism*, which gave rise to the "Mercersburg theology," of which

Dr. Nevin continued till his death to be the chief exponent. Also *The Mystical Presence* (Philadelphia, 1846), which, increased, in its doctrinal aspect, the controversy alluded to. *The History and Geography of the Hallelujah Church* (1847), and *Antichrist, or the Spiritual Sect and its doom* (1848). Dr. Nevin edited *The Mercersburg Review* quarterly (1849-53), resigned the direction of the Theological Seminary 1851, and the presidency of Marshall College on its removal to Lancaster and consolidation with Franklin College in 1853. He was president of Franklin and Marshall College 1866-76. D. at Carmarvon Place, near Lancaster, Pa., June 7, 1886. See his biography by Theodore Apper (Philadelphia, 1889).

Revised by S. M. JACKSON.

Nevis: an island of the British West Indies, in the federated Leeward group. It is 3 miles wide and 4 miles long, and rises by gradual slopes to a height of 3,200 feet. The scenery is beautiful, and the lower slopes of the island, which comprise some 6,000 acres, are fertile and well cultivated. It was discovered by Columbus in 1498, and was settled in 1628 by English emigrants from St. Christopher, with which it forms a presidency, with one legislative council, meeting at St. Kitts. The island was taken by the French in 1706; was restored by the Peace of Utrecht; was taken again by the French in 1782, and restored in the following year. Pop. 11,864. CHARLESTOWN (*q. v.*), the capital, is the chief town and has a safe roadstead. Sugar, rum, and molasses are exported.

Nevius, JOHN LIVINGSTON, D. D.: missionary and author; b. at Ovid, N. Y., Mar. 4, 1829; educated at Union College and Princeton Theological Seminary; was a missionary of the Presbyterian Board at Ningpo, China, 1853-61, and after 1861 in Shantung. D. at Chefoo, in Shantung, Oct. 19, 1893. He published in English *China and the Chinese* (New York, 1868); *Sung-Poh; or, North of the Hills* (Philadelphia; *Methods of Mission Work* (1886); and *Demon Possession* (1892); in Chinese, *Guide to Heaven* (1857; in classic Chinese, and in Ningpo dialect); *The Two Lights; Errors of Ancestral Worship; Guide to Evangelists; Systematic Theology* (3 vols., completed); *Explanation of the "True Doctrine"; a commentary on the Acts; Mark's Gospel with Notes; Manual for Inquirers, Evangelists, and Outstations; Questions on Matthew's Gospel, on the Acts with Commentary, and on Romans with Analysis for Bible and Theological Classes; Defense of Protestantism against Romanism* (1890); with other writers, *The Westminster Standards; and A Mandarin Hymn-book*.—His wife, HELEN S. COAN NEVIUS, b. at Lodi, N. Y., Jan. 8, 1832, wrote a number of books in the Chinese language, including *A Catechism of Christian Doctrine*; and in English, *Our Life in China* (New York, 1857).

Nevome Indians: SEE PIMAN INDIANS.

New Albany: city, capital of Floyd co., Ind. (for location of county, see map of Indiana, ref. 11-F); on the Ohio river, and the Balt. and Ohio S. W., the Louis., N. Alb. and Chi., the Louis., Evans, and St. L., and the Pitts., Cin., Chi. and St. L. railways; 3 miles W. of Louisville, Ky. It derives excellent power for manufacturing from the falls of the Ohio, 2 miles distant, and has a large commerce by rail and water. The census returns of 1890 showed that 299 manufacturing establishments (representing 65 industries) reported. These had a combined capital of \$5,352,521; employed 4,508 persons; paid \$2,099,091 for wages and \$3,471,487 for materials; and had products valued at \$6,633,259. The principal industries are the manufacture of iron and steel, cotton, woolen, and hosiery goods, plate glass, and tanned leather. The city has a new belt line of railway, electric street-railways extending through the suburbs, gas and electric light plants, new Masonic temple, Odd Fellows' hall, De Pauw College for young women, public high school for white pupils, Scribner High School for colored youth, 3 libraries (De Pauw College, founded 1846; Township, founded 1851; and Public, founded 1885) containing over 10,000 volumes, 4 national banks with combined capital of \$700,000, a State bank with capital of \$100,000, and a monthly, 2 daily, and 4 weekly periodicals. The assessed valuation in 1893 was \$11,113,060, and the net debt Jan. 1, 1894, \$367,989. Pop. (1880) 16,423; (1890) 21,059. — *Editorial of "Lexicon."*

New Amsterdam: the old name of New York city, adopted on the arrival of Gov. Stuyvesant, in 1647. Previous to that date the village was called Manhattan. On its capitulation, in Sept., 1664, to the English, its name was changed to New York.

Newark: town (founded in 1758; New City, N. J., D. C. (for location of county, see map of Delaware, ref. 2-H); on the Phil., Wil. and Balt. and the Balt. and Ohio railways; 12 miles S. W. of Wilmington, 37 S. W. of Philadelphia, 58 N. E. of Baltimore. It is in an agricultural region; has several paper-mills and vulcanite-fiber works; and contains the Delaware State College (endowed by the national land grant, and chartered in the year 1870), Academy of Newark (non-sectarian, chartered in the year 1769), Delaware Normal School, 2 libraries (Delaware College and the Delta Phi Society, both founded in 1835) containing over 6,000 volumes, one weekly and a monthly periodical, and a national bank with capital of \$50,000. Pop. (1880) 1,148; (1890) 1,191; (1894) estimated, 2,000.

Editorial of "DELAWARE LEXICON."

Newark: city (settled by families from Milford, Branford, and New Haven, Conn., in 1666; chartered as a city in 1836); port of entry; capital of Essex co., N. J. (for location, see map of New Jersey, ref. 2-D); on the Passaic river, the Penn., the Del., Lack. and W., the Erie, and the Central of N. J. railways, and several lines leased by them; 9 miles W. of New York city. It has a river and bay frontage of 10.5 miles, and an area of 18 sq. miles, of which two-thirds are improved and built up. There are 63 miles of paved streets, 28.38 miles of steam-railway track, and over 20 miles of trolley lines. The water-supply is obtained from the Pequannock watershed, 21 miles distant, the new system swelling the water debt to \$7,662,000. There are 153 separate sewers, aggregating 106.57 miles in length. The city is laid out regularly; has three public parks—Washington Park, containing a statue of Seth Boyden, the inventor; Military Park, the old training common, containing bronze statues of Gen. Philip Kearny and of Frederick T. Frelinghuysen, formerly U. S. Secretary of State; and Lincoln Park—and has broad avenues leading in various directions to the county lines, and extending to Elizabeth, the Oranges, Montclair, Caldwell, Rutherford Park, and other points. The city ranks next after New Haven in the number and age of its elm-trees. The river, navigable for some distance above the city, has been greatly improved by the U. S. Government, and, because of its sheltered position, has become a favorite racing-course for the National Association of Amateur Oarsmen and other rowing associations. The city is best known for the extent and variety of its manufactures. The census returns of 1890 showed that 2,413 manufacturing establishments (representing 185 industries) reported. These had a combined capital of \$53,847,452; employed 43,302 persons; paid \$24,568,966 for wages and \$38,074,115 for materials; and had products valued at \$81,399,137. The following table shows the principal industries:

CLASSIFICATION.	Establishments.	Capital.	Persons employed.
Malt liquors	1	\$5,360,473	67
Leather	20	5,248,111	2,361
Jewelry	68	8,811,111	2,361
Foundry and machine-shop products	15	3,000,000	2,200
Hardware	15	2,000,000	2,200
Ceruloid and celluloid goods	4	2,000,000	600
Hats and caps	40	1,000,000	2,121
Trunks and valises	14	1,000,000	2,200
Men's clothing, wholesale	60	2,000,000	2,200
Boots and shoes	15	1,100,000	1,765

Next in importance to its manufactories are its financial institutions. In 1894 there were 9 national banks with combined capital of \$2,950,000, a State bank with capital of \$100,000, 5 savings-banks, a private bank, 5 insurance companies with combined capital of \$1,915,312 and cash assets of \$6,535,349, and 2 widely known life companies—the Mutual Benefit and the Prudential of America. Official reports for 1891 showed 272 building and loan associations with 78,700 shareholders and \$25,600,000 in assets. The assessed valuations in 1893 were: Real estate, \$97,665,790; personal, \$25,964,764; total, \$123,630,554; and the net debt in 1894 was \$12,249,594. The foreign trade was represented in the calendar year 1893 by imports of merchandise valued at \$60,442 and by exports valued at \$5,434,929. In 1894 there were 129 churches, the Roman Catholic, Presbyterian, Methodist Episcopal, Baptist, and Protestant Episcopal, predominating in the order given. There were 58,894 children of school age, of whom 27,361 were attending the public schools and 9,471 attending private and parochial schools. The city owned 39 school buildings and hired 7. There were 476

public-school teachers, of whom all but 35 were women. The evening schools had 2,486 pupils. There were also the Newark Academy, an old-established classical institution, St. Benedict's College, and a technical school. Of libraries there were the Free Public (founded 1888), Board of Trade, Business College, Essex County Law, St. Benedict's College, Young Men's Catholic Association, New Jersey Historical Society, and the public-school libraries. The charitable and benevolent institutions included the Orphan Asylum, Foster Home, Home for the Friendless, Krueger Home for Aged Men and Women, Faith Home, Home for Incurables, St. Barnabas, St. Michael's, and the German hospitals, Hospital for Women and Children, Newark City Hospital, and the Charitable Eye and Ear Infirmary. There were 29 social clubs and associations and 8 singing societies. Pop. (1880) 136,508; (1890) 181,830; (1895) 215,806.

Revised by FREDERICK W. RICORD.

Newark: village; Wayne co., N. Y. (for location of county, see map of New York, ref. 4-E); on the N. Y. Cent. and H. R., the N. Cent., and the W. Shore railways, and the Erie Canal; 30 miles E. of Rochester. It is in an agricultural region; contains 10 churches, an academy, union school, 2 lower grade schools, water-works, electric lights, the State Custodial Asylum for Feeble-minded Women, union school library (founded 1857), a national bank with capital of \$50,000, 2 private banks, and 3 weekly newspapers; and is principally engaged in peppermint-distilling, fruit evaporating and canning, and the manufacture of tinware, vinegar, and flour. Pop. (1880) 2,450; (1890) 3,698; (1894) estimated, 4,000.

EDITOR OF "GAZETTE."

Newark: city; capital of Licking co., O. (for location of county, see map of Ohio, ref. 5-F); on the Balt. and O. and the Pitts., Cin., Chi. and St. L. railways, and the Ohio and Erie Canal; 33 miles N. E. of Columbus. It is in an agricultural, coal-mining, and natural-gas region; has a large trade in coal, grain, and live stock; and contains 7 public-school buildings, circulating library (founded 1877), 2 national banks with combined capital of 250,000, a savings-bank with capital of \$75,000, a private bank, and 3 daily and 4 weekly newspapers. The car-shops of the Balt. and Ohio Railroad are located here, and there are also manufacturing of glass, portable engines, stoves, iron-bridge work, paper, wire-cloth, carriages, flour, lumber, and soap. The assessed valuation in 1893 was \$5,950,870, and the total debt \$335,731. Pop. (1880) 9,600; (1890) 14,270.

EDITOR OF "ADVOCATE."

Newark System: in geology, a group of rocks of Mesozoic age, occurring in isolated tracts near the Atlantic coast from Nova Scotia to the Carolinas. Except in Nova Scotia they are sharply separated by unconformity from Archaean and Paleozoic rocks beneath and from Cretaceous and Cenozoic strata above. They are further contrasted by their prevailing red color, and they are distinguished from later formations by high dips. The system has received much attention from geologists, and, being of doubtful age, has been called by many names; its synonymy is larger than that of any other formation or group of the U. S. The largest tract follows the southeastern margin of the Appalachian Mountains from Southern New York across New Jersey, Pennsylvania, and Maryland into Virginia, and smaller areas carry the same trend to North Carolina. A more easterly belt is represented near Richmond, Va., and in Central and Southern North Carolina. A large tract occupies the Connecticut valley in Massachusetts and Connecticut, and other tracts border the Bay of Fundy in Nova Scotia.

The principal rock is shale, chiefly red, but also of dark-late color. Red sandstones associated with these, though thinner, are of such economic and topographic importance that the system is frequently spoken of as a sandstone. Limestones and conglomerates are of rarer occurrence. The maximum thickness, measured in Pennsylvania, is 27,000 feet. Interbedded with the sedimentary rocks, and also to some extent intruded among them, are traps, and these hard rocks have been left prominent by erosion, constituting the conspicuous hills of the Connecticut valley, the Palisade ridge along the Hudson, and the Watchung Mountains of New Jersey. Remains of plants and fishes have been found in the shales, and many sandstone layers show the tracks of large vertebrates.

The sandstones are quarried for building material and have a wide use under the name of brownstone. The traps constitute one of the best road materials in the country,

and are extensively quarried for this purpose, as also for the manufacture of paving-blocks. Coal-seams occur at various places, and were for many years mined near Richmond, Va. See JURA-TRIAS PERIOD, and consult I. C. Russell, *Bulletin No. 85, United States Geological Survey*.

G. K. GILBERT.

Newark-upon-Trent: town; in the county of Nottingham, England; on a navigable branch of the Trent; 120 miles N. by W. of London (see map of England, ref. 8-I). It has an ancient parish church, a grammar school founded in 1529, a free library, a hospital, a town-hall, a corn exchange, and a handsome coffee-palace. It has breweries, iron and brass foundries and other factories, and carries on a large trade in malt, flour, corn, wool, and cattle. Pop. (1891) 14,457.

Newaygo: village; capital of Newaygo co., Mich. (for location of county, see map of Michigan, ref. 6-H); on the Muskegon river, and the Chi. and N. W. Railway; 36 miles N. by W. of Grand Rapids. It has good water-power, and contains two flour-mills, large furniture-factory, saw and shingle mills, and sash-factory, a private bank, and a monthly and two weekly periodicals. Pop. (1880) 1,097; (1890) 1,330; (1894) 1,231.

EDITOR OF "REPUBLICAN."

New Bedford: city (set off from Dartmouth 1787, incorporated 1847); one of the capitals of Bristol co., Mass. (for location of county, see map of Massachusetts, ref. 5-I); on the Acushnet river near its mouth, and the N. Y., N. H. and Hart. Railroad; 55 miles S. of Boston. For more than 100 years it has been the chief seat of the U. S. whale-fishery. From 1755 till about 1854 this industry was at its height and employed 400 whaling-ships, but it has since declined steadily, and in 1890 employed only 57 vessels of all kinds. As this industry declined local capitalists turned their attention to manufacturing, and by 1890 had made New Bedford the third cotton-manufacturing city in the country. The census returns of that year showed that 351 manufacturing establishments (representing 57 industries) reported. These had a combined capital of \$19,602,583; employed 10,730 persons; paid \$4,626,135 for wages and \$7,961,817 for materials; and had products valued at \$15,886,288. The principal industry was the manufacture of cotton goods, which had 9 establishments and \$14,036,446 capital; employed 6,379 persons; paid \$2,312,693 for wages and \$4,020,914 for materials; and had products valued at \$8,185,286. There were also 11 foundries and machine-shops, 10 carriage and wagon factories, 4 boot and shoe factories, 4 looking-glass and picture-frame factories, and 4 lubricating-oil works. The cotton-mills had 854,500 spindles and 12,471 looms, and a woolen-mill had 4,500 spindles and 63 looms. There are 43 churches, an excellent system of endowed public schools, a free public library (founded 1852) containing over 60,000 volumes and having an endowment of \$64,100, 5 other libraries containing nearly 20,000 volumes, a Friends Academy, St. Luke's and St. Joseph's Hospitals, an orphan asylum, a water-service with over 60 miles of mains, gas and electric light plants, electric street-railway, 5 national banks with combined capital of \$4,100,000, 2 savings-banks with deposits of \$16,477,691, a safe-deposit and trust company with capital of \$200,000, a private bank, and 3 daily and 4 weekly newspapers. The city has regular steamboat communication with Providence, Martha's Vineyard, and New York, and has become an important coal-shipping point. The beautiful harbor in Buzzard's Bay is protected by a granite fortification on the extremity of Clark's Point, which is connected with the heart of the city by an avenue 4 miles long. New Bedford has the reputation of being the wealthiest city per capita in the country. The assessed valuations in 1893 were: Real, \$25,344,300; personal, \$19,130,795; total, \$44,475,095; and the net city debt on Jan. 1, 1894, was \$1,833,695. Pop. (1880) 26,845; (1890) 40,733; (1895) 55,251.

EDITOR OF "STANDARD."

Newbern: city (settled by the Swiss in 1710); capital of Craven co., N. C. (for location of county, see map of North Carolina, ref. 4-J); at the junction of the Neuse and Trent rivers, and on the Atlantic and N. C. and the Wil., Newb. and Norfolk railways; 90 miles N. E. of Wilmington, 108 miles E. S. E. of Raleigh. It has direct communication with the sea by Ocracoke inlet, and regular connection with Norfolk, Baltimore, and New York by steamship. It is the port of entry for the Pamlico customs district, has a valuable trade in cotton, lumber, naval stores, and fish, and ships early vegetables to Northern markets. The principal local industries are the manufacture of tobacco and lumber

and the distillation of turpentine. There are 15 churches, public library (founded 1886), high school, collegiate institute, a national bank with capital of \$100,000, a State bank with capital of \$75,000, a citizens' bank with capital of \$50,000, a private bank, and a daily and a weekly newspaper. The city was the capital of the province of North Carolina from the organization of the Government till 1793, and was captured by a Union force under Gen. Burnside on Mar. 14, 1862. Pop. (1880) 6,413; (1890) 7,843.

EDITOR OF "JOURNAL."

Newberry: town; capital of Newberry co., S. C. (for location of county, see map of South Carolina, ref. 5-D); on the Columbia and Greenville and the Col., Newb. and Laurens railways; 47 miles N. W. of Columbia. It is the seat of Newberry College (Lutheran, chartered 1856), has graded schools for white and colored pupils, and contains a cotton-factory, cottonseed-oil mill and ginnery, fertilizer-works, door, sash, and blind factory, a national bank with capital of \$150,000, a savings-bank with capital of \$15,000, and three weekly newspapers. It is a growing cotton-market. Pop. (1880) 2,342; (1890) 3,020; (1894) estimated, 4,000.

EDITOR OF "HERALD AND NEWS."

Newberry, JOHN STRONG, M. D., LL. D.: geologist and naturalist; b. at Windsor, Conn., Dec. 22, 1822; graduated at Western Reserve College in 1846, and at Cleveland Medical College in 1848. In 1851 he established himself as a physician in Cleveland, but, finding no time for scientific studies, in 1855 he accepted an appointment as surgeon and geologist of the expedition under Lieut. R. S. Williamson, U. S. army, for the exploration of the territory lying between San Francisco and the Columbia river. In 1857-58 he was attached, in the same capacity, to the expedition under Lieut. J. C. Ives, U. S. army, which made the first exploration of the Colorado river. In 1859 he accompanied Capt. J. N. Macomb, U. S. engineers, in the exploration of the country bordering the upper Colorado and San Juan rivers. During the civil war he was a member of the U. S. Sanitary Commission, and to him was delegated the organization and direction of all its operations in the valley of the Mississippi. In 1866 he was appointed Professor of Geology in the School of Mines, Columbia College, New York, a position he retained until his death, which occurred at New Haven, Conn., Dec. 7, 1892. In 1869 the Geological Survey of Ohio was organized, and he was placed at its head. Under his direction the work was vigorously prosecuted, and an important series of reports were published. Dr. Newberry was honored with membership in most of the learned societies of the U. S. and in many of Europe; was one of the original incorporators of the National Academy of Sciences; was president of the American Association for the Advancement of Science (1867), of the New York Academy of Sciences (1867-91), of the Torrey Botanical Club (1880-90), and of the International Congress of Geologists (1891), and received the Murchison medal of the Geological Society of London (1888). His publications have been chiefly in the department of geology and paleontology, but also include papers on botany and zoölogy. The most important are a report *On the Geology, Botany, and Zoölogy of Northern California and Oregon; The Geology of the Colorado Expedition* (1860); *Geology of the Sacramento Expedition* (1875); *Reports of the Geological Survey of Ohio; Our Latest Extinct Fauna* (1869); *Catalogue of the Plants of Ohio* (1860); *Fossil Plants collected on the Northwestern Boundary Commission* (1863); *The Rock Oils of Ohio* (1859); *Cruciferous Deposits in America* (see *Section of Rocks* 1873); *Fossils of the United States* (1874); *The Structure and Relations of Dinichthys* (1875); *Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley* (1888); *Fossil Fishes of North America* (1889). Revised by G. K. GILBERT.

New Braunfels: city (founded by Prince Braunfels in 1845); capital of Comal co., Tex. (for location of county, see map of Texas, ref. 5-II); at the intersection of the Comal and Guadalupe rivers, and on the International and Gt. N. Railroad; 30 miles N. E. of San Antonio, 50 miles S. by W. of Austin. It is in an agricultural and stock-raising region, has excellent water-power, and contains 3 churches, public school, 2 denominational schools, hospital, water-works, electric lights, 2 cotton-gins, 2 roller-mills, several carriage and machine shops, cottonseed-oil mill, a national bank with capital of \$50,000, and 2 weekly newspapers. Pop. (1880) 1,938; (1890) 1,608; (1894) estimated, 2,500.

PUBLISHERS OF "HERALD."

New Brighton: village, NASSAU CO., N. Y. (for location of township; Richmond co., N. Y. (for location of county, see map of New York, ref. 8-A); on the north shore of Staten Island, and on the Staten Island Rapid Transit Railroad; 6 miles S. W. of New York city, with which it is connected by steam-ferry. It comprises several villages, which command a fine view of the upper bay of New York and the Narrows, and the Sailors' Snug Harbor, for aged mariners, a richly endowed estate with extensive buildings, and an institution for destitute children of seamen. The village contains 10 churches, 3 libraries (Brighton Heights Seminary, Sailors' Snug Harbor, and Trinity English and Classical School) containing nearly 10,000 volumes, 2 large hotels, a national bank with capital of \$100,000, the S. R. Smith Infirmary (a small but thoroughly equipped hospital), 2 weekly newspapers, and many costly residences of New York business men. There are two dyeing and printing works, several large plaster-mills, the largest cotton-storage warehouses on New York harbor, wall-paper and silk printing-factories, and public water-works and an electric-lighting system supplying New Brighton, West New Brighton, and Tompkinsville. Pop. (1880) 12,679; 1890 16,423; 1892 State census, 17,261.

EDITOR OF "STATEN ISLANDER."

New Brighton: borough; Beaver co., Pa. (for location of county, see map of Pennsylvania, ref. 4-A); on the Beaver river, and the Pitts., Ft. W. and Chi., the Erie and Pitts., and the Pitts. and Lake Erie railways; 29 miles N. N. W. of Pittsburgh. It is in a coal and clay region, contains 8 churches, 4 public-school buildings, library (Y. M. C. A., founded 1852), 2 national banks with combined capital of \$150,000, a private bank, and a daily and a weekly newspaper, and has 4 potteries, 2 flour-mills, 2 planing-mills, novelty iron-works, bath-tub works, flint-glass factory, sewer-pipe works, horse-nail works, gas-engine works, and soap-factory. Pop. (1880) 3,653; (1890) 5,616; (1894) estimated, 6,500.

EDITOR OF "NEWS."

New Britain: a name given by Dampier to the group of islands now called BISMARCK ARCHIPELAGO (*q. v.*), and especially to the largest island of this group, now under German protection and called NEU-POMMEREN or NEW POMERANIA (*q. v.*).

New Britain: city (first settlement made about 1650; became a town in 1850; chartered as a city in 1870); Hartford co., Conn. (for location of county, see map of Connecticut, ref. 9-G); on the N. Y. and N. E. and the N. Y., N. H. and Hart. railways; 9 miles S. W. of Hartford. It contains 12 churches, a Roman Catholic cathedral, State armory, State Normal School, high school, public-school property valued at over \$260,000, 2 libraries (Normal School, founded 1851, and Institute, founded 1853) containing over 16,000 volumes, public park of 74 acres, gas, water, and electric-light plants, 2 national banks with combined capital of \$410,000, a savings-bank with deposits of over \$2,500,000, and 2 daily and 3 weekly newspapers. The industries include the manufacture of iron and brass goods, artistic bronze house-trimmings, builders' hardware, cutlery, hosiery, joiners' tools, and brick. The assessed valuation of the city in 1892 was \$8,154,059, and the net debt on Jan. 1, 1894, was \$459,816. Pop. (1880) township, 13,979; city, 11,800; (1890) township and city coextensive, 19,007.

EDITOR OF "HERALD."

New Brunswick: a province of the Dominion of Canada, formerly a part of Nova Scotia; bounded N. by the Province of Quebec and the Bay of Chaleurs, E. by the Gulf of St. Lawrence, Northumberland Strait, and the Bay of Fundy, and W. by the State of Maine. It lies between 44° 30' and 48° 5' N. lat., and 63° 47' and 69° 5' W. lon. Area, 28,100 sq. miles (for location, see map of provinces of Quebec and New Brunswick).

Physical Features.—The physical features of New Brunswick are a reflection of its geological history. All the geological deposits of greater age than the Carboniferous form a *massif* or "complex," diversified in places by ridges of intrusive granite. Of the granites there are two principal bands which form the axes of two ranges of hills, the one in the northern portion of the province, the other near its southern coast. In most places the rocks of the *massif* are altered by heat and pressure, and contain in places ores of various metals. Between the two ranges of granite hills a large triangular area of the *massif* is covered by sandstones and shales of Carboniferous age, which are unaltered, and therefore comparatively soft and friable, and contain beds of coal and other mineral deposits of economical importance.

The Carboniferous deposits form an undulating plain whose eastern margin borders the Gulf of St. Lawrence, and on the other two sides is limited by the slopes of the two hill ranges mentioned above.

North of the northern granite range the *massif* forms a plateau of calcareous slates which is crossed by the upper branches of the St. John river, and extends down the valley of the Restigouche to Chaleurs Bay. The plateau and the plain nearly meet on the middle courses of the St. John river, where the Palfrey Mountains on the one side and the Nepisiguit Hills on the other sink down to the level of the plain. Similarly in its lower courses the St. John river breaks through the southern range of hills, its valley dividing the Nerepis Hills from the Quaco Hills. In the Quaco Hills the rocks consist largely of ancient, consolidated volcanic deposits, and the granitic core appears at the surface in only a few places.

The highest hills are in the main granitic belts. Bald Mountain, in the Nerepis Hills, is 1,400 feet high, and the Sagamore Mountain, in the Nepisiguit Hills, is 2,240 feet high. The largest lake in the province is Grand Lake, in the hollow of the carboniferous plain, and is 30 miles long; but the lower reaches of the St. John river, among the Southern Hills, present several lake-like expansions of considerable size, as Washademoak Lake and Belleisle and Kennebecasis Bays.

The chief rivers are the St. John, over 440 miles long, the Miramichi, the Restigouche, and the Nepisiguit, the first discharging its waters into the Bay of Fundy, the other three emptying into the Gulf of St. Lawrence. The St. Croix and the Petitcodiac are also rivers of some importance entering the Bay of Fundy. The St. John river is unique, for one of so considerable size, in being contracted at its mouth to 400 feet, and having there a tidal rapid with alternate flow out and in twice a day.

The principal indentations of the eastern coast of New Brunswick are Chaleur, Miramichi, and Verte Bays. The province is divided from Prince Edward Island on this coast by the Strait of Northumberland, and from Nova Scotia by the Bay of Fundy. This bay has two indentations of its northern shore, Passamaquoddy at one end, and Chignecto Bay at the other. The bays of both shores of the province afford excellent fishing-grounds.

Mineral Products.—Coal has been found at many points in New Brunswick, but occurs only in thin seams; the most important is that at Grand Lake, which has been worked for many years. A valuable deposit of albertite (melanaspalt) was formerly worked at Hillsboro, in Albert County, but the vein is exhausted. It occurs in an extensive deposit of pyroschist, of which at present no use is made. Quarries of excellent freestone are worked in Albert, Westmoreland, Northumberland, and Gloucester Counties, and the product sent to the upper provinces of Canada, and more largely to the U. S. Good roofing-slates are found in the northern part of Charlotte County and elsewhere. Lime is calcined at St. John, where there are large deposits of limestone; the product is used for domestic purposes and for exportation to the U. S. Manganese mines have been opened, and are still operated in Albert and King's Counties. Extensive deposits of nickeliferous pyrites have been found in Charlotte County, but are not yet worked with profit. Plumbago, copper, antimony, bismuth, and lead occur; gold has been found in small quantities, and iron ore of several kinds is known to occur in considerable quantities, but is not mined.

Climate.—The climate of New Brunswick has some unusual contrasts. The western part of the central plain has a high summer temperature, and the mercury sometimes rises to 95° and 100° in the shade; here the native flora or wild plants include many species found in Eastern Ontario and Western Massachusetts; the genial temperature is due to the southern range of hills, which exclude the moist, chilly winds of the Gulf of Maine. On the other hand, many of the plants of Labrador are found growing on the islands and points of the southern shore that jut out into the Bay of Fundy, which are thus bathed in the cool air and fogs of the Atlantic Ocean. As a result the vegetation of this shore has a more arctic (or alpine) aspect than that of the highest hills of the interior. Statistics show that the hottest months of the year are those in which fogs are most prevalent along the coast. In 1889 the maximum temperature at St. John in February was 42°, minimum—11°; maximum in June 86°7', minimum 45°; mean temperature for year, 43°; average annual rainfall, 26·4 inches. At Fredericton, 80 miles inland, the maximum temperature in Feb-

ruary was 42·9°, minimum—33°; maximum in May 91·7°, minimum 32°; mean temperature for year, 43·9°; average annual rainfall, 25·8 inches.

Soil.—Considerable tracts in New Brunswick are of a hilly and broken character, and so not suitable for agricultural purposes; but the moisture of the climate encourages the growth of trees, and such tracts afford excellent timberland. Other parts consist of good farming land. The best soils are found in connection with calcareous slates of Silurian age, as in Carleton, Victoria, Restigouche, and Queen's counties; or with the red sandstones of Carboniferous age, as in the valleys of King's, Albert, and Westmoreland; or on the flood plains of the great rivers, as the St. John, Miramichi, and Restigouche. Very fertile diked lands occur around the shores near the head of the Bay of Fundy. The total acres occupied in 1891 were 4,471,250; under crop, 1,018,704; in pasture, 479,607; gardens and orchards, 11,479; woodland and forest, 2,961,460. A great impetus has been given to dairying and cheese-making, both federal and provincial governments aiding the farmers in these directions. The chief agricultural products are wheat, buckwheat, oats, rye, hay, potatoes, and other root-crops.

Geographical Divisions and Population.—The province is divided into sixteen counties, as follows:

COUNTIES.	* Ref.	Pop. 1861.	Pop. 1891.	COUNTY-TOWNS.
Albert	5-I	12,329	10,971	Hopewell Cape.
Carleton	5-G	23,365	22,529	Woodstock.
Charlotte	6-G	26,087	23,752	St. Andrews.
Gloucester	3-H	21,614	24,897	Bathurst.
Kent	4-I	22,618	23,845	Richibucto.
King's	5-H	25,617	23,087	Hampton.
Madawaska	3-F	.....	.....	Edmundston.
Northumberland	4-H	25,109	25,713	Newcastle.
Queen's	5-H	14,017	12,152	Gagetown.
Restigouche	3-G	7,058	8,308	Dalhousie.
St. John (city)	6-H	26,127	34,184	St. John.
St. John (county)	6-H	26,839	25,390	Oromocto.
Sunbury	5-H	6,651	5,762	Grand Falls.
Victoria	4-G	15,686	18,217	Dorchester.
Westmoreland	5-I	37,719	41,477	Fredericton.
York	5-G	30,397	30,979	
Totals		321,233	321,263	

* Reference for location of counties, see map of provinces of Quebec and New Brunswick.

Madawaska and Victoria are separate counties for provincial and municipal purposes, but constitute one county under the name of Victoria for Dominion purposes, and hence the census returns appear only under the latter. The population in 1824 was 74,176; in 1840, 156,662; in 1861, 252,047. In 1881 the origins of the people were: English, 93,387; French, 56,635; Irish, 101,284; Scotch, 49,829; German, 6,310; Dutch, 4,373. Of the Irish, fully one-half were north of Ireland Protestants. In 1891 more than three-fourths of the population were of native parentage. The chief centers of population are the city of St. John, pop. 39,179, including Portland, annexed in 1889 (in census return in above table Portland is included in St. John county); Fredericton, pop. 6,500; Moncton, 8,762; Chatham, 5,644; Newcastle, 4,000; Sussex, 3,200; Woodstock, 3,288; St. Stephen, 2,680; Bathurst, 4,800; Richibucto, 3,986; St. Andrews, 1,778; Marysville, 1,400.

Means of Communication.—There are in operation fully 1,350 miles of railway, intersecting the province in all directions, and bringing all parts into easy communication, connecting it with Nova Scotia and Quebec on the E. and N. and with the U. S. on the W. Chief among the lines of railway are the Intercolonial Railway, running from St. John to Moncton and connecting the latter city with Halifax on the E. and Quebec on the N., having within the province a length of 345 miles; the Canadian Pacific Railway, extending from St. John to Vaneboro, Fredericton, Woodstock, and Edmundston, and connecting with the railway systems of Canada and the U. S., with over 400 miles of rails in the province; the Canada Eastern Railway, running from Fredericton to Chatham through the interior of the province, 127 miles; the Shore Line Railway, 82 miles long, extending from St. John to St. Stephen; the Central Railway, 75 miles long; the Kent Northern, 34 miles; the Salisbury and Harvey and Albert Southern, 69 miles; the Caraque Railway, 68 miles; the Elgin and Havelock, and other shorter lines.

During the summer steamers ply on the river St. John, where is to be seen some of the finest natural scenery in the world. A line of steamers also runs between St. John and

Boston, from St. John to Digby and Annapolis in Nova Scotia, and from Shediac to Prince Edward Island. Regular passenger and freight steamships also run from St. John to Great Britain and to the West Indies. A very large amount of money has already been expended in the construction of a ship-railway across the isthmus of Chignecto between New Brunswick and Nova Scotia, a distance of 17 miles. It will connect the waters of the Gulf of St. Lawrence and the Bay of Fundy, and when completed will be able to transport the largest ships.

Industries and Business Interests. Ship-building, and lumbering, outside of agriculture, were the staple industries for years. Lumbering still occupies a prominent position, but ship-building, owing to the use of iron and steel in the construction of ships, has very considerably declined. The number of vessels on the registry for 1893 was 1,010; the total tonnage, 156,086. The industrial establishments in 1881 were 3,117, with 19,922 persons employed; in 1891 there were 5,419; capital invested, \$16,608,755; number of employees, 26,609; wages paid, \$5,936,021; cost of new material, \$12,443,943; value of products, \$24,687,636. The value of machinery and tools employed in 1891 was \$5,478,924; number of steam-engines in use, not including those used in mines, agriculture, and shipping, 507, with 23,626 horsepower. There are five cotton-mills, a sugar-refinery, two rolling-mills, nail-mills, a pulp-mill, several foundries, together with many factories and other industrial establishments. The total value of exports for the year 1893 (exclusive of trade with the other provinces of Canada) was \$7,253,611, of which \$3,069,027 went to Great Britain and \$3,735,974 to the U. S. For the same year the total value of imports was \$5,763,884, of which \$1,976,225 came from Great Britain and \$2,933,763 from the U. S. The chief articles of export were minerals, value \$80,417; fish, \$756,437; forest products, \$5,539,676; animals and their products, \$210,539; agricultural products, \$174,968; manufactures, \$464,940; miscellaneous, \$26,634.

In 1893 there were engaged in the fisheries 226 vessels; tonnage, 3,382; value, \$83,795; men employed on vessels, 827. Also 5,978 boats; value, \$202,382; men employed on boats, 10,478; fathoms of gill-nets and seines in use, 528,817; value of nets, seines, lobster plant, etc., \$1,489,035. The total value of the fisheries for 1893 was \$3,746,121.

Political Organization. The Government consists of a Lieutenant-Governor, appointed by the Governor-General of Canada, whose term of office is five years, or until his successor thereafter is appointed; an executive council, consisting of an attorney-general, solicitor-general, provincial secretary, chief commissioner of board of works, surveyor-general, and two or three others. All members of the executive council must be members of the legislative assembly. The legislative assembly is composed of forty-one members and elected for four years, unless sooner dissolved by the Lieutenant-Governor. The legislative council, or upper house, was abolished in 1892. The franchise is so broad that it nearly approaches manhood suffrage. Any male person twenty-one years of age, being a British subject, under no disability, owning real estate of the value of \$100, or real and personal together of the value of \$400, or having an annual income of \$400, or being a priest or other Christian minister in charge of a congregation, or a licensed teacher or professor in any school or college, or a resident for twelve months prior to the election in any electoral district, may have his name put on the voters' list.

The judiciary of the province is composed of a chief justice and five associate justices of the Supreme Court; six county court judges, having jurisdiction in actions of contract to the extent of \$400 and of torts to \$200, with criminal jurisdiction the same as the Supreme Court, except in capital offenses. Parish court commissioners and justices of the peace have limited jurisdiction in their localities for the collection of debts and in preliminary examinations.

The total annual revenue is about \$650,000, of which \$483,569 is received as a subsidy from the Dominion. The balance is derived from crown lands, fishing rights, fees of offices, and certain sources of direct taxation. This revenue is expended by the executive Government in paying interest on the public debt, toward the support of public schools, roads, bridges, agriculture, charitable institutions, and other public services. The net debt, incurred chiefly in aid of railway construction within the province, on Dec. 31, 1893, was \$2,183,563.

Churches and Schools. In 1891 there were 974 church edifices, as follows: Roman Catholic, 153; Church of Eng-

land, 156; Baptist, 322; Methodist, 208; Presbyterian, 108; others, 19. The Roman Catholics numbered 115,961; Baptists, 79,649; members of the Church of England, 43,095; Presbyterians, 40,639; Methodists, 35,504; all others, 6,415.

The public-schools system is free and non-sectarian, under the control of the provincial Government, and liberally supported from the public funds. The property of the different localities is also assessed to support the schools. During the first term of 1893 there were 1,614 schools, taught by 1,693 teachers; attendance of pupils, 60,154, or 1 in 5.34 of the population. There may be a grammar school in each county and a superior school in every parish. In 1893 there were 14 grammar and 50 superior schools. The attendance given above includes these schools. The payment of provincial funds for the year ended June 30, 1893, was \$148,832.27. The total expenditure during the year for grammar, superior, and common schools (not including district assessments for school buildings, apparatus, fuel, etc.) was \$421,383.60, or an average cost per pupil of \$6.06.

The province also maintains at Fredericton a normal school for training teachers; attendance, 1892-93, 264. Three institutions possess university powers and confer degrees in the different arts and faculties—the University of New Brunswick (coeducational) at Fredericton, supported by the province; attendance in 1893, 81; the University of Mt. Allison (coeducational), Sackville, controlled by the Methodists; attendance, 1892-93, 152; Mt. Allison was the first university in Canada to confer full university privileges and degrees upon women; St. Joseph's College, Memramcook, under the control of the Roman Catholics, and especially patronized by the French Acadians. The Methodists also maintain a Ladies' College and Boys' Academy at Sackville; the Baptists, a seminary for both sexes at St. Martins; and the Roman Catholics, convent schools at St. John and other parts of the province.

Charitable Institutions, etc. Several of these are at St. John, including the provincial asylum for lunatics, hitherto maintained by the province, but now in part by the counties, and under control of the Government; the General Public Hospital, open to all and supported by the province, by the municipality of St. John, by fees from paying patients, and from income from invested funds; the Protestant and Roman Catholic orphan asylums; the Wiggins Male Orphan Asylum for the benighted sons of deceased mariners; the Reformatory for Boys, where the inmates are educated and taught a trade; and the Home for Aged Women. The Victoria Hospital at Fredericton is supported in the same manner as the General Public Hospital. The Lazaretto, at Tracadie, Gloucester County, for the care of those smitten with leprosy, is supported by the Dominion Government, and the Roman Catholic Sisters of the Hôtel Dieu take charge of the patients. There were about twenty-five patients in 1893. The penitentiary for the maritime provinces, at Dorchester, is supported by the Dominion for the incarceration of convicts.

History, etc.—The province was formerly a part of Nova Scotia, and known as Sunbury County. A colony of about 800 persons in 1761 from New England settled at Manguerville on the St. John river. The largest immigration took place when the United Empire Loyalists, mostly from Massachusetts, arrived in the province May 18 and Oct. 4, 1783. They founded the city of St. John. Their descendants are scattered throughout the province, and are found in all walks of life. By royal letters patent, dated Aug. 16, 1784, King George the Third made it a separate province, and appointed Thomas Carleton, a brother of Sir Guy Carleton, captain-general and governor-in-chief. Fredericton is the capital, where are fine legislative buildings. The first legislature met at St. John Jan. 3, 1786. The province became a part of the Dominion of Canada July 1, 1867, and is represented in the Senate of Canada by ten members, appointed for life, and in the House of Commons by sixteen members, elected for five years.

Authorities.—For detailed information as to the history and growth of the province, consult Munro's *History of New Brunswick*; Johnson's *Agricultural Report*; Cooney's *History of New Brunswick*; Henry's *History of New Brunswick*; Gray's *History of Confederation*; Fenn's *Prince of Wales*; Lawrence's *Fool Prints*; the annual parliamentary reports; and the decennial census returns. ALFRED A. S.

New Brunswick: city (settled under the name of Prigmore's Swamp in 1681, received its present name in 1714, granted a royal charter in 1730, incorporated as a town in

1736, and as a city on Sept. 1, 1784; capital of Middlesex co., N. J. (for location of county, see map of New Jersey, ref. 4-D); at the head of navigation on the Raritan river, at the eastern terminus of the Delaware and Raritan Canal, and on the Penn. Railroad; 26 miles N. E. of Trenton, 33 miles S. W. of New York city. It is the seat of Rutgers College (Reformed, chartered 1766), of a theological seminary of the Reformed Church (chartered 1784), and of the State Mechanical and Agricultural College (endowed with the national land grant and now a part of Rutgers College). There are 2 private classical schools for boys, a grammar school connected with the college, a young ladies' seminary, a model farm and observatory belonging to the college, 2 national banks with combined capital of \$350,000, a savings-bank with assets of \$1,654,472, a public library, and 3 daily and 6 weekly newspapers. The industries include the manufacture of wall-paper, rubber goods, printing-presses, boots and shoes, lamps and bronze-work, porous plasters, machinery, hosiery, and buttons. The assessed valuation in 1893 was \$10,200,000, and the net debt on Apr. 1, 1894, was \$1,256,276. Pop. (1880) 17,166; (1890) 18,603; (1895) 19,910. EDITOR OF "HOME NEWS."

Newburg: city (settled by the whites in 1709; known as the Palatine Parish of Quassaic till 1752, when it received its present name; chartered as a city in 1865); one of the capitals of Orange co., N. Y. (for location of county, see map of New York, ref. 7-I); on the Hudson river, and the Erie and the West Shore railways (the N. Y. C. and H. R., the N. Y. and N. E., and the Newburg, Dutchess and Conn. railways on the opposite side of the river); 60 miles N. of New York city. It is in an agricultural region, has an elevated site, and possesses much historical interest. The old Hasbrouck House was occupied by George Washington during a part of the Revolutionary war, and his proclamation disbanding the American army was promulgated there. The building contains many relics of Revolutionary days, and with the grounds is carefully preserved. Near the building is a stone monument, erected by the Federal and State governments to commemorate the successful close of the war. The city has regular steamboat connection with New York and the principal cities on the Hudson, and contains 25 churches, graded public and parochial schools, Free Library (founded 1852), Y. M. C. A. Library (founded 1881), Second Judicial District Law Library (founded 1880), Home for the Friendless, St. Luke's Home, Home for Children, an academy, hospital, electric street-railways, 3 national banks with combined capital of \$1,000,000, a savings-bank with surplus of nearly \$1,100,000, and 4 daily, a monthly, 2 semi-weekly, and 2 weekly newspapers. There is a large trade in coal and dairy products. The principal industries are ship-building and the manufacture of agricultural implements, oilcloth, cotton and woolen goods, carpets, paper, shoes, and carriages. Pop. (1880) 18,049; (1890) 23,087; (1892) State census, 24,536. EDITOR OF "JOURNAL."

Newburyport: city (settled about 1635, was separated from the town of Newbury in 1764, chartered as a city in 1851); seaport; one of the capitals of Essex co., Mass. (for location, see map of Massachusetts, ref. 1-I); on the Merrimack river, and the Boston and Maine Railroad; 3 miles W. of the Atlantic Ocean, 36 miles N. E. of Boston. It contains the Putnam Free School, Anna Jaques Hospital, Y. M. C. A. Memorial Building, Old Ladies' Home, high, training, and graded public schools, Marine Museum, public library (founded 1854) containing nearly 30,000 volumes, electric street-railways, 4 national banks with combined capital of 670,000, 2 savings-banks with aggregate deposits of about \$6,500,000, and 2 daily and 2 weekly newspapers. The industries include ship-building and the manufacture of cotton goods, boots and shoes, fiberloid, carriages, silverware, hats, pumps, steam-engines, and combs. The assessed valuation in 1893 was \$9,705,528, and the net debt on Jan. 1, 1894, was 388,790. Pop. (1880) 13,538; (1890) 13,947; (1895) 14,552. EDITOR OF "HERALD."

New Caledonia: an island in the South Pacific, about 800 miles E. of Queensland, and half way between New Guinea and New Zealand. It was discovered by Cook in 1774 and annexed by France in 1853. It is 250 miles long, with a greatest breadth of 30 miles, and extends N. W. and S. E. Along its axis run a series of mountain masses, of which the culminating points reach 5,600 feet. At some distance from the west coast is a coral reef which protects the shores from the force of the waves, and gives a sort of interior navigation with smooth water. The soil is fertile,

the climate excellent, and the plants of the tropics and temperate zone can be raised. There are many nickel mines, some of which yield ore containing 7 to 10 per cent. of pure nickel. Gold was formerly worked, iron ore is abundant, and valuable deposits of copper, mercury, tin, and platinum are known to exist. The chief port and capital is Noumea, an excellent port on the west coast near the south end; pop. 4,600. With its dependencies, including the Loyalty islands, 60 miles E., New Caledonia forms a convict colony with an area of 7,654 sq. miles, and a population (1890) of 62,752. The native population numbered 70,000 at the time of annexation, but they are rapidly decreasing, and now number less than 25,000. They are called Kanakas. The remaining population is chiefly white and half of its number consists of convicts, either under punishment or liberated. The Isle of Pines, at the southern extremity, was assigned to Communists deported after the overthrow of the Paris Commune. MARK W. HARRINGTON.

New Canaan: town (incorporated in 1801); Fairfield co., Conn. (for location of county, see map of Connecticut, ref. 12-D); on the N. Y., N. H. and Hart. Railroad; 5 miles N. W. of Norwalk, 8 miles N. by E. of Stamford. It is delightfully situated among hills ranging from 300 to 500 feet above tide-water, has fine drives into the country and to the beaches on Long Island Sound, and contains many summer homes of New York physicians and business men, boot, shoe, and clothing factories, a national bank with capital of \$100,000, a savings-bank, a library and reading-room, and a weekly newspaper. Pop. (1880) 2,673; (1890) 2,701; (1894) estimated, 3,000. EDITOR OF "MESSENGER."

New Castile: See CASTILE, NEW.

Newcastle: a port of entry; capital of Northumberland County, New Brunswick; on the left bank of the Miramichi, 30 miles from its mouth (see map of Quebec, ref. 4-H). The river is to this point navigable for large ships. Its ship-building, lumber-trade, and fisheries are important. Salmon, herring, bass, mackerel, oysters, and lobsters are largely exported. Pop. 4,000.

Newcastle: a town of New South Wales; 80 miles N. N. E. of Sydney; at the mouth of the Hunter river, terminus of a railway running to the counties N. W. and N. (see map of Australia, ref. 6-J). This is the center of the principal coal industry of Australia. The coal is sent largely to China. There is also a large commerce in cereals. The town is unattractive, and is given a sable color by the large amount of coal handled. The tonnage of the port is very large. Pop. (1891) 12,913. M. W. H.

New Castle: city (formerly the county-seat); New Castle co., Del. (for location of county, see map of Delaware, ref. 2-H); on the Delaware river at the head of Delaware Bay, and on the Phil., Wil. and Balto. Railroad; 5 miles S. of Wilmington, the county-seat, 36 miles S. W. of Philadelphia. It has an excellent harbor with navigation open almost the entire year, is in an agricultural region, and has manufactories of cotton and woolen goods, carpets, rolling-mill products, piping, and agricultural implements. There are a library (founded 1812), a branch of the Farmers' Bank of Delaware (State), and a daily newspaper. Pop. (1880) 3,700; (1890) 4,010.

Newcastle: town; capital of Henry co., Ind. (for location, see map of Indiana, ref. 6-F); on the Blue river, and the Ft. Wayne, Cin. and Louisv., the Cleve., Cin., Chi. and St. L., and the Pitts., Cin., Chi. and St. L. railways; 15 miles S. of Muncie, 42 miles E. by N. of Indianapolis. It is in an agricultural region, has important manufactures, and contains a national bank with capital of \$100,000, a State bank with capital of \$130,000, and three weekly newspapers. Pop. (1880) 2,299; (1890) 2,697.

New Castle: city; capital of Lawrence co., Pa. (for location of county, see map of Pennsylvania, ref. 4-A); at the confluence of the Shenango and the Neshannock rivers, which here form the Beaver river, and on the Erie, the Penn., the Pitts. and Lake Erie, the Pitts. and W., and the W. N. Y. and Penn. railways; 52 miles N. by W. of Pittsburgh. It is in a bituminous coal, limestone, fire-clay, iron-ore, and sandstone region, and has numerous blast furnaces and mills, 3 machine-shops, wire-rod mill, steel-billet mill, large wire-nail mill, tin-plate mill, asphalt-block works, stove-works, 2 glass-factories, grist and planing mills, several foundries, and a paper-mill. There are three national banks with combined capital of \$500,000, 20 churches, 16 schools, 2 colleges, a library (Y. M. C. A., founded 1886),

and a monthly, 2 daily, and 4 weekly periodicals. Pop. (1880) 8,418; (1890) 11,600, with suburbs, 15,000.

EDITOR OF "COURANT":

Newcastle, Duke of: See CAVENTISH, WILLIAM.

Newcastle, Thomas Pelham Holles, Duke of: Prime Minister of Great Britain; b. in 1693, the son of the first Lord Pelham, to whom property and estates he succeeded in 1712. He had previously inherited the large estates of his uncle, and was one of the wealthiest land-owners in England. All the weight of his influence was thrown on the Whig side, and his services to the House of Hanover won him the gratitude of the king. He was made Lord of Chesham in 1714, Duke of Newcastle in 1715, and in 1724 became Secretary of State in Walpole's ministry. His abilities are represented as of a mean order, but he held this office for thirty years, and when he laid it down he became Prime Minister, succeeding his brother, Henry Pelham, in that office in 1754. He resigned in 1756, but was recalled in the following year to form the ministry rendered brilliant by the genius of Pitt. Newcastle, who was merely the nominal head, resigned in 1762, and after this, with the exception of a few months in 1765, when he was Lord Privy Seal, he held no official position. D. in Aug., 1768. F. M. COBBY.

Newcastle-upon-Tyne: a city with the constitution of a county; in the county of Northumberland, England; on the left bank of the Tyne, 8 miles from its mouth; 275 miles from London and 117 from Edinburgh (see map of England, ref. 3-II). The city is built for the most part on steep hills and gently rising ground. It presents a striking appearance, owing to the contrasts of antiquated and modern buildings. Among the former are several towers belonging to the old walls, the keep and chapel of the old castle, and the Black Gate. The Church of St. Nicholas (1359-1435), now the cathedral, was built upon the site of an earlier structure, destroyed by fire in 1216, of which a few remains still exist. St. John's church, built in the reign of Henry I., contains much original Norman work, with other later additions. St. Andrew's church, dating from the twelfth century, is built in the Transition style. The central part of Newcastle owes its stately buildings chiefly to Richard Grainger (1798-1861). Grey Street (named from Earl Grey) and Grainger Street are the finest thoroughfares in the city. The town-hall, built in 1863, stands near the cathedral, and close by are the corn-market and the corporation offices. Other notable buildings are the Guild-hall, the Exchange, the Moot Hall for the meetings of assizes, and the Central News room and art-gallery. The Museum of the Natural History Society (1884) contains a collection of British birds and a unique series of Bewick's wood-cuts. The Public Library contains nearly 70,000 volumes, and the library of the Literary and Philosophical Society has 40,000 volumes. Two important colleges—the College of Science (1871) and the College of Medicine (1851)—are affiliated to the University of Durham. There is also the Rutherford College (1878). There are several public parks, including the Town Moor, an extensive common 987 acres in extent, the Leazes ornamental park, Brandling Park, besides Armstrong Park and Desmond Dene, for which Newcastle is indebted to Lord Armstrong. The Tyne is crossed by three bridges which connect Newcastle with GATESHEAD (q. v.), which is virtually a part of Newcastle. The High Level Bridge, built by Robert Stephenson (1846-49), is a quarter of a mile long. It contains a carriage-way 90 feet above high water, by which the precipitous streets on both sides of the river are avoided, and a railway at a height of 118 feet above high water. The Swing Bridge, finished in 1876, which is 241 feet in length, is worked by hydraulic machinery. It was erected on the site of a Roman and two later bridges.

The port of Newcastle is the fourth in importance in the United Kingdom; London, Liverpool, and Cardiff coming first. The total tonnage (excluding that coastwise) entered and cleared in 1892 was 4,265,580. The Tyne is navigable for large vessels as far as Elswick, a township on the western outskirts of Newcastle, where the engineering and ordnance works of Sir W. G. Armstrong, Mitchell & Co. are situated. These occupy an area of 125 acres and present a frontage of about a mile to the river. The principal article of trade is coal. The output of the coal-fields of Durham and Northumberland, of which Newcastle is the center, was in 1892 33,362,861 tons; and in the same year 4,117,450 tons of coal and coke, exclusive of that used by steamers engaged in the foreign trade, were exported, mainly to Ham-

burg, the Baltic, and the Mediterranean. In 1891 the total number of persons employed in the coal business, including those washing and coking coal, was 123,404, of whom three-fourths were working underground. In ship-building the Tyne comes next to the Clyde. In 1892 92 steamships (not including war vessels), with a gross tonnage of 176,743, were launched at the Tyne ports, which include North and South Shields. The principal manufactures are locomotive and marine engines, heavy ordnance, lead and its compounds, chemical manures, earthenware, fire-brick, alkali, cement, and glass of various kinds. One of the alkali-works turns out the largest quantity of caustic soda of any works in the world. In 1891 over 40,000 tons of various goods and 180,000 tons of coal and coke were exported to the U. S.

In the times of the Romans there was a stationary camp at the bridge called *Pons Ælii*. Later, on account of its fortified position giving protection to the monks of the neighboring monasteries, the town was called Monckchester. Robert of Courthose, son of William the Conqueror, built a castle here which was called Newcastle and became the nucleus of the modern town. In the reign of Edward I. it was surrounded by walls, and afterward on four different occasions defeated the attempts of the Scots to effect its capture. In 1640, having declared in favor of the king, it was taken by the Scotch Covenanters under Leslie, who held it for a year. In 1644 it was taken again after a siege of ten months.

Newcastle is the seat of a bishopric founded in 1882. Since 1835 the city has been governed by a corporation composed of a mayor, 16 aldermen, and 48 town councilors. It returns 2 members to Parliament. Pop. (1893) 196,997; with Gateshead, 287,935. R. A. ROBERTS.

Newchwang: See NICHUWANG.

Newcomb, SIMON: astronomer and mathematician; b. at Wallace, Nova Scotia, Mar. 12, 1835; removed to the U. S. in boyhood; taught school in Maryland for several years; in 1857 was employed as a computer on *The Nautical Almanac*. In the following year he first gave special attention to theoretical astronomy; was appointed in 1861 Professor of Mathematics in the navy, and stationed at the Naval Observatory, for which he supervised the construction and erection of the great telescope; was secretary of the commission created by Congress in 1871 for the observation of the transit of Venus, Dec. 9, 1874, and took part in organizing the expeditions sent to remote quarters of the earth upon that occasion. Since 1877 he has been superintendent of *The Nautical Almanac*, published by the Navy Department. The Royal Astronomical Society of England in 1874 awarded to him its gold medal for his tables of Uranus and Neptune. From 1884 until 1893 he acted as Professor of Mathematics and Astronomy in Johns Hopkins University. In 1878 he received the Huyghens medal of the Dutch Society of Sciences, and in 1890 the Copley medal of the Royal Society of London. Besides numerous astronomical investigations, he has written a number of mathematical textbooks and several works on economic subjects, and was one of the associate editors of the revised edition of *Johnson's Universal Cyclopedia*.

Newcomen, THOMAS: the inventor of the modern form of the steam-engine; b. in Devonshire, England, about the middle of the seventeenth century; practiced the trade of a blacksmith; became interested in the applications of steam, and in 1705 patented a fire-engine.

The engines of the Marquis of Worcester and of Savery and of all their predecessors in this field were more or less reproductions of the old steam-fountain of Hero (B. C. 120); but Newcomen made an entirely new departure and constructed in 1705 the first real steam-engine, consisting of a train of mechanism in which the steam-motor was at the one end, and the pump to which its work was applied was at the other, the intermediate parts being the simplest possible and giving direct connection between the driving and the driven parts. In the earlier engines the same vessel had usually served as boiler, engine, and pump, and performed each of its several offices with inefficiency. Newcomen, following Savery, built a steam-boiler of which the only function was to make and supply the steam required; he made a working cylinder of which the sole purpose was the transformation of the heat of the steam into useful work by a thermodynamic operation. He then transferred the power thus generated to a pump, by means of which it was applied to the useful work of raising water from the depths of a mine. The net result was the accomplishment

of this work with an economy greatly exceeding that attained by the best machines of his predecessors. The new engine also demanded but an insignificant steam-pressure, and thus was much safer where working at considerable depths than was the Savery engine, which, under similar conditions, employed a comparatively high pressure. Its greater safety and immense economy soon drove the latter entirely out of the market.

The principal defect of the Newcomen engine was the combining of the functions of working cylinder and condenser in the same vessel, and it was the invention of an improvement upon the Newcomen engine, the separate condenser, that gave James Watt his opportunity and his fame. The modern condensing pumping engine, however, is a Newcomen engine rather than a Watt engine, and Newcomen, rather than Watt, is "the inventor of the steam-engine."

R. H. THURSTON.

New Cumberland: town: capital of Hancock co., W. Va. (for location, see map of West Virginia, ref. 2-H); on the Ohio river, and the Pitts., Cin., Chi. and St. Louis Railway; 9 miles N. of Steubenville, O., 30 miles W. of Pittsburgh, Pa. It has manufactories of fire-brick, terra-cotta work, sewer-pipe, and foundry and machine shop products, a private bank, and two weekly newspapers. Pop. (1880) 1,218; (1890) 2,305.

New Decatur: town: Morgan co., Ala. (for location, see map of Alabama, ref. 1-C); on the Tennessee river, and the Louisville and Nashville Railroad; 87 miles N. of Birmingham. It is in an agricultural, lumbering, and wool-growing region, and has a weekly newspaper. Pop. (1880) not in census; (1890) 3,565.

Newell, SAMUEL: missionary; b. at Durham, Me., July 24, 1784; graduated at Harvard in 1807; studied theology at Andover Seminary; was one of the signers of the memorandum (dated June 27, 1810) from students of that institution which led to the formation of the American Board of Commissioners for Foreign Missions; was ordained as a foreign missionary at Salem with four associates Feb. 5, 1812; sailed for Calcutta with Judson; in the same month was ordered to retire by the British authorities of Bengal; went to the Isle of France, thence to Ceylon, and settled at Bombay in 1817, where he wrote, with his companion missionary, Gordon Hall, a work entitled *The Conversion of the World, or the Claims of Six Hundred Millions* (Andover, 1818), which had an extensive circulation. He also prepared a memoir of his first wife, Harriet (Atwood) Newell, who died at the Isle of France, Nov. 30, 1812, at the age of nineteen years—a work which had a wide popularity, and was translated into several languages. D. at Bombay, Mar. 30, 1821.

New England: collectively, the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. The territory comprised in these States was originally called North Virginia, when granted in 1606 by James I., to the Plymouth Company for colonization, but received its present name from Capt. John Smith, who explored it in 1614, and made a map of the coast. The first white settlers were chiefly natives of England. In 1890 the population of New England was 4,700,745. See the articles on the individual States.

Newfoundland: an island and British colony in North America, lying across the entrance of the Gulf of St. Lawrence. It is situated between the parallels of 46° 36' 50" and 51° 39' N. lat., and between the meridians of 52° 37' and 59° 24' 50" W. lon. Its greatest length from Cape Ray (the southwestern extremity of the island) to Cape Norman (the farthest northern land) is 317 miles, and the greatest breadth from Cape Spear (the most easterly point) to Cape Anguille (the most westerly) is 316 miles. The total area is 42,200 sq. miles. Its coast is 1,000 miles round, measuring from headland to headland; but so deeply indented are its shores with bays that if these were circumnavigated the operation would more than double that extent of coast-line. It is that part of the continent of North America which lies nearest to Europe, the distance between the most eastern part of Newfoundland and Valentia, in Ireland, being 1,640 miles. By the two great bays of Trinity and Placentia it is almost severed into two portions, the southern being the peninsula of Avalon, on which St. John's (*q. v.*), the capital, is situated, and which is united to the northern by a narrow isthmus, in one place only 3 miles in width. The Avalon peninsula is further divided by the bays of St. Mary and

Conception; and, having thus an extensive frontage on the Atlantic and numerous harbors, and being in proximity to the best fishing-grounds, it is the most thickly populated portion of the island. On all sides the great arms of the Atlantic penetrate far into the land, some of the bays being 90 miles in length. Within a degree of the eastern coast is the Great Bank of Newfoundland—the greatest submarine island of the globe, 600 miles in length and 200 in breadth—the chief breeding-ground of the cod. The whole Atlantic coast of Labrador, 1,100 miles in extent, with its valuable fisheries, is also attached to Newfoundland and under the jurisdiction of the colony.

Climate.—The fogs generated on the Banks by the confluence of the Arctic current and the Gulf Stream are felt only on the southern and southeastern shores of the island when southerly winds prevail. The climate is variable, but taken as a whole is more temperate and more favorable to health than that of the neighboring continent. In winter the thermometer seldom sinks more than a few degrees below zero, and that for but a few hours. The summer range of the thermometer is from 70° to 80°, and it is seldom that 84° is reached. The average mean temperature is 41°–42°; the average rainfall is 58–30 inches. Tornadoes are unknown and thunder-storms very rare.

Geology.—All the great ancient rock systems between the Lower Laurentian and the coal measures are more or less represented at one part or another of the island. The Laurentian system has an immense spread, constituting the principal mountain ranges and coming to the surface through the more recent deposits or brought up by great dislocations. Three-fourths of the peninsula of Avalon are Huronian (equivalent to the Cambrian of English geologists). Lower Silurian rocks have a large development, and in these the metallic ores occur. The Carboniferous series occupy a large area in the neighborhood of St. George's Bay and Grand Lake.

Mountains.—The coasts present, for the most part, a forbidding aspect. Dark cliffs, miles on miles of rocky walls from 200 to 300 feet in height, bold promontories and headlands, greet the voyager at almost all parts of the island; but when the bays are entered scenes of rare beauty are frequently met with. On passing from the rugged coastline to the interior a hilly country presents itself, with eminences of no great elevation. The center of the island, which is but imperfectly known, consists of an elevated, undulating plateau traversed here and there by ranges of low hills, the surface being diversified by valleys, woods, and lakes. Much of the interior is a savanna country, the soil being a fine black peat-mould. All the great hill ranges take a northeasterly and southwesterly direction. The principal of these is the Long Range, which extends along the western side of the island for nearly its entire length, having peaks more than 2,000 feet in height. Parallel to this is the Anguille Range. The Middle Range stretches across the country from Fortune Bay to Notre Dame Bay. Avalon district is traversed by several ranges of hills. In addition, there are isolated and sharply peaked summits having the local name of "tolls."

Bays, Rivers, and Lakes.—The largest bay is Placentia, 55 miles wide at the entrance and 90 miles in length, containing numerous islands. Fortune Bay is 25 miles wide and 70 in length. At its mouth are the islands of St. Pierre and Miquelon, ceded by treaty to France as a shelter for its fishermen. Bay St. George, on the western coast, is 40 miles wide, with a good harbor at its head. Notre Dame Bay, on the northeastern coast, is 50 miles wide at its mouth, and with its numerous arms penetrates more than 80 miles inland. Bonavista Bay presents some of the finest scenery in the island. Trinity Bay runs 70 miles inland. The harbor on which the town of Trinity stands is one of the finest in the world. On the south side of the bay is Heart's Content, where the Atlantic cables are landed. Conception Bay is the most populous and commercially important.

The three largest rivers are the Exploits, the Humber, and the Gander. The Exploits rises in the southwestern angle of the island, flows in a northeasterly direction, and falls into the Bay of Exploits after a course of more than 200 miles. It drains an area of nearly 4,000 sq. miles. The Humber drains an area of 2,000 sq. miles and falls into the Bay of Islands. The Gander falls into Gander Bay, and drains an area of 2,500 sq. miles.

Lakes and ponds cover nearly a third of the entire surface, and in many districts they form a very beautiful feature in the landscape. The largest is Grand Lake, 56 miles

in length, with an area of 192 sq. miles, enclosing an island 22 miles long and 5 miles in breadth. Red Indian Lake is 33 miles long, with an area of 64 sq. miles. Gander Lake is 33 miles in length.

Fauna and Flora.—The reindeer, black bear, wolf, beaver, and several species of fox are among the indigenous wild animals. The species of birds, most of which are migratory, number about 300. The forests are chiefly found in the valleys of the large rivers and along the banks of their tributaries. The principal varieties of the forest timbers are white pine, white and black spruce, tamarack, fir, yellow and white birch. In the Gander, Exploits, Humber, and Gambo valleys there are considerable areas of pine-forests. There are many kinds of berry-bearing plants.

Minerals.—The first copper mine—that of *Tat Cave*—was opened in 1864, on the shore of Notre Dame Bay. Another still more productive mine was opened in 1875 at Betts Cove, in the same district, and in 1878 a third, at Little Bay, which has eclipsed both its predecessors. A rich deposit of lead ore has been discovered at Port-a-Port, and lead and silver deposits on the shores of Placentia Bay. Gold has been found in small quantities. Gypsum in immense quantities is found on the western coast, also marble of various shades of color. There is a coal-field in St. George's Bay 25 miles wide by 10 miles in length. It is still unworked. The total value of copper ores exported up to 1891 was \$9,193,790, and of all ores \$9,594,717.

Agriculture.—While there are districts irreclaimably barren, especially near the southern and southeastern shores, there are many fertile belts which if cultivated would sustain a very large population in comfort. In the region around St. George's Bay there are 730 sq. miles suitable for settlement. Bay of Islands, including the Deer Lake and Grand Lake country, contains 600 sq. miles, the valley of the Gander 1,700 sq. miles, and the Exploits valley 1,620 sq. miles available for settlement. In addition, there are less extensive tracts of fertile land in other localities fit for agricultural purposes, and also extensive areas admirably suited for cattle and sheep raising, forming an area of 2,000,000 acres. Thus there are known to be close on 5,000,000 acres fit for agricultural and grazing purposes. Of this, 64,494 acres are improved land, and 20,524 acres are in pasture.

Fisheries.—The fisheries constitute the great staple industry. The most important is the cod-fishery, which is prosecuted around the shores of the island, along the coast of Labrador, and to a limited extent on the Banks. The average annual value of this fishery is about \$6,000,000. It is prosecuted from June 1 till the middle of October. The codfish when salted and dried are exported to Brazil, the West Indies, Spain, Portugal, Italy, and Britain. (See *FISHERY RELATIONS OF THE UNITED STATES*.) The seal-fishery is next in value. It is carried on in powerful steamers and stout sailing vessels from Mar. 1 till the middle of April. The young seals are taken on the ice-fields brought down by the Arctic current, where they are suckled by the mothers till three or four weeks old, when they are in the best condition. In 1892 the catch was 348,624; average value, \$2 per seal. The chief seats of the herring-fishery are Labrador, Bonne Bay, Bay of Islands, St. George's Bay, and Fortune Bay. The salmon and lobster fisheries are also important.

Population.—The seats of population are all situated on the various bays and harbors, there being no settlement at any distance from the seacoast. The earliest record of the resident population is that of 1654, which gives the number as 1,750; in 1763 it was 7,000; in 1804, 20,380; in 1857, 124,288; in 1884, 197,589; and in 1891, 202,145. Of these, 53,502 were engaged in catching and curing fish, the number of able-bodied fishermen being about 30,000. The population is distributed about the shores of the island as follows: South coast, from Cape Ray to Cape Race, 34,752; east and northeast coast, from Cape Race to Cape St. John, 150,389; from Cape Ray to Cape St. John, 12,773; Labrador (Atlantic coast), 4,211. According to the census of 1891, there were 72,342 Roman Catholics, 68,075 members of the Church of England, 52,672 Methodists, 2,092 members of the Salvation Army, and 1,447 Presbyterians.

Education.—The system of education is the separate or denominational one. The legislature each year appropriates from the general revenue a certain amount for educational purposes; in 1892 the sum was \$144,450. This is divided among the religious denominations in proportion to their respective numbers. There are three superintendents of schools—one representing the Church of England,

one the Roman Catholic Church, and one the Methodist Church. The number of elementary schools is 543. There are three colleges—Church of England, Roman Catholic, and Methodist—one Presbyterian Academy, and two grammar schools. In the elementary schools there are 31,422 pupils; in the colleges, academy, and grammar schools, 969. The total number of pupils is 31,614 of the entire population.

Government. This consists of a governor who is appointed by the crown of England; a legislative council or upper chamber, composed of 15 members nominated by the governor in council and holding office for life; and a house of assembly of 36 members, elected every four years by the votes of the people, each male twenty-one years of age having a vote. The executive council consists of 7 members chosen by the party commanding a majority in the legislature. They are responsible to the house of assembly. The island is divided into 17 electoral districts.

Revenue and Expenditure. The revenue is mainly derived from duties on imports. The revenue for the year 1892 amounted to \$1,883,790. The public debt at the close of the year 1892 was \$6,393,367. The value of exports for the year 1892 was \$5,651,116; the value of imports was \$5,062,877. The great import trade is with Great Britain, the U. S., and Canada. The registered shipping of Newfoundland at the close of 1891 was: vessels, 2,207; tonnage, 98,619.

Railways.—The first railway was opened for traffic in 1884, from St. John's to Harbour Grace, 834 miles, with a branch to Placentia, 27 miles in length, built in 1888. In 1893 the Legislature decided on an extension of this line, and entered into a contract for building a line to Port-a-Basque, on the southwestern extremity of the island, via the Exploits valley, Bay of Islands, and St. George's Bay, 500 miles in length, to be completed in 1896. In Sept., 1894, 260 miles of this new line were completed and in operation.

History.—Newfoundland was discovered in 1497 by John Cabot, although five hundred years before, according to Icelandic sagas, it was visited by Lief, son of Eric the Red. The value of its fisheries was soon afterward made known, and fishermen from Normandy, Brittany, and the Basque Provinces were attracted to its encompassing seas. It was not till 1583 that formal possession of the island was taken by Sir Humphrey Gilbert, in the name of Queen Elizabeth. Various attempts at planting a colony were made, the most important being by Sir George Calvert, afterward Lord Baltimore, who in 1623 obtained a patent entitling him to the lordship of the whole southern peninsula. He built a house at Ferryland and introduced settlers, but was so harassed by the French that he abandoned the place and settled in Maryland, where he founded the city of Baltimore. Meantime English fishermen in increasing numbers carried on the valuable cod-fisheries on the Banks and along the shores. The fish taken were dried on shore, and when winter approached the fishermen embarked for England, taking with them the products of their labors. Laws were enacted prohibiting fishermen from remaining behind at the close of the fishing season, forbidding settlement, or even the erection of a house without a special license. For more than a century this policy was persevered in, greatly retarding the prosperity of the country and inflicting cruelties and hardships on the settlers who resisted the tyranny of the merchant adventurers; but the laws prohibiting settlement and land-grants were at length repealed, a governor was appointed in 1728, and a new order of things began, but it was not until the beginning of the nineteenth century that the last restrictions were removed.

The French long disputed with Great Britain for the possession of Newfoundland, but the contest was ended in 1713 by the Treaty of Utrecht, which ceded the island to England, but secured to the French the right of fishing and curing fish on the northern coast from Pointe Riche to Cape Bonavista; the limits were afterward (1783) changed to Cape Ray and Cape St. John. This concession to the French has led to continual disputes and bitter animosities, and, though they have no territorial rights, that portion of the coast on which they have fishing privileges is but scantily settled and is far behind the rest of the island.

In 1832 representative institutions were introduced into Newfoundland by the British Parliament. Household suffrage was established and the people acquired the power of making their own laws, and expending their own revenue. In 1854 the present form of government was established. In 1846 the prosperity of the colony met a severe check by a terrible fire which destroyed three-fourths of St. John's, the

capital, leaving 12,000 people homeless. Another in 1892 destroyed more than half the city; the estimated loss was \$20,000,000. In 1858 the first transatlantic submarine cable was laid, connecting Newfoundland with the Old World. Previously the island had been connected by cable with the American continent. In 1873 direct steam communication with Great Britain and the U. S. was established, which gave an important impulse to trade. In 1887 the ballot system was introduced in the election of members of the legislative assembly; and in 1889 manhood suffrage was adopted.

M. HARVEY.

Newfoundland Dog: See Dogs.

Newgate: a prison in London; at the west end of Newgate Street, opposite the Old Bailey. It is mentioned as a prison in 1207. It was at the new gate of the city. In the fifteenth century Sir Richard Whittington in his will left funds to rebuild it. In 1666 it was again rebuilt after the great fire. The present edifice was erected in 1780, but was greatly damaged by a fire in the No-popery riots of that year. In 1808 Mrs. Fry began her labors for the improvement of the horrible condition which had for centuries characterized the place. Debtors ceased to be sent there in 1815, and the institution gradually became, in many respects, a model one of its kind. Since 1877 Newgate has been practically disused, except during sessions or when the gallows are required.

New Glasgow: town; Pictou co., Nova Scotia; on the Nova Scotia Railway; 9 miles S. E. of Pictou; on East river (see map of Quebec, ref. 2-C). It has ship-yards, foundries, tanneries, and other manufactories, several important coal mines, and a weekly newspaper. Pop. (1891) 3,776.

New Granada: See COLOMBIA.

New Guinea: the largest known island except Greenland. It lies just N. of Australia, between the equator and 11° S. lat., and has an estimated area of 312,000 sq. miles. If the bottom of the shallow channel between New Guinea and Australia were elevated about 300 feet the island would form a part of the southern continent. On the other sides of New Guinea, however, the insular mass is clearly defined by the rapid slope of the sea-bottom to oceanic depths. Most of the north and southeast coasts are high and mountainous, long ranges paralleling the shores usually at some distance inland, the culminating point of the island, as far as is known, being Mt. Owen Stanley (about 13,200 feet) in the southeast prolongation of the island. The Charles Louis Mountains, which abut on the southwest coast, form the only important range whose main axis is directed from the sea toward the central regions. The island is surrounded by many large and small islands, naturally a part of the mainland and doubtless joined with it in an earlier geological age. There are also many verdant coral islands. The coasts are indented by deep bays, few of them, however, affording first-rate harbors. Unlike most of the adjacent portions of Australia, the island has an abundant rainfall and a luxurious flora. Its drainage system is fairly well developed, though much of the land in the non-mountainous regions adjacent to the coasts is of a swampy character. The largest rivers are the Fly and the Kaiserin Augusta, both of which take their rise in the central regions, the Fly following a tortuous course southward to the Gulf of Papua, and the Kaiserin Augusta taking a course almost due E. through the German possessions. Most of the rivers are densely wooded along their banks, but where the bush is penetrated for a few miles an open, undulating country is reached, covered with grass and scattered forest trees.

The flora of the western half of the island differs considerably from that of the remainder, being nearly akin to the flora of the myriad islands farther W., while the vegetation of the rest of the island unmistakably shows the influence of Australia. There are also many species peculiar to New Guinea. For instance, fifty palms are named as found only on this island. In its fauna, however, New Guinea far more strongly resembles Australia than the lands nearer Asia. Only two mammals and about fifty birds are known to be peculiar to New Guinea, but some of these are very remarkable, as, for instance, the several varieties of the birds of paradise. The inhabitants are chiefly Papuan, though among some of the tribes a Malayan admixture is apparent, and other natives, particularly in the S. E., resemble and are evidently related to the Polynesians. The island is sparsely settled, which may be due to the almost incessant warfare between the tribes that was common every-

where before the whites obtained a firm foothold on the coasts. The population probably does not exceed 700,000.

The entire island has been divided by treaty among three European powers. About one-half the total area, comprising all of the island W. of the 141st meridian, is Dutch territory, and for governmental purposes has been attached to the residency of Ternate, Molucca islands. The Dutch have done very little to develop this large domain, which is estimated to contain 200,000 inhabitants.

British New Guinea (founded 1888, area 90,000 sq. miles, estimated pop. 300,000) comprises the southern part of East New Guinea and the neighboring islands. British missionaries have labored there with encouraging results, and have laid the foundations of law and order. The cost of the administration is guaranteed by New South Wales, Victoria, and Queensland, and the administrator is appointed by the British Government. The chief settlement is Port Moresby on the Gulf of Papua; the white population is about 250, and there are eight stations along the coast to which mails are regularly carried by an Australian line of steamers. The country has a fair amount of resources, including gold, and some of the land is suited for sugar and other tropical cultures.

Kaiser Wilhelm's Land (German protectorate since 1884, area 72,000 sq. miles, estimated pop. 110,000) includes all of the northern part of Southeast New Guinea. The German New Guinea Company, to whom the administration is intrusted, have planted a number of stations, opened plantations with success, and are exporting tobacco, the best product so far, to Europe. Horses and cattle flourish in some districts, and the protectorate has much fine timber and other natural riches. See d'Albertis, *New Guinea* (London, 1880); Chalmers and Gill, *Work and Adventure in New Guinea* (London, 1885); Romilly, *From my Verandah in New Guinea* (London, 1889).

C. C. ADAMS.

New Hampshire [named from *Hampshire* in England]: one of the U. S. of North America (North Atlantic group); the ninth of the thirteen original States that ratified the Federal Constitution.

Location and Area.—It lies between 42° 40' and 45° 18' 23" N. lat., and 70° 37' and 72° 37' W. lon.; in general shape it is that of a right-angled triangle, with its apex toward the N. and the right angle at the S. E.; extreme length, 178 miles; extreme width, 100 miles; bounded on the N. by the Province of Quebec, on the E. by Maine and the Atlantic Ocean, on the S. S. E. and S. by Massachusetts, and on the W. by Vermont; area, 9,336 sq. miles (5,975,040 acres). The relative position of New Hampshire in the Union in 1890 was third in manufacture of cotton, sixth in manufacture of wool, twenty-fourth in assessed valuation, and thirty-third each in population and agricultural products.

Physical Features.—The Appalachian range of mountains enters the State from Maine and, crossing diagonally, forms first an elevated mountain tract, known as the White Mountain region, exceeding 2,000 feet in height, and then passes southwesterly in a range of lesser hills along the western side of the State. Coos County, N. of the White Mountains, has an average elevation of over 1,500 feet above the sea, while the S. E. part of the State, between the highlands and the coast, has an average elevation of less than 500 feet. The White Mountain district, comprising about 1,400 sq. miles, and divided by the valleys of the Saco and Lower Ammonoosuc rivers and the famous "Notch" into two ranges, known locally as the White and Franconia ranges, is one of great beauty, and is fitly called the Switzerland of America. Its highest peak is Mt. Washington (6,286 feet), the highest land near the coast N. of Mt. Mitchell in North Carolina; but there are twenty-eight other peaks



Seal of New Hampshire.

NEW HAMPSHIRE

Scale of Miles

County Towns & Railroads

This type indicates a population of 2,000 or over.



above 4,000 feet. The picturesque scenery of the State, together with its beautiful climate, has made it attractive as a summer resort. New Hampshire has only 18 miles of seacoast, and Portsmouth is the only port of call. Of the Isles of Shoals, a group of eight rocky islands lying 8 or 10 miles off the coast, three belong to New Hampshire. There are five principal drainage basins. The entire western portion, about 4,000 sq. miles, is drained by the Connecticut river, which, rising in the extreme N. of New Hampshire, forms for the entire distance the natural boundary between it and Vermont. Its chief tributaries in New Hampshire are the Upper and Lower Ammonoosuc in the mountain region, the Mascota and Sugar rivers (the latter the outlet of Sunapee Lake) in the central part, and the Ashuelot river in the S. The N. E. portion, 775 sq. miles, is drained by the Androscoggin river, which rises in Lake Umbagog. The eastern mountain district, 850 sq. miles, discharges its waters through the Saco river. The S. E. basin, 825 sq. miles, is that of the Piscataqua, which with its tributary, the Salmon Falls river, forms for a considerable distance the boundary with Maine. The Cochecho river also flows into the Piscataqua, which forms the harbor of Portsmouth, and is the only navigable river in the State. The central and southern parts, about 3,825 sq. miles, are drained by the Merrimack, which is formed by the junction of the Pemigewasset, that, rising in the mountains, receives the waters of Squam and New Found Lakes, and the Winnipiseogee, which is the outlet of the lake of the same name. Its principal tributaries are the Contoocook, Sowhegan, Suncook, and Nashua rivers. The Merrimack is thickly set with manufacturing cities, and is said to turn more spindles than any other stream in the world. The State is noted for the number and beauty of its lakes and ponds, the water area being about 600 sq. miles. The largest is Lake Umbagog (i. e. The smile of the Great Spirit), in Belknap and Carroll Counties. It is 19 miles long and 8.25 miles wide. Its outline is very irregular, and it contains 264 islands. The other principal sheets of water are Umbagog, 18 sq. miles (partly in Maine); Squam, 15.6; Sunapee, 11.2; New Found, 8; Ossipee, 7.4; and Great Bay, 6.8.

Geology and Mineralogy.—New Hampshire was one of the earlier portions of the American continent to appear above the primal ocean. Nearly all its formations belong to the Eozoic age, and few parts of the country exhibit in

those ordinarily found in New England and several Canadian species. In the northern forests are deer, fox, bear, raccoon, mink, marten, and smaller game. The streams, once full of trout, have been greatly depleted, and the State Fish Commission is attempting to restock the waters with trout and

Soil and Productions.—The soil is not fertile. It is light and sandy in the southern part, but portions of the Connecticut valley and of Coos County are well adapted to farming. The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	PERCENT.
Total number of farms...	10,840	10,840	94
Total acreage of farms...	3,459,018	3,459,018	70
Total value of farms...	12,840	12,840	128

* Figures in 1890.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1893:

CROP.	Acreage.	Yield.	Value.
Corn...	25,074	794,846 bush	\$4,000,000
Wheat...	2,327	64,000 "	2,000,000
Oats...	28,787	84,000 "	423,341
Barley...	1,003	4,000 "	21,804
Hay...	5,081	1,840,000 "	89,984
Produce...	21,840	2,000,000 "	1,687,345
Hay...	634,487	672,556 tons	10,000,000
Totals...	718,599		\$10,000,000

On Jan. 1, 1894, the farm animals comprised 56,741 horses, value \$3,267,145; 112,585 milch cows, value \$2,455,479; 92,898 oxen and other cattle, value \$2,107,888; 115,471 sheep, value \$274,821; and 51,658 swine, value \$538,151; total head, 429,353; total value, \$8,643,484.

Climate.—The climate is cold but healthful, the winters being severe and the summers mild and agreeable. The mean annual temperature for the part N. of the White Mountains and on the W. as far S. as Hanover is 41°, that of the southern part is 45°; the mean winter and summer temperatures for the two parts respectively are 17° and 65°, and 23° and 66.5°. The monthly average temperatures at the following places show the local variations:

PLACE.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average.	Record.
Concord	29.37°	24.35°	31.30°	44.47°	57.37°	65.47°	71.4°	68.22°	60.77°	50.1°	36.7°	30.42°	46.42°	2 years.
Hanover	16.5	18.6	26.4	41.0	55.8	65.2	69.3	66.2	57.7	45.6	33.2	21.0	43.0	20 "
Stratford	16.6	17.8	25.53	39.29	52.6	62.97	67.13	62.38	55.73	43.13	32.47	18.6	41.13	15 "
Mt. Washington	5.6	7.0	10.53	20.33	31.47	44.43	47.6	47.06	40.6	30.2	16.76	9.2	26.1	15 "

moraines and the scarification of the rocks better proofs of the ice age. The general movement of the glaciers during

The average precipitation in inches, including melted snow, is shown by the following table:

PLACE.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average.	Record.
Lunenburg, Vt.	3.4	2.88	3.4	2.7	3.09	3.91	3.65	3.39	3.39	3.39	2.2	2.68	40.09	2 years.
Concord	2.40	2.4	2.6	2.6	3.39	3.23	3.86	3.94	3.34	3.34	2.42	2.68	40.09	20 "
Dover	2.4	2.6	2.48	2.33	3.39	3.39	3.61	3.65	3.39	3.39	3.39	2.68	42.05	20 "
Hanover *	2.4	1.86	2.29	2.36	2.81	3.39	3.06	2.87	2.86	2.80	2.36	2.08	41.13	21 "
Worcester	3.4	2.8	3.83	3.37	3.39	3.39	4.16	3.36	3.36	4.02	3.36	4.02	43.12	25 "

* The mean for 18 years before at Hanover was 36.25.

that period was to the S. E. The terraces of the next period are very marked along the Connecticut and Merrimack rivers. Ores of gold, silver, copper, zinc, lead, tin, arsenic, iron, bismuth, manganese, and molybdenum are found in the State, but in quantities so small or so difficult of extraction that at present none is mined. Other minerals are quartz and feldspar for glass, plumbago, precious stones, ochers, whetstones, and soapstone. Beryl is very abundant, and the largest known crystals have been found at Grafton and Acworth, one having weighed 2,900 lb. Mica occurs in fine sheets at Grafton and Alstead. Four-fifths of the entire product of the U. S. comes from New Hampshire. There are also found fine brick-clays, slate, limestone and colored porphyries, and granite.

Flora and Fauna.—About 50 per cent. of the State is covered with forests, but the large forest areas are restricted to the White Mountain district and to Coos County. The principal trees are the chestnut, hornbeam, locust, elm, butternut, white ash, hickory, white oak, poplar in the S., and the beech, sugar-maple, white and yellow birches, red oak, pine, spruce, larch, and fir in the N. The birds include

Divisions.—For administrative purposes the State is divided into ten counties, as follows:

COUNTIES AND COUNTY TOWNS, WITH POPULATION.

COUNTIES	Area.	Pop.	COUNTY TOWNS	Pop.
Barnstable	8.4	1,448	1	6,143
Belknap	6.4	18,224	1	1,630
Carroll	10.0	29,794	20,579	7,446
Coos	3.1	18,580	23,211	1,796
Crawford	6.6	38,788	37,217	3,373
Hillsborough	11.1	70,043	93,247	2,545
Merrimack	8.1	40,000	40,000	1,852
Moulton	10.0	40,000	40,000	4,000
Strafford	8.4	38,788	38,442	17,001
Sullivan	8.0	18,161	17,394	4,284
Totals				12,790

* Refer to the table of the population of the State.

Principal Cities and Towns, with Population for 1890.—Manchester, 44,126; Nashua, 19,311; Concord, 17,004; Dover, 12,790; Portsmouth, 9,827; Keene, 7,446; Rochester, 7,396; Somersworth, 6,207; Laconia, 6,143; Claremont, 5,565; Exeter, 4,284; and Franklin, 4,085.

Population and Races.—The population in 1860 was 326,073; in 1870, 318,300; in 1880, 346,991; and in 1890, 376,530 (natives, 304,190; foreign, 72,340; males, 186,566; females, 189,964; whites, 375,840; colored, 690).

Industries and Business Interests.—The principal industry is manufacturing. It is estimated that there are 2,000 water-powers in the State, many of them of great value. There is considerable manufacture of paper and of boots and shoes, but that of cotton and woolen goods forms the chief industry. The lumber and sawmill industry is also large. The census returns of 1890 showed that 3,229 manufacturing establishments reported, having a combined capital of \$79,375,160, employing 63,361 persons, paying \$24,248,054 for wages and \$47,754,152 for materials, and having products valued at \$85,770,549. The cotton industry had 27 plants and \$26,801,933 capital, employed 19,533 persons, paid \$6,429,084 in wages, consumed 107,319,124 lb. of raw material, and had products valued at \$21,958,002; the woolen industry had 89 plants and \$14,721,786 capital, employed 9,400 persons, paid \$3,341,695 for wages, consumed 22,152,190 lb. of raw material, and had products valued at \$14,445,172; and the lumber and sawmill industry had 831 plants and \$11,883,447 capital, employed 8,932 persons, paid \$2,519,609 for wages and \$4,883,591 for materials, and had products valued at \$10,907,438. In 1891 New Hampshire was tied with Rhode Island for fifth rank in the production of granite, the output in each State having a value of \$750,000.

Finance.—Official reports for the year ending May 31, 1893, showed balance on hand, \$345,219; receipts, \$1,718,461; disbursements, \$1,956,307; balance, \$107,373. The assessed valuation of taxable property was \$274,816,342, and the tax rate was \$15 per \$1,000. On Jan. 1, 1894, the debt was \$2,007,200, and the treasury held trust funds amounting to \$593,311. The total State, county, and municipal debt was \$7,759,699.

Banking and Insurance.—The first bank in the State was established at Portsmouth in 1792, and the first savings-bank in 1823. In 1894 there were 53 national banks, with combined capital of \$6,380,000, surplus and undivided profits of \$2,281,854, and individual deposits of \$7,693,414; one State bank; 70 savings-banks, with combined surplus and undivided profits of \$6,097,817, and individual deposits of \$74,377,279; and 12 loan and trust companies, with combined capital of \$1,455,000, surplus and profits of \$312,162, and deposits of \$3,724,279. Under the law, loan and trust companies may carry on savings-bank business. The insurance business was represented in 1893 by 38 local and 45 foreign fire-insurance companies, which wrote risks amounting to \$84,222,246, received premiums of \$1,026,593, and paid losses of \$595,665; 21 life and 11 fidelity and casualty companies, which wrote risks of \$16,594,075, received premiums of \$762,189, and paid losses of \$432,524; and 21 fraternal beneficiary associations, which had 621,000 members, received \$17,294,443 for assessments, and paid \$7,474,901 for all liabilities.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 557 post-offices, of which 45 were presidential (2 first-class, 8 second-class, and 35 third-class) and 512 fourth-class. There were 14 daily, 82 weekly, 1 bi-weekly, 19 monthly publications, and 1 quarterly; total, 117.

Libraries.—In 1892 there were reported 31 public libraries of 1,000 volumes and over, which contained 150,668 bound volumes and 13,197 pamphlets. They were classified as follows: General, 6; school, 8; college, 5; college society, 1; law, 1; public institution, 2; State, 1; Y. M. C. A., 1; social, 3; historical, 1; and not reported, 2.

Means of Communication.—The first railway in the State was chartered in 1835. The mileage has increased as follows: (1850) 467; (1860) 661; (1870) 736; (1880) 1,015; (1890) 1,142; (1894) about 1,163, including a narrow-gauge railway of 13 miles, and excluding lumber roads used only in winter. The railway up Mt. Washington is noticeable as a triumph of engineering. It makes an ascent of 3,625 feet in 2½ miles, with a maximum grade of 1,980 feet to the mile, and an extreme curve of 497 feet radius. With a few slight exceptions all the railways of the State are embraced in five systems, the Boston and Maine, the Concord and Montreal, the Fitchburg, the Maine Central, and the Grand Trunk.

Churches.—The U. S. census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations	Churches and halls.	Members.	Value of church property.
Roman Catholic.....	68	67	39,920	\$205,600
Congregational.....	188	228	19,712	1,405,050
Methodist Episcopal.....	134	132	12,354	614,350
Baptist.....	85	100	8,768	585,050
Free will Baptist.....	94	93	8,004	379,000
Unitarian.....	26	28	3,252	357,200
Protestant Episcopal.....	44	55	2,911	541,400
Advent Christian.....	43	43	1,978	36,500
Christian.....	23	24	1,522	62,950
Universalist.....	33	34	1,204	203,025

There are also communities of Shakers at Enfield and Canterbury, numbering 100 and 150 respectively.

Schools.—In 1892 there were 37 academies in the State, having 180 teachers, 2,630 pupils, and buildings valued at \$955,000, and 51 high schools, with 125 teachers and 3,180 pupils. In 1885 the district system was abolished and the town system established. This has resulted in a considerable increase in the length of the school year, which in 1892 was 24½ weeks. In that year there were 2,226 different public schools, of which 648 were graded. The number of pupils was 61,271. The total number of pupils in schools, public and private, was 69,452. The total revenue for the support of public schools was \$835,712.59. Of this sum, \$558,782.72 was raised by the towns, \$158,878.36 by special districts, and \$73,464.40 came from the "literary fund," which is the proceeds of a special tax on the capital of banks and on deposits in the savings-banks by non-residents. Each town is required by law to raise for school purposes \$350 for every \$1 of its apportionment of the State tax. The only normal school was established at Plymouth in 1870; in 1892 it had 5 teachers and 234 pupils. It is supported by the State. Its course of study covers two years. There are two colleges in the State—DARTMOUTH COLLEGE (*q. v.*) and the New Hampshire College of Agriculture and the Mechanic Arts. The latter was established in connection with Dartmouth College in 1866, and was removed to Durham by act of Legislature in 1893, when it had a faculty of twelve members and fifty-four students.

Charitable, Reformatory, and Penal Institutions.—The New Hampshire Asylum for the Insane was established at Concord in 1838. It is supported by the income of considerable invested funds and by what is paid by individuals and towns for the support of patients. A training-school for nurses is established in connection with it. There is also an asylum for the insane in each county. The State board of health is also a commission of lunacy, and "all persons committed to custody as insane persons shall be wards of the State, and subject to State supervision." The New Hampshire Orphans' Home at Franklin, established in 1871, is supported by voluntary contributions. The Industrial School, established at Manchester in 1851, is a "house of reformation for juvenile offenders" of both sexes. Boys are instructed in farm and garden work, or are taught some trade; girls are instructed in housework, and are taught to make both men's and women's clothing. The State prison was established at Concord in 1812.

Government.—Manhood suffrage prevails, restricted only in the case of paupers, of persons voluntarily excused from taxation, and of unnaturalized aliens. The Governor, 5 counselors, and the Legislature, consisting (1894) of 24 Senators and 359 Representatives, are elected biennially in November and enter upon office on the first Wednesday of the next ensuing January. A majority is necessary for an election. From 1734 to 1792 the chief magistrate was called President; after that date the title was Governor. The first biennial election was in 1878. In 1889 the beginning of official terms was changed from June to January. The judiciary system of 1874 provided for a superior court, composed of a chief justice and two associate justices, and a circuit court similarly constituted; but in 1876 these were combined into a Supreme Court with a chief justice and six associate justices, having legal and equitable jurisdiction.

History.—The first European who visited New Hampshire was Martin Pring, who entered the Piscataqua in June, 1603; and the first map of the coast was made by Capt. John Smith in 1614. The territory was included in the grant made in 1620 to the Plymouth Company, and was further included in that made by the company in 1622 to Sir Ferdinando Gorges and Capt. John Mason of all the

land between the Merrimack and Kennebec rivers and 1,000 to 60 miles inland. The name given to the district at that time was "Maine," but it was changed to "New Hampshire" when the settlement was made in 1623 at Little Harbor (now Dover). Stratham, Bartlett's son, was killed in 1609. Exeter in 1608, and Hampton in 1609. In N. 1629 Mason and Gorges divided their grant, Mason taking that part W. of the Piscataqua river, to which the name of province of New Hampshire, from the name of Hampshire, was given. His efforts at Mason and his associates to secure their proprietary rights led to litigation that was not finally quieted till 1787. His opponents based their claims upon a deed said to have been obtained by one Wheelwright from four Indian chiefs in May, 1629. In 1641 the province voluntarily united with Massachusetts. In 1677 a royal charter fixed the northern boundary of Massachusetts at 3 miles N. of the Merrimack, and in 1679 a proclamation was established a government in New Hampshire. The king appointed the governor and council, and the people elected the assembly. This plan was interrupted by the appointment in 1685 of Joseph Dudley as governor of New England, but in 1692 the separate provincial government of New Hampshire was established, which continued till the Revolution. Owing to its frontier position, New Hampshire suffered terribly from the Indians in the French and Indian wars. It furnished 500 men for the siege of Louisburg in 1745, 500 for the attack upon Crown Point in 1755, and 2,600 for the succeeding operations of the war. The boundaries of the province were fixed by royal determination, much the same as now, the S. and E. in 1740, and the W. in 1764. The province grew rapidly in population after the quieting of the Indians, so that it had 80,000 inhabitants at the outbreak of the Revolution. In that struggle it took an active part, and one of the first assaults on royal authority was the capture of the fort at New Castle in Dec., 1774. Two regiments from New Hampshire were in the battle of Bunker Hill. New Hampshire and Vermont troops, under the command of Gen. Stark, who bore a commission from New Hampshire, gained the decisive victory of Bennington. For the whole war New Hampshire furnished 12,497 men. A State constitution was adopted in 1784, and on June 21, 1788, the Federal Constitution was adopted by a small majority. As New Hampshire was the ninth State to adopt this Constitution, the Union was thus secured. The State constitution was thoroughly revised in 1792, slightly modified in 1852, and again revised in 1877. Once in seven years by special vote is taken "the sense of the people as to the revision of the constitution and calling a convention for that purpose." In the war of 1812 New Hampshire furnished more than 2,000 men, and in the civil war she furnished 18 regiments of infantry, 1 of cavalry, 1 light and 1 heavy battery, and 3 companies of sharpshooters—in all, 32,750 men, or about 10 per cent. of the population. Portsmouth was the capital of the province. From 1775 to 1805 the Legislature met at different places, but since then Concord has been the capital.

GOVERNORS OF NEW HAMPSHIRE.

John Ball	1677-80	John Ball	1776-77
John Ball	1680-81	John Ball	1777-78
John Ball	1681-82	John Ball	1778-79
John Ball	1682-83	John Ball	1779-80
John Ball	1683-84	John Ball	1780-81
John Ball	1684-85	John Ball	1781-82
John Ball	1685-86	John Ball	1782-83
John Ball	1686-87	John Ball	1783-84
John Ball	1687-88	John Ball	1784-85
John Ball	1688-89	John Ball	1785-86
John Ball	1689-90	John Ball	1786-87
John Ball	1690-91	John Ball	1787-88
John Ball	1691-92	John Ball	1788-89
John Ball	1692-93	John Ball	1789-90
John Ball	1693-94	John Ball	1790-91
John Ball	1694-95	John Ball	1791-92
John Ball	1695-96	John Ball	1792-93
John Ball	1696-97	John Ball	1793-94
John Ball	1697-98	John Ball	1794-95
John Ball	1698-99	John Ball	1795-96
John Ball	1699-1700	John Ball	1796-97
John Ball	1700-1701	John Ball	1797-98
John Ball	1701-1702	John Ball	1798-99
John Ball	1702-1703	John Ball	1799-1800
John Ball	1703-1704	John Ball	1800-1801
John Ball	1704-1705	John Ball	1801-1802
John Ball	1705-1706	John Ball	1802-1803
John Ball	1706-1707	John Ball	1803-1804
John Ball	1707-1708	John Ball	1804-1805
John Ball	1708-1709	John Ball	1805-1806
John Ball	1709-1710	John Ball	1806-1807
John Ball	1710-1711	John Ball	1807-1808
John Ball	1711-1712	John Ball	1808-1809
John Ball	1712-1713	John Ball	1809-1810
John Ball	1713-1714	John Ball	1810-1811
John Ball	1714-1715	John Ball	1811-1812
John Ball	1715-1716	John Ball	1812-1813
John Ball	1716-1717	John Ball	1813-1814
John Ball	1717-1718	John Ball	1814-1815
John Ball	1718-1719	John Ball	1815-1816
John Ball	1719-1720	John Ball	1816-1817
John Ball	1720-1721	John Ball	1817-1818
John Ball	1721-1722	John Ball	1818-1819
John Ball	1722-1723	John Ball	1819-1820
John Ball	1723-1724	John Ball	1820-1821
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John Ball	1732-1733	John Ball	1829-1830
John Ball	1733-1734	John Ball	1830-1831
John Ball	1734-1735	John Ball	1831-1832
John Ball	1735-1736	John Ball	1832-1833
John Ball	1736-1737	John Ball	1833-1834
John Ball	1737-1738	John Ball	1834-1835
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John Ball	1748-1749	John Ball	1845-1846
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John Ball	1752-1753	John Ball	1849-1850
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John Ball	1764-1765	John Ball	1861-1862
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John Ball	1766-1767	John Ball	1863-1864
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John Ball	1768-1769	John Ball	1865-1866
John Ball	1769-1770	John Ball	1866-1867
John Ball	1770-1771	John Ball	1867-1868
John Ball	1771-1772	John Ball	1868-1869
John Ball	1772-1773	John Ball	1869-1870
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John Ball	1774-1775	John Ball	1871-1872
John Ball	1775-1776	John Ball	1872-1873
John Ball	1776-1777	John Ball	1873-1874
John Ball	1777-1778	John Ball	1874-1875
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John Ball	1788-1789	John Ball	1885-1886
John Ball	1789-1790	John Ball	1886-1887
John Ball	1790-1791	John Ball	1887-1888
John Ball	1791-1792	John Ball	1888-1889
John Ball	1792-1793	John Ball	1889-1890
John Ball	1793-1794	John Ball	1890-1891
John Ball	1794-1795	John Ball	1891-1892
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John Ball	1796-1797	John Ball	1893-1894
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John Ball	1799-1800	John Ball	1896-1897
John Ball	1800-1801	John Ball	1897-1898
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John Ball	1802-1803	John Ball	1899-1900
John Ball	1803-1804	John Ball	1900-1901
John Ball	1804-1805	John Ball	1901-1902
John Ball	1805-1806	John Ball	1902-1903
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John Ball	1807-1808	John Ball	1904-1905
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John Ball	1810-1811	John Ball	1907-1908
John Ball	1811-1812	John Ball	1908-1909
John Ball	1812-1813	John Ball	1909-1910
John Ball	1813-1814	John Ball	1910-1911
John Ball	1814-1815	John Ball	1911-1912
John Ball	1815-1816	John Ball	1912-1913
John Ball	1816-1817	John Ball	1913-1914
John Ball	1817-1818	John Ball	1914-1915
John Ball	1818-1819	John Ball	1915-1916
John Ball	1819-1820	John Ball	1916-1917
John Ball	1820-1821	John Ball	1917-1918
John Ball	1821-1822	John Ball	1918-1919
John Ball	1822-1823	John Ball	1919-1920
John Ball	1823-1824	John Ball	1920-1921
John Ball	1824-1825	John Ball	1921-1922
John Ball	1825-1826	John Ball	1922-1923
John Ball	1826-1827	John Ball	1923-1924
John Ball	1827-1828	John Ball	1924-1925
John Ball	1828-1829	John Ball	1925-1926
John Ball	1829-1830	John Ball	1926-1927
John Ball	1830-1831	John Ball	1927-1928
John Ball	1831-1832	John Ball	1928-1929
John Ball	1832-1833	John Ball	1929-1930
John Ball	1833-1834	John Ball	1930-1931
John Ball	1834-1835	John Ball	1931-1932
John Ball	1835-1836	John Ball	1932-1933
John Ball	1836-1837	John Ball	1933-1934
John Ball	1837-1838	John Ball	1934-1935
John Ball	1838-1839	John Ball	1935-1936
John Ball	1839-1840	John Ball	1936-1937
John Ball	1840-1841	John Ball	1937-1938
John Ball	1841-1842	John Ball	1938-1939
John Ball	1842-1843	John Ball	1939-1940
John Ball	1843-1844	John Ball	1940-1941
John Ball	1844-1845	John Ball	1941-1942
John Ball	1845-1846	John Ball	1942-1943
John Ball	1846-1847	John Ball	1943-1944
John Ball	1847-1848	John Ball	1944-1945
John Ball	1848-1849	John Ball	1945-1946
John Ball	1849-1850	John Ball	1946-1947
John Ball	1850-1851	John Ball	1947-1948
John Ball	1851-1852	John Ball	1948-1949
John Ball	1852-1853	John Ball	1949-1950
John Ball	1853-1854	John Ball	1950-1951
John Ball	1854-1855	John Ball	1951-1952
John Ball	1855-1856	John Ball	1952-1953
John Ball	1856-1857	John Ball	1953-1954
John Ball	1857-1858	John Ball	1954-1955
John Ball	1858-1859	John Ball	1955-1956
John Ball	1859-1860	John Ball	1956-1957
John Ball	1860-1861	John Ball	1957-1958
John Ball	1861-1862	John Ball	1958-1959
John Ball	1862-1863	John Ball	1959-1960
John Ball	1863-1864	John Ball	1960-1961
John Ball	1864-1865	John Ball	1961-1962
John Ball	1865-1866	John Ball	1962-1963
John Ball	1866-1867	John Ball	1963-1964
John Ball	1867-1868	John Ball	1964-1965
John Ball	1868-1869	John Ball	1965-1966
John Ball	1869-1870	John Ball	1966-1967
John Ball	1870-1871	John Ball	1967-1968
John Ball	1871-1872	John Ball	1968-1969
John Ball	1872-1873	John Ball	1969-1970
John Ball	1873-1874	John Ball	1970-1971
John Ball	1874-1875	John Ball	1971-1972
John Ball	1875-1876	John Ball	1972-1973
John Ball	1876-1877	John Ball	1973-1974
John Ball	1877-1878	John Ball	1974-1975
John Ball	1878-1879	John Ball	1975-1976
John Ball	1879-1880	John Ball	1976-1977
John Ball	1880-1881	John Ball	1977-1978
John Ball	1881-1882	John Ball	1978-1979
John Ball	1882-1883	John Ball	1979-1980
John Ball	1883-1884	John Ball	1980-1981
John Ball	1884-1885	John Ball	1981-1982
John Ball	1885-1886	John Ball	1982-1983
John Ball	1886-1887	John Ball	1983-1984
John Ball	1887-1888	John Ball	1984-1985
John Ball	1888-1889	John Ball	1985-1986
John Ball	1889-1890	John Ball	1986-1987
John Ball	1890-1891	John Ball	1987-1988
John Ball	1891-1892	John Ball	1988-1989
John Ball	1892-1893	John Ball	1989-1990
John Ball	1893-1894	John Ball	1990-1991
John Ball	1894-1895	John Ball	1991-1992
John Ball	1895-1896	John Ball	1992-1993
John Ball	1896-1897	John Ball	1993-1994
John Ball	1897-1898	John Ball	1994-1995
John Ball	1898-1899	John Ball	1995-1996
John Ball	1899-1900	John Ball	1996-1997
John Ball	1900-1901	John Ball	1997-1998
John Ball	1901-1902	John Ball	1998-1999
John Ball	1902-1903	John Ball	1999-2000
John Ball	1903-1904	John Ball	2000-2001
John Ball	1904-1905	John Ball	2001-2002
John Ball	1905-1906	John Ball	2002-2003
John Ball	1906-1907	John Ball	2003-2004
John Ball	1907-1908	John Ball	2004-2005
John Ball	1908-1909	John Ball	2005-2006
John Ball	1909-1910	John Ball	2006-2007
John Ball	1910-1911	John Ball	2007-2008
John Ball	1911-1912	John Ball	2008-2009
John Ball	1912-1913	John Ball	2009-2010
John Ball	1913-1914	John Ball	2010-2011
John Ball	1914-1915	John Ball	2011-2012
John Ball	1915-1916	John Ball	2012-2013
John Ball	1916-1917	John Ball	2013-2014
John Ball	1917-1918	John Ball	2014

mated at \$6,000,000. The ordinary receipts of city, town, and school district in 1893 were \$1,441,035.52, and the ordinary expenses \$1,396,087.02. The indebtedness, bonded and floating, of these three corporations in 1893 was \$2,696,929.09. There are 13 banks, viz., 7 national, 3 State, and 3 savings-banks, and 1 building and loan association. The national and State banks form the New Haven Clearing-house. The principal business is the distribution of goods to surrounding towns and cities, and the manufacture of carriages, rifles, clocks, hardware, and corsets. The census returns of 1890 showed that 1,042 manufacturing establishments (representing 128 industries) reported. These had a combined capital of \$16,826,635, employed 17,654 persons, paid \$9,876,270 for wages and \$13,259,097 for materials, and had products valued at \$28,574,038.

Late in the autumn of 1637 Theophilus Eaton, a London merchant, and a few associates settled on one of the bays of Long Island Sound. He was joined the next spring by Rev. Mr. Davenport and a small company, who named the place New Haven. The same place had previously been named by Block, the Dutch discoverer, Roodenberg—red hills—because of the appearance of East and West Rocks. These settlers acknowledged allegiance to neither king nor government. They accepted the Scriptures as containing the only proper rule for the government of both Church and state. Under this theocracy they lived in simplicity and independence, until a liberal charter, procured by Connecticut from Charles II. in 1662, included them within its jurisdiction. By this charter, to which New Haven after much ill feeling submitted, New Haven and Hartford were made joint capitals of Connecticut. In 1873, by an amendment to the constitution, Hartford was made the sole seat of government. New Haven is now governed by three corporations—the City of New Haven, the Town of New Haven, and the New Haven School District. The town possesses the most territory and includes all of both city and school district. The school district includes all of the city, but not all of the town. Each of these corporations possesses complete autonomy, and is supreme within its own jurisdiction. The city is governed under a special charter adopted in 1881. A mayor is the nominal head of the executive division. The departments of public works, fire, and police are managed by boards of commissioners called non-partisan, but in reality bi-partisan. The legislative division consists of a court of common council, which is divided into two boards, the board of aldermen and the board of councilmen. There are 24 aldermen, two from each ward, of whom one in each ward is elected annually, and 36 councilmen, all of whom are elected annually. The administrative duties of the town are performed by a board of 7 selectmen, elected by the people. The legislature of the town is its adult male citizens acting in a properly called town meeting. The administrative duties of the school district are in the hands of a board of education, consisting of 9 members. Adult citizens of the district meet, lay a school-tax, and vote supplies. Pop. (1880) city and town reported as coextensive, 62,882; (1890) city, 81,298; town, 86,045; (1894) town, estimated at over 90,000.

FRANK S. BISHOP.

New Hebrides: an archipelago of Polynesia consisting of a chain of islands extending from lat. 13° S. and lon. 166° E. to lat. 20° S., lon. 170° E., a distance of over 500 miles. They are under the protection of a mixed French and British commission. The total area is about 5,100 sq. miles. There are a dozen larger islands and innumerable smaller ones. The largest is Espiritu Santo (75 miles by 40) toward the northern end of the group, discovered by Quiros in 1606. S. E. of it is Malakolo (56 miles by 20), with a fine harbor. Banks islands are in the northern part of the group. The islands are volcanic and nearly free from coral reefs. The soil is generally rich and deep. The rainfall is heavy; the principal rainy season extends from December to March. The temperature does not fall below 58° F., and seldom rises above 90°. The islands are densely wooded and the breadfruit, sago-palm, banana, sugar-cane, yam, taro, arrowroot, orange, and pineapple flourish. Mammals and birds are scarce. Whaling is extensively carried on in the neighboring seas, and one of the important products is bêche-de-mer. Imhaus estimates the population at from 75,000 to 80,000, among them 150 whites—missionaries and traders. The missions here have been successful; on the southern island (Aneiteum) the entire population is said to be Christian, and this influence predominates over the southern end of the group. The natives are Polynesian and Papuan. They

are usually neat and clean, strong and often willing to work, but generally inhospitable and cruel. They vary much in the different islands. See Imhaus, *Les Nouvelles Hébrides* (1890), and Paton, *John G. Paton, Missionary in the New Hebrides: an Autobiography* (1891).

MARK W. HARRINGTON.

New Holland: See AUSTRALIA.

New Iberia: town; capital of Iberia parish, La. (for location of parish, see map of Louisiana, ref. 10-D); on the bayou Teche, and the S. Pac. Railroad; 125 miles W. of New Orleans. It is in a sugar, rice, cotton, and lumber region, and is principally engaged in the manufacture of cypress lumber. Minor industries are the manufacture of cotton-seed oil, brick, sash, doors, and blinds, soap, and mineral waters. There are 2 national banks with combined capital of \$100,000, high school, 2 public schools, convent, Howe Institute, seminary, 8 churches, 2 public halls, park and race-track, electric lights, iron bridge across the Teche, and a daily and a weekly newspaper. Pop. (1880) 2,709; (1890) 3,447.

EDITOR OF "ENTERPRISE."

New Ireland: a large island of the Bismarck Archipelago, now called NEW MECKLENBURG (*q. v.*).

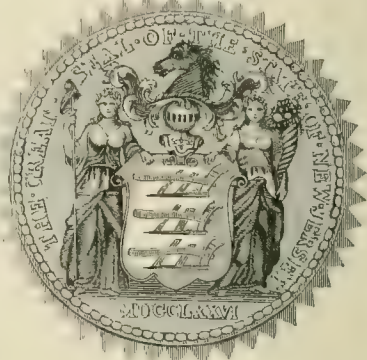
New Jersey [named from the island of *Jersey* in the English Channel]: one of the U. S. of North America (North Atlantic group); the third of the original thirteen States that ratified the Federal Constitution; capital, Trenton.

Location and Area.

—It is situated between Delaware river and bay and the Atlantic Ocean and Hudson river, and between 38° 55' 50" 42' and 41° 21' 19" N. lat., and 73° 53' 51" 25' and 75° 33' 2" 74" W. lon.; bounded on the N. by New York, on the E. by the Hudson river, Staten Island Sound, Raritan Bay, and the Atlantic, on the S. by Delaware Bay, and on the

W. by the Delaware river, which separates it from Delaware and Pennsylvania; extreme length, 167½ miles (according to the State topographical survey); greatest breadth, 59 miles; least breadth, 32 miles; area, 8,224.44 sq. miles (5,263,641.60 acres), of which 7,514.40 sq. miles are land surface.

Physical Features.—A straight line drawn from Jersey City to Trenton divides the State into two strongly contrasted parts; the northern, undulating, hilly, and in places mountainous; the southern, through most of its extent almost a plain. Three mountain ranges traverse the northern part, two of which—the Blue Mountain or Blue Ridge, called also Kittatinny and known in New York as Shawangunk, and the Highland Range—belong to the Appalachian chain. The third is a part of the low range which may be traced from Massachusetts into New Jersey through Southeastern New York. The Blue Ridge, composed of quartzose conglomerate, with softer slate, crosses the Delaware river at the Water Gap, where its summit is 1,479 feet above the sea, and runs N. E. for 40 miles in an almost unbroken ridge to the New York State line, near which, at High Point, it rises to an elevation of about 1,800 feet. The Kittatinny valley lies between the Blue Ridge on the N. W. and the Highland Range on the S. E., and is noted for its rural beauty and agricultural wealth. The Highland Range occupies a belt 22 miles wide on the New York State line and 10 miles wide on the Delaware, and is composed of numerous disconnected ridges, among which are Hamburg Mountain, reaching a height at Rutherford's Hill of 1,488 feet; Wawayanda Mountain, height 1,450 feet; Musconetcong, Schooley's, and Green Pond Mountains. The third range consists of ridges of trap rock, which diversify the red sandstone belt, a strip of an average width of 20 miles crossing the State from N. E. to S. W., the south boundary of which coincides closely with a straight line drawn from Jersey City to Trenton. The chief of these ridges are the First, a part of which is better known as Orange Mountain, 534 feet high



Seal of New Jersey.

NEW JERSEY

Scale of Miles

5 10 20 30

County Towns & Railroads

This type indicates a population of 5,000 or over



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Map of New Jersey

at Garret Rock, near Paterson; the Second, the less continuous Third Mountain, Rocky Hill, Tenmile Run Mountain, Long Hill, Second Mountain, Great Hill, Round Mountain, Peck's Mountain, 167 feet high, and the Palisades, which wall in the Hudson on the W. from the New York State line nearly to Jersey City. In the southern part there are a few rounded hills, but no rocky eminences. The Navesink Highlands, S. of Sandy Hook, which are an outcrop dipping toward New York harbor, reach a height of 400 feet. Southern New Jersey is a gently undulating plain, from 150 to 190 feet in elevation in the center, and sloping gradually to the Atlantic on the E. and the Delaware river or bay on the W. The prevailing surface is a siliceous formation of great value, containing marls, useful in agriculture, and plastic clay and kaolin, extensively employed in the manufacture of brick, pipe, tile, porcelain, and pottery, is found in a belt bounded on the N. W. by a line drawn from Raritan Bay on the N. E. to the head of Delaware Bay on the S. W. Sand available for making glass exists throughout the southern part of the State. In the same region the cedar swamps form a curious and important deposit of timber, which is exhumed in good condition from bogs in which it has lain for hundreds of years.

The Hudson river bounds the State on the E. for 28 or 30 miles. It receives from New Jersey only the Wallkill river, which enters it at Rondout, N. Y. The swiftness of the drainage into the Hudson is due to the barrier interposed by the Palisades. Newark Bay receives the Passaic and Hackensack rivers, with their tributaries. The Ramapo, Wanauque, and Pequannock rivers, whose union forms the Pompton river, and the Rockaway river, all affluents of the Passaic, yield, at a minimum elevation of 200 feet above the sea, 314,000,000 gal. of water daily, which is available for the supply of the cities of Northern New Jersey. Raritan Bay receives the Raritan river, with its north and south branches. The Elizabeth and Rahway rivers flow into Staten Island Sound. The Navesink, Shrewsbury, Shark, Manasquan, Metedeconk, Tom's, Little Egg Harbor or Mullicas, and Great Egg Harbor rivers and Cedar creek flow into the Atlantic or into bays communicating directly with the sea. Delaware Bay receives the Delaware river, with its fifteen tributaries and four affluents of these, and in the extreme S. of the State Cohansey creek and Maurice river, as well as a number of smaller streams. The tidal bays along the coast, sometimes called harbors or sounds, form a line of internal water communication from the Metedeconk river to Cape May for vessels of light draught, and abound in game, fish, and shellfish. The principal ones are Barnegat Bay, Little Egg Harbor, Great Bay, Absecom Bay, and Great Egg Harbor. In the northern part of the State are many mountain lakes and ponds, remarkable for purity of water and quite generally stocked with black bass. Greenwood Lake, partly in New York, is from a third to half a mile wide, and 7 or 8 miles long. It is drained by the Wanauque. Lake Hopatcong, the largest body of fresh water in the State, is 914 feet above mean tide, $5\frac{1}{2}$ miles long, and from a third to $1\frac{1}{2}$ miles in width, and is drained by the Musconetcong. Budd's Lake, on the top of Schooley's Mountain, is nearly circular, with a circumference of about $3\frac{1}{2}$ miles, and is the source of the south branch of the Raritan. Green Pond, in Morris County, 1,044 feet above the sea, is 3 miles long and a quarter to half a mile wide. These lakes and ponds are favorite places of summer resort. The Delaware river receives the drainage of 2,344.80 sq. miles; Delaware Bay of 1,060.10 sq. miles; the Atlantic Ocean, directly or through tidal sounds, of 3,857.60 sq. miles; the Hudson river of 271.90 sq. miles.

Geology.—Hardly any coal is found in New Jersey, but in other directions its mineral and geological wealth is great and remarkably diversified. In 1891 it was the ninth State in amount of product of iron ore. There were thirty-two mines, which produced 525,612 long tons of ore, of which 517,922 tons were magnetite. Official reports for 1892 and 1893 show a falling off. In the latter year the total product was 356,150 long tons, of which 351,453 tons were magnetite. New Jersey supplies 3.07 per cent. of the country's total output of iron ore. Manganiferous zinc ores of excellent quality are found at Franklin, Sussex co., and supply a large part of the zinc oxide and metallic zinc used in the U. S. In 1891 there was a production of granite valued at \$400,000, sandstone valued at \$400,000, limestone valued at \$100,000, slate valued at \$10,000, ocher valued at \$7,200, and metallic paint valued at \$13,178. Reports for 1892 and 1893 show a considerable falling off in each of these items.

Among building materials are a very fine gneiss, white and blue limestones, roofing and writing slates, and flag and paving stones. The trap ridges supply the best of road material in such abundance and at so low a cost that the northern part of the State is now covered with a network of admirable highways. Graphite or plumbago has been mined with profit. Large quantities of porcelain and pottery clays of excellent quality are found; infusorial earth, used for polishing and in the preparation of giant powder, is obtained in Morris County; and moulding sand of good quality and sand for making the brick for reverberatory furnaces abounds in Burlington and Morris Counties. Sulphate of baryta, manganese, molybdenum, iron pyrites, used largely for producing sulphuric acid, and green sand for chemical purposes and glass-making, are among the other mineral products. The sum of \$8,000 has been appropriated annually for many years for the geological survey of the State.

Soil and Productions.—The soil is a sandy loam, easily tilled, and lighter in the southern than in the middle and northern parts of the State. Clay marls, pure marls, shell marls, lime, and the peat and marsh-mud of the tide-washed region are advantageously used to enrich the land. The forest area covers about one-third of the State. The prevalent timber of the southern part is pine, with some cedar in the swamps; the forest of the northern part consists chiefly of oak, hickory, chestnut, hornbeam, tulip-tree, basswood, elm, ash, pine, sassafras, and wild cherry. The *magnolia glauca* is found in the swamps. Wild grapes, cranberries, whortleberries, blackberries, and raspberries are abundant. The flora of the State is large. The rattlesnake and copperhead are the only poisonous reptiles.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	PER CENT.
Total number of farms	44,221	30,826	10.1
Total acreage of farms	2,929,773	2,662,000	9.1
Total value of farms	\$190,875,833	\$207,224,840	9.1

* Decrease.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1893:

CROPS.	Acreage.	Yield.	Value.
Corn	277,183	7,179,040 bush.	\$3,733,101
Wheat	123,701	1,800,000 bush.	1,080,000
Oats	100,744	2,622,882 bush.	918,069
Rye	76,478	1,171,118 bush.	717,317
Black-wheat	1,141	16,707 bush.	129,701
Potatoes	49,064	1,876,222 bush.	1,081,314
Hay	532,162	526,840 tons	9,182,821
Totals	1,181,974		\$18,622,769

On Jan. 1, 1894, the farm animals comprised 83,321 horses, value \$7,105,037; 8,296 mules, value \$843,644; 190,734 milch cows, value \$6,713,837; 52,641 oxen and other cattle, value \$1,532,272; 57,571 sheep, value \$235,177; and 182,830 swine, value \$1,981,880; total head, 575,393; total value, \$18,411,847. Much attention is paid to seed-farms and nurseries, especially in districts within easy reach of the markets of New York and Philadelphia. In 1890 the area in seed-farms was 6,272 acres, and the value of seed-farm implements and buildings more than \$2,000,000. In the same year there were 145 nurseries, with an area of 5,465 acres, representing an investment of about \$2,000,000. The fruit crop is large, notably in peaches, apples, and grapes.

Climate.—The following table exhibits the mean temperature (in degrees F.) and rainfall (in inches) by months, from observations taken through a series of years at different points:

MONTHS.	Temper.	Precip.	MONTHS.	Temper.	Precip.
January	29.8	3.8	July	71.8	3.80
February	34.4	3.8	August	74.5	4.0
March	40.2	3.8	September	66.0	4.0
April	50.2	2.91	October	58.0	4.0
May	58.8	4.0	November	44.4	4.0
June	65.8	4.0	December	35.8	4.0

Average for the year . . .

The climate of New Jersey is more temperate than in the southern counties than in the northern, although the mean temperature of the spring months is only three or four degrees higher.

Divisions.—For administrative purposes the State is divided into twenty-one counties, as follows:—

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	Rel.	Pop. 1890.	Pop. 1895.	COUNTY-TOWNS.	Pop. 1895.
Atlantic.....	7 C	28,836	34,750	May's Landing..	1,359
Bergen.....	2-E	47,226	65,415	Hackensack.....	7,282
Burlington.....	5-D	58,928	59,117	Mt Holly.....	63,467
Camden.....	6-C	87,687	100,104	Camden.....	13,292
Cape May.....	8-C	11,268	12,855	Cape May C.-H..	215,806
Cumberland.....	7-B	45,438	49,815	Bridgeton.....	8,853
Essex.....	2-D	256,098	312,000	Newark.....	182,713
Gloucester.....	6-B	28,649	31,191	Woodbury.....	2,060
Hudson.....	2-E	275,126	328,000	Jersey City.....	62,518
Hunterdon.....	3-C	35,355	35,354	Flemington.....	3,157
Mercer.....	4-C	79,978	85,538	Trenton.....	10,290
Middlesex.....	3-D	61,754	70,058	New Brunswick..	19,910
Monmouth.....	4-E	69,128	75,543	Freehold.....	6,337
Morris.....	2-D	54,101	59,536	Morristown.....	4,514
Ocean.....	5-D	15,974	18,739	Tom's River.....	3,426
Passaic.....	2-D	105,046	123,227	Paterson.....	43,834
Salem.....	6-B	25,151	26,084	Salem.....	1,834
Somerset.....	3-C	28,311	30,447	Somerville.....	
Sussex.....	1-C	22,250	22,586	Newton.....	
Union.....	3-D	72,467	85,404	Elizabeth.....	
Warren.....	3-C	36,553	37,283	Belvidere.....	
Totals.....		1,444,933	1,673,106		

* Reference for location of counties, see map of New Jersey.

Principal Cities and Towns, with Population for 1895.—Newark, 215,806; Jersey City, 182,713; Paterson, 97,344; Camden, 63,467; Trenton, 62,518; Hoboken, 54,083; Elizabeth, 43,834; Orange, 22,792; New Brunswick, 19,910; Bayonne, 19,856; Atlantic City, 18,329; East Orange, 17,927; Passaic, 17,894; Plainfield, 13,629; Bridgeton, 13,292; Perth Amboy, 13,030; Millville, 10,466; Morristown, 10,290; Phillipsburg, 9,081; Rahway, 7,945; Burlington, 7,844; Long Branch, 7,333; Hackensack, 7,282; Salem, 6,337; Gloucester, 6,225; Bordentown, 4,185; and Princeton, 3,488.

Population and Races.—The population in 1850 was 489,555; 1860, 672,035; 1870, 906,096; 1880, 1,131,116; 1890, 1,444,933 (native, 1,115,958; foreign, 328,975; males, 720,819; females, 724,114; white, 1,396,581; colored, 48,352, of whom 47,638 were persons of African descent, 608 Chinese, 22 Japanese, and 84 civilized Indians).

Industries and Business Interests.—The manufacturing interest is of extraordinary volume and variety. In 1890 New Jersey, compared with other States, ranked fifth in combined textile products, first in silk fabrics, seventh in woolen, and eleventh in cotton. The value of silk fabrics manufactured in 1890 was \$25,405,982, against \$12,851,045 in 1880, and was nearly one-half greater than that of any other State. The value of woolen fabrics from 55 establishments was \$9,984,640, against \$6,829,074 in 1880. Seventeen establishments produced cotton fabrics worth \$5,902,615. The value of the whole textile product from 199 establishments was \$46,647,626, against \$28,499,579 in 1880. Eighteen furnaces made 145,040 tons of pig iron in 1890, of which 41,479 tons were Bessemer, and 8 establishments made 17,999 short tons of steel. Six establishments made 185,510 tons of cast-iron pipe and fittings, value \$5,032,571, more than one-third of the product of the U. S. The census reports of 1890 showed that 9,221 manufacturing establishments reported. These had a combined capital of \$249,890,428, employed 186,901 persons, paid \$96,509,703 for wages and \$188,960,704 for materials, and had products valued at \$353,179,917. See HOBOKEN, NEWARK, PATERSON, and TRENTON.

Finance.—No State tax upon individuals has been imposed for many years, except one for school purposes, apportioned among local taxing districts at the rate of \$5 for each child between the ages of five and eighteen years, as shown by a school census taken annually. The amount thus collected by the State is reapportioned equitably, and paid over to the local school authorities. This is additional to the amount raised by local taxation for school purposes. Official reports of the State finances for the year ending Oct. 31, 1893, showed balance from previous year, \$619,701.15; receipts, \$1,962,319.80; disbursements, \$1,857,982.83; balance, \$724,038.12. The State debt on Jan. 2, 1894, was \$735,400, payable in installments, the last of which will fall due in Jan., 1902. The State school fund, resulting largely from the sale of riparian lands, amounted on Oct. 31, 1893, to \$3,693,621.22, from the income of which an appropriation of \$100,000 is required to be made annually for the support of public schools. The assessed valuation of real and personal property in 1893 was \$768,295,274.50.

Banking.—In Dec., 1893, there were 99 national banks, with a combined capital of \$14,608,350, surplus and undivided profits of \$11,136,185, and individual deposits of \$49,593,347, and 21 State banks, with capital of \$1,680,460, surplus and profits of \$1,126,356, and deposits of \$6,667,745. The savings-banks on Jan. 2, 1894, numbered 25, and had 137,897 depositors, surplus of \$3,235,976, and deposits of \$34,266,298.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 896 post-offices, of which 86 were presidential (6 first-class, 30 second-class, 50 third-class) and 810 fourth-class. There were 387 money-order offices and 19 money-order stations. Of newspapers and periodicals there were 367, of which 48 were daily, 2 tri-weekly, 2 semi-weekly, 255 weekly, 2 bi-weekly, 7 semi-monthly, 44 monthly, 4 bi-monthly, and 3 quarterly publications.

Libraries.—In 1892 there were reported 96 public libraries of 1,000 volumes and over, which contained 655,127 bound volumes and 112,434 pamphlets. The libraries were classified as follows: General, 28; school, 27; college, 7; college society, 3; law, 3; theology, 4; public institution, 4; State, 1; Y. M. C. A., 4; social, 9; scientific, 3; historical, 1; I. O. O. F., 1; and mercantile, 1. The library of the New Jersey Historical Society at Newark contains about 14,000 volumes and 20,000 pamphlets; the State library at Trenton, about 41,000 volumes, two-thirds of which are on legal subjects.

Means of Communication.—The railway development of the State has been as follows: (1850) 206 miles; (1860) 560; (1870) 1,125; (1880) 1,684; (1890) 2,099; (1892) main track, 2,162, second track, 708, third and fourth tracks, 178, sidings, 1,206—total, 4,254. The principal main lines are the Penn., the Central of N. J., the Phila. and Reading, the N. Y., Lake Erie and W., the Del., Lack. and W., the N. Y., Susquehanna and W., the West Shore, and the Lehigh Valley. The valuation of all railway and canal property in 1893 was \$218,406,065, and the taxes were: State, \$1,092,030.32; local, \$391,446.68—total, \$1,483,477. The Morris and Essex Canal, built about 1830, connects Jersey City and Phillipsburg, and was formerly a general commercial route, but for many years has been used as a coal route by the Lehigh Valley Railroad, its lessee. It is about 106 miles long. The Delaware and Raritan Canal, connecting New Brunswick and Trenton, about 43 miles long, built in 1831-34, affords direct communication between New York and Philadelphia by means of the Raritan and Delaware rivers. The street-railways, chiefly electric, aggregate over 300 miles.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organiza- tions.	Churches and halls.	Members.	Value of church property.
Roman Catholic.....	219	218	222,274	\$6,050,682
Methodist Episcopal.....	579	584	82,955	5,009,075
Presb. in the U. S. of America.....	300	423	58,759	6,699,100
Baptist.....	224	268	39,757	2,957,628
Protestant Episcopal.....	184	236	30,103	3,815,850
Reformed Church in America.....	124	155	24,057	2,091,029
Lutheran. General Council.....	30	27	7,940	339,500
African Methodist Episcopal.....	54	69	5,851	159,850
Congregational.....	33	38	4,912	655,300
Methodist Protestant.....	39	39	3,459	181,950
Friends.....	43	47	3,281	267,750
African Methodist Episcopal Zion.....	25	25	2,954	107,700
Jews, Orthodox.....	19	19	2,521	44,300
Lutheran, General Synod.....	16	16	2,415	126,100

Schools.—The general supervision of public schools is entrusted to a State superintendent of public instruction, appointed by the Governor for a term of three years, and to one superintendent for each county, appointed by the State board of education. The school census enumeration, May 30, 1892, was: males, 205,958; females, 199,264—total, 405,222. The appropriations for 1892-93 were as follows: State school tax, \$2,151,700; State appropriation, \$100,000; township school tax, \$13,202.50; interest of surplus revenue, \$31,525.86; district and city school tax, \$1,405,164.78—total, \$3,701,593.14. The value of school property in 1891-92 was \$10,004,236; number of male teachers, 766; female teachers, 4,015. The State Normal School at Trenton, opened in 1855, has a three years' course. The New Jersey College of Agriculture, at New Brunswick, is the scientific school of Rutgers College, with a four years' course. It has a farm of 100 acres and 130 free scholarships, receives State aid to the amount of about \$7,000 annually, and had, in 1892-93, 171 students. The principal higher educational institutions are the College of New Jersey, at Princeton, founded in 1746;

Rutgers College, at New Brunswick, chartered as Queen's College (1766); Burlington College (1846); St. Mary's Hall (1837); at Burlington (Protestant Episcopal); St. John's Hall College, at South Orange (Roman Catholic); 1866; Stevens Institute of Technology, at Hoboken; Theological Seminary, Presbyterian, at Philadelphia; Drew Theological Seminary (Methodist), at Madison; German Theological School (Presbyterian), at Bound Brook; Lawrenceville School, Paddle Institute, Hightstown; Convent College Institute, at Hackettstown (Methodist Episcopal); Newark Academy (1792); Barn Presbyterian Academy, at Blauvelt; St. Elizabeth's Academy, for girls (Roman Catholic), near Morrisstown; and the Pennington Seminary, for both sexes, at Pennington.

Charitable, Reformatory, and Penal Institutions. These comprise the State prison, at Trenton, built in 1836 and since much enlarged; the State Reformatory for Boys, at Jamesburg, opened in 1867, with a farm of 490 acres; the State Industrial School for Girls, near Trenton, with a farm of 79 acres; a Hospital for the Insane, at Trenton, built in 1844; a Hospital for the Insane, at Morris Plains, opened in 1876 at a cost of \$2,250,000; the Institution for Feeble-minded Women, at Vineland, opened in 1888; the Training-school for Feeble-minded Children at Vineland, opened in 1888; the School for Deaf Mutes, near Trenton; and the Soldiers' Home at Kearney, near Newark. There are public county asylums for lunatics in Burlington, Camden, Cumberland, Essex, Gloucester, Hudson, Passaic, and Salem Counties.

Political Organization. The Governor is elected for a term of three years, and can not hold the office for two consecutive terms. He appoints most of the members of the judiciary, and many heads of departments and executive officers. The Legislature consisted in 1894 of a Senate of twenty-one members, and a General Assembly of sixty members. Each county elects one Senator for a term of three years, one-third of the body being elected each year. The Legislature meets annually, with no limit of session. The right of suffrage is enjoyed by every male citizen of the U. S., of the age of twenty-one years, who shall have been a resident of the State one year, and of the county in which he claims his vote five months next before the election, excepting idiots, insane paupers, and convicts not pardoned or restored by law to the right of suffrage. A modification of the Australian ballot system is in operation.

History. The earliest white settlers of New Jersey were the Dutch, who between 1614 and 1621 founded the colony of New Netherlands on the territory between the Hudson and Delaware rivers. In 1664 this region passed to the English, and the Duke of York, who held a grant from the king, made it over to John, Lord Berkeley, and Sir George Carteret. The province was named in honor of Carteret, who had distinguished himself while governor of the island of Jersey. The proprietors established a government, republican in its character, which continued until 1676, when the province was divided into East Jersey and West Jersey by a line drawn from Little Egg Harbor to a point on the Delaware in lat. 41° 40' N. The two divisions remained distinct until 1702, when the proprietors surrendered their powers of government to the crown, reserving their exclusive right to dispose of the soil. Thereafter, until the Revolution, New Jersey was a royal province. From 1703 to 1738 the provinces of New York and New Jersey had the same governors. There were no Indian troubles, and the course of provincial history after 1702 was prosperous and uneventful. On July 2, 1776, two days before the Declaration of Independence, the provincial congress adopted a constitution for an independent State, which was ratified on July 18, 1776, and under this the State was governed until 1844. New Jersey was fighting-ground during most of the Revolution. The important battles of Trenton, Princeton, and Monmouth, with other minor engagements, were fought within her borders. Washington was in winter quarters at Morristown (*q. v.*) in 1777, and in 1779-80 and 1780-81. William Paterson, of New Jersey, was eminently influential in the convention that framed the Federal Constitution, which was ratified by the State on Dec. 18, 1787. In this wise and patriotic act New Jersey was anticipated only by Delaware and Pennsylvania. It is worthy of notice that the State constitution of 1776 allowed universal suffrage, both male and female, white and colored, subject to a property qualification of £50. Women continued to vote until 1807. A new constitution was adopted in 1844, and was amended in 1875.

New Jersey furnished 88,405 men to the army during the Revolution. The naval and military forces in 1844 were 18,841. The entire expense of the State in organizing, equipping, subsisting, supplying, and discharging her troops was \$8,894,384.00.

GOVERNORS OF NEW JERSEY

William Livingston	1776-80	Richard M. Hobbes	1880-81
William Livingston	1780-81	William A. Newell	1881-82
Richard M. Hobbes	1781-82	Charles S. Condit	1882-83
Richard M. Hobbes	1782-83	John Barringer	1883-84
Richard M. Hobbes	1783-84	Marion L. Ward	1884-85
Richard M. Hobbes	1784-85	Theodore F. Randolph	1885-86
Richard M. Hobbes	1785-86	John Parker	1886-87
Richard M. Hobbes	1786-87	Joseph D. Rogers	1887-88
Richard M. Hobbes	1787-88	George B. McClellan	1888-89
Richard M. Hobbes	1788-89	George C. Lindbergh	1889-90
Richard M. Hobbes	1789-90	Levi Abbott	1890-91
Richard M. Hobbes	1790-91	Robert S. Grout	1891-92
Richard M. Hobbes	1791-92	Levi Abbott	1892-93
Richard M. Hobbes	1792-93	George J. Worris	1893-94
Richard M. Hobbes	1793-94	John W. Griggs	1894-95
Richard M. Hobbes	1794-95		
Richard M. Hobbes	1795-96		
Richard M. Hobbes	1796-97		
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Richard M. Hobbes	1798-99		
Richard M. Hobbes	1799-00		
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Richard M. Hobbes	1890-91		
Richard M. Hobbes	1891-92		
Richard M. Hobbes	1892-93		
Richard M. Hobbes	1893-94		
Richard M. Hobbes	1894-95		

Authorities. See the State Archives, 16 vols.; Cook, *Geology of New Jersey* (1868); publications and *Proceedings* of the New Jersey Historical Society; Elmer, *The Constitution and Government of the Province and State of New Jersey* (1872); Maclean, *History of the College of New Jersey* (Philadelphia, 1877); Mulford, *Civil and Political History of New Jersey* (2 vols., Philadelphia, 1851); Raum, *History of New Jersey*; Smith, *History of New Jersey* (Burlington, 1765; 2d ed. 1877); Gordon, *History and Gazetteer of New Jersey* (1844); Barber and Howe, *New Jersey Historical Collections*.

FREDERIC ADAMS.

New Jersey, College of: an institution of learning (whose corporate name was changed in 1896 to *Princeton University*) founded under the auspices of the Presbyterian Synod of New York, which then included New Jersey. Chartered by New Jersey in 1746, it was opened in Elizabethtown in May, 1747, received a more liberal charter in 1748, was removed to Newark, and finally to Princeton in 1757, where a large building was erected named Nassau Hall, in memory of William III. of the house of Nassau. It was occupied as a barracks and a hospital both by the colonial and the British troops in the Revolution. Gen. Washington drove the British from its walls Jan. 3, 1777. The Continental Congress met in it in 1783, and the members of Congress and Gen. Washington attended the commencement in that year. Gen. Washington presented fifty guineas to the trustees to repair the damages of war, which were appropriated for a portrait of Washington by the elder Peale. Dr. Witherspoon and two of the alumni, Richard Stockton and Benjamin Rush, were signers of the Declaration of Independence. Rev. Jonathan Dickinson was the first president from May to Oct., 1747. Rev. Dr. James McCosh was president from 1868 to June, 1888. Active and energetic, his reputation greatly advanced the interests of the college. The faculty was enlarged, the number of students increased, new studies introduced, nine large buildings erected, and the funds greatly augmented. Among its benefactors have been N. Norris Halstead, who erected the observatory, John C. Green, and Henry G. Marquand. Mr. Green gave \$750,000 to found a school of science, erect a library, Dickinson Hall, and for other objects. The trustees of his estate erected Witherspoon Hall and Edwards Hall and Chemical Hall, enlarged the school of science, and endowed a number of professorships. These donations have amounted to \$2,500,000. In 1882 Mr. Marquand erected a handsome chapel, costing \$125,000, and other friends placed in the observatory one of the largest telescopes ever constructed. William Libbey, Sr., who founded the museum of geology and archaeology at a cost of \$100,000, also presented to the college the University Hotel, which cost more than \$250,000.

The college year is divided into two terms; most of the studies are elective in the junior and senior years. There are many prizes and fellowships, the recipients of the latter being required to pursue a prescribed course of study for one year after graduation. The John C. Green School of Science is now in operation. There are (1894) 42 professors, 34 tutors and assistants, and 1,109 students. The post-graduate courses are increasing. In 1892 they had 110 students. President Francis L. Patton, D. D., LL. D., was inaugurated June 20, 1888. Since that time the faculty has been

ber of students increased by more than 300, and more than \$2,000,000 has been given to the college, chiefly in the form of large and beautiful buildings. The college and society libraries contain 105,000 volumes. The number of graduates is (1894) nearly 6,000, among whom have been some of the most distinguished men in Church and state, the most eminent being James Madison, fourth President of the U. S. Within the last twenty years \$4,000,000 have been contributed by friends to the college. The buildings are mostly of stone, and occupy the campus, which runs parallel with the main street of the town. The grounds are shaded with fine trees. Nassau Hall, East and West Colleges, the American Whig and Cliosophic halls form a fine quadrangle, within which are planted two Revolutionary cannon. The other buildings lie E. and S. W. of this quadrangle. The geological and archeological museum in Nassau Hall and the museum of natural history in the School of Science are rapidly growing in importance. See Maclean, *History of the College of New Jersey* (2 vols., Philadelphia, 1877). HENRY C. CAMERON.

New Jersey Tea: a small shrub (*Ceanothus americanus*) belonging to the Buckthorn family (*Rhamnaceæ*), whose leaves were used as a substitute for tea during the American Revolution. The other species of the genus *Ceanothus* are abundant in Western and Southwestern U. S. See CEANOTHUS. CHARLES E. BESSEY.

New Jerusalem, Church of the: the name taken by a body of Christian worshippers who accept as true the doctrines taught in the theological writings of Emanuel Swedenborg. (See SWEDENBORG, EMANUEL.) In 1787, fifteen years after Swedenborg's death, the first organization for worship on the basis of those doctrines was formed in London, and consisted of sixteen persons. Two years later a general conference was held, also in London, of believers in the new faith. From that time to the present similar meetings have been held annually in England, with the exception of a few years; and in 1821 a legal body was formed under the title, The General Conference of the Ministers and other Members of the New Church, signified by the New Jerusalem in the Apocalypse or Revelation of John.

This church has flourished principally in England, the U. S., and Canada, though a few scattered societies are to be found on the continent of Europe. The beginnings in the U. S. were but little later than those in England, the first regular society, with a minister at its head, having been formed in Baltimore, Md., in the year 1792. In 1817 the body now known as The General Convention of the New Jerusalem in the United States of America was organized at a meeting held in Philadelphia. From that time till 1893 it has held seventy-three annual sessions. This body was incorporated in the year 1861, under the laws of the State of Illinois, and includes the larger part of those in the U. S. and Canada who openly accept the doctrines of the New Church. It consists of eleven "associations" and other local organizations, comprising in the aggregate 107 societies, or worshipping assemblies, with 95 ministers and 6,461 members. If the isolated and scattered believers be added to the foregoing, the total would probably be, in round numbers, 10,000. Besides the above, not a few who retain their connection with other Christian bodies are known to favor the teachings of Swedenborg.

The term New Church, or Church of the New Jerusalem, is used by those who adopt it not only because Swedenborg himself uses it, but because his writings seem to them to contain a complete new system of Christian doctrine. Without setting aside anything that is true in the old Christianity, the new system claims to be a deeper unfolding of the Scriptures and of God's nature and purposes as revealed therein. Swedenborg was no organizer of religious institutions, but confined himself to a statement of the principles on which others, at their discretion, may establish them. These all center in three general or essential ones, which relate respectively (1) to God, (2) to Divine revelation or the Scriptures, and (3) to heavenly life and happiness. These three subjects may properly be considered in their order.

Concerning God.—1. God is one in essence and in person, and can never be thought of otherwise without grievous error. 2. Not only did he create all other beings in the beginning, but by the unceasing communication of his life he continually preserves them; so that preservation is perpetual creation. 3. He is, in his essence, perfect love and wisdom. Love is his inmost nature, and wisdom is the means whereby love gives itself expression and carries out its purposes. His love is absolute goodness, his wisdom ab-

solute truth. 4. His Divine Providence is the active operation and oversight of infinite love and wisdom in the government of men. They live because he loves them, and the ruling purpose of his providence is their spiritual and eternal welfare; but true happiness can be realized only in the exercise of freedom. Man is therefore created a free agent. This freedom renders possible a reciprocal relationship between him and God on the basis of mutual love; but it also involves possibilities of an opposite character. Accordingly, the origin of evil is due to man's abuse of his freedom. 5. God can not be known or apprehended by finite men except so far as he is revealed in a manner accommodated to their limited powers of thought and sight. The theophanies, or divine appearances, recorded in the Old Testament were produced by his filling an angel with his presence, and being thus seen as a man. 6. More marked than any of these manifestations was that which found expression in the birth of Jesus Christ, which event, according to the New Church theology, was simply the way in which the one God Jehovah came into nearer and more definite relations with his human family. He clothed himself with their nature so that outwardly he was a man like themselves, but inwardly "the everlasting Father." His nature had at first its own distinct life and consciousness. Being derived, in part, from a finite human mother, it inherited her imperfections, with tendencies to evil and liabilities to temptation. By means of temptations successfully resisted he overcame evil and hell, and thus brought redemption to men. In this process, which was gradually effected, his human nature was wonderfully transformed. Its evil and limiting conditions were put away, and there came down into the place of them the perfect goodness and wisdom of the Father. In other words, his human was glorified, or made divine. He became to eternity "Emmanuel, God with us." The Lord Jesus Christ, as thus embodying in himself all of deity, is the one true object of Christian worship. 7. There is a Trinity in God, though not a Trinity of persons, but a threefold or trinal order of being, such as finds expression in the one person of our Lord Jesus Christ. Man is made "in the image, after the likeness," of God; and in him is a trinity of soul, body, and proceeding life or operation. In God likewise is the inmost and inscrutable Divinity, or the Father; the Divine Human or the Son, bringing the Father forth to view; and the Divine proceeding life or energy, pictured by the Lord's breathing on his disciples. These are the constituent parts or elements of one Divine person, each being essential to a full conception of him.

The Scriptures.—According to Swedenborg, the Bible, or Sacred Scripture, is the veritable Word of God, uttered by him through writers whose minds he used as his instruments. It is divine not only from the fact that God gave it, but also because it partakes of his nature and quality. The truth which it contains is infinite. The natural or literal sense of Scripture is its least and lowest part. Within that sense are higher senses or degrees of meaning, which are distinct from and yet make one with the letter. In other words, the Scriptures are written by what Swedenborg terms correspondences. That is to say, every object, place, or person that is mentioned in them represents something that pertains to the mental or spiritual life of man. By the interpretation of these representatives or correspondences a connected spiritual sense is obtained entirely different from the sense of the letter, and serving to show that the Scriptures, though outwardly clothed in thoughts and language borrowed from natural men, are internally and essentially the living truth of God. The law of correspondence is not arbitrary, but coincides with the law of creation itself; for every natural object exists from a spiritual cause, and is the visible form and embodiment of some particular phase of spiritual life, to which it is said to correspond. Of the relation between the natural and spiritual worlds more will be said below. By means of correspondence the Word is in its literal sense brought down to all possible conditions of human character, so that it may reach every man where he stands, and help him to ascend to a higher state of life. Many correspondences are obvious, and constantly occur in common language. Heat, for instance, corresponds to love, light to wisdom, and water to cleansing truth. Most of Swedenborg's theological writings are devoted to an exposition of the spiritual sense of Scripture by applying thereto the doctrine of correspondence. Of our common Bible, the books of Ruth, Chronicles, Ezra, Nehemiah, Esther, Job, Proverbs, Ecclesiastes, and the Song of Solomon, in the Old Testament, and the Acts and Epistles in the New, have no

continuous spiritual sense, and were not withdrawn from the same full inspiration as the remaining books, were not of that sense. The first chapters of Genesis trace the origin of truth, the history of truth regarding man, and the life of Abraham. The remainder of the Word, with few exceptions, deals with a full history, yet holds the spiritual meaning within.

Heavenly Life and Happiness. All of Swedenborg's teachings are adopted by the different sects, but he gives respecting the other world. He shows that the latter is not far off in space, but an inner realm of being, always present, and bearing the same relation to the world of nature that a man's spirit bears to his body. Indeed, the spirits of all men are living, though unconsciously, in the spiritual world, and when their natural bodies die they wake to a clear perception of its realities. The spiritual body, of which Paul speaks, is an essential part of the human organism. The spiritual world is real and substantial, though intangible to natural senses. It is full of visible persons and objects like those on earth, as appears from the fact that they were seen by the prophets and others when the eyes of their spirits were opened. Such opening is possible to all men, but is seldom permitted, and then only for some special purpose. Swedenborg affirms that it was his own frequent experience, in order that he might understand the things which it was his office to teach; but he warns his readers against the dangers of intercourse with spirits, except when it comes unsought, and so by Divine permission.

Heaven is in its essence a state of the mind, and the same is true of hell. The one is a state which is ruled by love of the Lord and the neighbor; the other, a state in which love of self and the world is supreme. So far as man cherishes heavenly affections he is brought into harmonious relations with heaven, and is actually making heaven his home. In like manner, so far as he cherishes selfish and worldly loves, or—what is the same—indulges his evil tendencies, he brings himself under the influence of infernal spirits, and becomes identified with them. After death he finds a permanent abode in the other world, according to the choice which he has made here. No one is condemned to hell, but each one who goes there condemns himself. The pure atmosphere of unselfish love which rules in heaven is but torment to those who are confirmed in evil, and they turn away from it to a more congenial life and companionship. JAMES KILB.

New Kensington: borough (founded in 1891); Westmoreland co., Pa. (for location of county, see map of Pennsylvania, ref. 5-B); on the Allegheny river, and the Allegheny Valley Railway; 18 miles N. E. of Pittsburgh. It contains 4 churches, 2 school buildings, a bank, a weekly newspaper, and several glass-works, foundry and machine-shop, and reduction, cold-rolled steel, stone, and white-lead works. Pop. 1890 (estimated), 7,000.

EDITOR OF "DISPATCH."

New Lebanon: town; Columbia co., N. Y. (for location of county, see map of New York, ref. 6-J); on the Lebanon Springs Railroad; 24 miles S. E. of Albany. It contains the villages of Lebanon Springs, a summer resort noted for its thermal springs, New Lebanon Center, West Lebanon, New Britain, and Tilden's, and the Shaker community of Mt. Lebanon; is in an agricultural region; and contains a seminary for girls, several hotels, churches, public schools, and manufactories of thermometers, glass, machinery, flour, lumber, pharmaceutical preparations, brooms, and vinegar. Pop. (1880) 2,245; (1890) 1,765.

New Leon: See *NEW YORK*.

New Lexington: village; capital of Perry co., O. (for location of county, see map of Ohio, ref. 6-G); on the Erie, Cent. and the Cin. and Musk. Valley railways; 21 miles S. W. of Zanesville, 53 miles S. of Columbus. It is surrounded by hills containing valuable deposits of coal, and has a coal-mining industry. Pop. (1887) 1,800; (1890) 1,800. town-hall which cost \$12,000, public-school building which cost \$20,000, St. Aloysius Female Academy, a private bank, and two weekly newspapers. The industries are coal-mining and meat-packing. Pop. (1880) 1,800; (1890) 1,770; (1894) 1,800.

New Light and Old Light: names of the two parties in the Associate Synods of Scotland, about 1800, and used later for the two parties in the Reformed Presbyterian Church in the U. S. See *PREBYTERIAN CHURCH*.

New Lisbon: town; Marion co., O. (for location of county, see map of Ohio, ref. 6-G); on the Beaver river, and the Erie and the Pitts., Marion and Chi. Railway; 35 miles E. of Canton, 56 miles W. N. W. of Pittsburgh, Pa. It is in an agricultural, coal, iron, and wool-growing region, and has manufactories of fire-brick, sewer-pipe, and woolen goods, a national bank with capital of \$50,000, a private bank, and four weekly newspapers. Pop. (1880) 2,028; (1890) 2,278.

New London: city (founded in 1646, name changed from Naumag in 1658, plundered and burned by the British in 1781, chartered as a city in 1784); port of entry; one of the capitals of New London co., Conn. (for location, see map of Connecticut, ref. 11-K); on the Thames river, here crossed by a noted bridge (see *BRIDGES*), 3 miles above its entrance into Long Island Sound, and on the Cent. Vt., the N. Y. and N. E., and the N. Y., N. H. and Hart. railways; 40 miles S. E. of Hartford, 50 miles E. of New Haven. The site rises from the river to a series of hills back of the city and commands an attractive stretch of scenery. The harbor is considered the best on the Sound, is 3 miles wide and 30 feet deep, thoroughly protected against storms and floating ice, defended at its entrance by Fort Trumbull, and was once the base of large commercial operations. New London has daily steamboat communication with New York, is much frequented in summer by tourists, and contains many summer residences of people doing business elsewhere. There are 12 churches, the Bulkeley High School for boys, the Williams Memorial Institute for girls, the Haven Public Library building, the New London County Historical Society (with valuable library), 3 national banks with combined capital of \$550,000, 2 savings-banks with surplus of nearly \$400,000, a State bank with capital of \$300,000, and a weekly, a quarterly, and 3 daily periodicals. The city has ample water, sewerage, gas, and electric light plants, and contains 4 ship-yards, extensive silk-mills, iron-foundries, woolen-mill, cotton-gin factory, large sawmill, printing-press manufactory, and many minor industries. The river here is a favorite racing-course for college rowing-clubs. Above the city and on the opposite side of the river the U. S. Government has established a naval station. Among the attractions is Fort Griswold, an earthwork with a small battery, the scene of a massacre on Sept. 6, 1781, which is commemorated by a shaft 127 feet high. Pop. (1880) 10,537; (1890) 13,757.

EDITOR OF "TELEGRAPH."

New London: city; Waupaca co., Wis. (for location of county, see map of Wisconsin, ref. 5-E); at the confluence of the Wolf and the Embarras rivers, and on the Chi. and N. W. and the Green Bay, Win. and St. P. railways; 21 miles W. N. W. of Appleton, 39 miles W. S. W. of Green Bay. It is in an agricultural and lumber region; has planing, saw, and flour mills, breweries, and screen door and window, furniture, excelsior, and embossed-wood factories; and contains a private bank, weekly newspaper, and water for domestic purposes pronounced the purest in the State. Pop. (1880) 1,808; (1890) 2,050; (1895) 2,494.

EDITOR OF "TELEGRAPH."

Newman, EDWARD, F. L. S.: entomologist; b. at Hampstead, England, May 13, 1801; began in childhood to study natural history, especially entomology; established and edited *The Entomologist* (London, 1831-75); *Transactions of the Entomological Society of London* (1831-75); *The Zoologist* (1841-44); *The Philologist* (1844-45); in 1840 a publisher, and issued, besides many popular works by other writers, his own *History of British Ferns* (1840); *Dictionary of British Birds* (1866); *Illustrations of the History of British Butterflies* (1866); *Illustrations of the History of British Butterflies* (1871), and several minor treatises. He gave almost exclusive attention for several years to insects injurious to vegetation. D. June 12, 1876.

Newman, FRANCIS WILLIAM, LL. D.: author; b. in London, June 27, 1805; educated at Ealing and at Worcester College, Oxford, and graduated with double first-class honors 1826; was fellow of Balliol 1826-30, when he resigned on account of theological objections to subscribing the Thirty-nine Articles; traveled extensively in the East, acquiring a familiar knowledge of Arabic and of Oriental literature, but gradually becoming widely alienated from Anglican theology; was classical tutor in Bristol College from 1834-40, Professor of Classics at Manchester New College, London, 1840-46, and Professor of the Latin Language and Literature at University College, London, 1846-63; since that time has devoted himself exclusively to literature. Similar in mental characteristics to his brother, he has diverged from the Christian and the English Church.

tion, though the title of his first book betrays the same longing for ecclesiastical unity which led Dr. John H. Newman to the Church of Rome. He is the author of *Catholic Union: Essays toward a Church of the Future and the Organization of Philanthropy* (1844); a scholarly *History of the Hebrew Monarchy* (1847); *The Soul, its Sorrows and Aspirations* (1849; n. e. 1882); a remarkable autobiography entitled *Phases of Faith, or Passages from the History of my Creed* (1850; n. e. 1891); *The Odes of Horace translated into Unrhymed English Meters* (1853); *The Iliad of Homer translated into Unrhymed English Meters* (1856); *Theism, Doctrinal and Practical* (1858; n. e. as *Hebrew Theism*, 1874); an *English-Arabic Dictionary* in Roman type (2 vols., 1871); *Early History of Cardinal Newman* (1891); besides treatises on many other subjects, including mathematics, social science, politics, elocution, philology, and general literature, which exhibit great scholarship and wonderful versatility. Some have been gathered up in his *Miscellanies* (4 vols., 1869-90). Revised by S. M. JACKSON.

Newman, JOHN HENRY, D. D.: religious leader; b. in London, Feb. 21, 1801; educated at Ealing and at Trinity College, Oxford; graduated B. A. 1820; was chosen a fellow of Oriel 1823; took Anglican orders 1824; was vice-principal of St. Albans Hall 1825-26; tutor of Oriel 1826; opposed Catholic emancipation 1829; was one of the university preachers 1830; joined with Hurrell Froude in forming a conservative Anglo-Catholic party within the Church of England; visited Rome and Sicily 1832-33; took part with Keble and Pusey in originating the Oxford Movement; was a leader in the propaganda of High Church doctrines by means of the celebrated *Tracts for the Times*; rapidly developed his tendencies toward Roman Catholicism; was in 1828-43 incumbent of St. Mary's, Oxford, and chaplain of Littlemore, and acquired great fame as a preacher and writer; founded at Littlemore in 1842 a community of ascetics. In 1845 he joined the Roman Catholic priesthood, and in 1849 established a branch of the brotherhood of St. Philip Neri at Edgbaston, where he took up his residence. He delivered lectures on *Anglican Difficulties* in 1850, and on *Catholicism in England* in 1851. The latter, in which he depicted the popular prejudices against Roman Catholics with great powers of irony and satire, gave rise to an action for libel by Dr. Giovanni Giacinto Achilli. The verdict went against Newman, and he was condemned to pay £100, after a famous trial which cost him upward of £10,000, for which he was reimbursed by his friends. He wrote a number of the *Tracts for the Times* (1833-41), including the famous *Tract No. 90*; *Parochial Sermons* (6 vols., London, 1834-42); *Essay on Development of Christian Doctrine* (1845); *Arians of the Fourth Century* (1833); *Theory of Religious Belief* (1844); *Loss and Gain* (1848); *Callista, a Sketch of the Third Century* (1855); *Apologia pro Vita Mea* (1864), afterward recast as *A History of my Religious Opinions* (1865); *An Essay in Aid of a Grammar of Assent* (1870); *A History of Arianism* (1875); many sermons, lectures, essays, poems, and other works, including a reply to Gladstone's pamphlet on *The Vatican Decrees* (1875) and *A Letter addressed to His Grace the Duke of Norfolk*. He was made a cardinal May 12, 1879. D. at Edgbaston, Birmingham, Aug. 11, 1890. See his *Letters*, written while in the Church of England (2 vols., 1891), and E. A. Abbott, *Anglican Career of Cardinal Newman* (2 vols., 1892). Revised by S. M. JACKSON.

Newman, JOHN PHILIP, D. D., LL. D.: bishop; b. in New York city, Sept. 1, 1836; educated at Cazenovia Seminary; became a minister of the Methodist Episcopal Church; was for several years pastor of the Metropolitan Methodist Episcopal Church, Washington, D. C., and chaplain of the U. S. Senate 1869-74; was pastor Madison Avenue Congregational Church, New York, 1882-84. In 1886 he again became pastor of the Metropolitan Methodist Episcopal Church. He was elected bishop May 24, 1888, and settled in Omaha, Neb. He is a member of the Society of Biblical Archaeology, and author of *From Dan to Beersheba: The Thrones and Palaces of Babylon and Nineveh* (1875); *Christianity Triumphant* (1884); *America for Americans* (1887); *The Supremacy of Law* (1890). Revised by A. OSBORN.

Newmarket: town of England; partly in the county of Cambridge, partly in that of Suffolk; 69 miles N. N. E. of London (see map of England, ref. 10-K). It is the seat of the most famous race-course in England, and in 1891 had 6,213 inhabitants, most of whom are jockeys, grooms, trainers, and stablemen.

Newmarket: post-village of York County, Ontario, Canada; on the Northern Railway; 34 miles N. of Toronto (see map of Ontario, ref. 4-D). It has two weekly newspapers, important manufactures, and trade. Pop. of sub-district (1891) 2,143.

New Market: town; Rockingham co., N. H. (for location of county, see map of New Hampshire, ref. 10-G); on the Lamprey river, and the Boston and Maine Railroad; 14 miles W. of Portsmouth, 38 miles E. of Concord. It contains a national bank with capital of \$80,000, a town library (founded 1872), and a daily and two monthly periodicals, and is principally engaged in the manufacture of cotton goods. Pop. (1880) 2,368; (1890) 2,742.

EDITOR OF "ADVERTISER."

Newmarket Road, BATTLE OF: See FRAZIERS FARM, BATTLE OF.

New Mecklenburg, or New Ireland (native *Tambara*): an island of the Bismarck Archipelago, N. E. of New Guinea. It is the second largest island of the group, and is separated from the largest (New Pomerania) by a strait so narrow that it was long undiscovered, and was later half choked by a volcanic eruption near it. It is about 200 miles long by 20 or 30 broad, lies N. W. and S. E., and contains about 4,000 sq. miles. It is generally mountainous, higher at the western end. It is but little known, and attempts to colonize have been unsuccessful. In climate and population it is similar to NEW POMERANIA (q. v.). It is under German protection. M. W. HARRINGTON.

New Mexico: one of the Territories of the U. S. of North America (Western group); organized Sept. 9, 1850; capital, Santa Fé.

Location and Area.—It lies between 31° 20' and 37° N. lat., and 103° 2' and 109° 2' W. lon.; is bounded on the N. by Colorado, on the E. by Indian Territory and Texas, on the S. by Texas and Mexico, on the W. by Arizona; length from N. to S., 345 miles on the east side, 380 miles on the west side; breadth from E. to W., 330 miles on the north line, 352 miles on the south; area, 122,580 sq. miles (78,451,300 acres).

Seal of New Mexico.

Physical Features.—New Mexico forms a part of the lofty table-land which is the foundation of the Rocky Mountain ranges, as well as those of the Sierra Madre. This table-land gradually slopes southward to the Llano Estacado, or Staked Plain, and to El Paso. The Llano Estacado is a broad, almost level, treeless, and waterless plain, extending over three or four degrees of longitude and nearly as many of latitude, which is apparently barren, but is capable, if irrigated, of yielding large crops. From the elevated table-land there rise hundreds of summits of the Rocky Mountains, and W. of the Rio Grande the peaks of the Sierra Madre lift themselves from 3,000 to 10,000 feet above the mesa or plateau. The mountain chains E. of the Rio Grande valley are known locally as the Guadalupe, Sacramento, and Organ Mountains, and still farther E. the Sierras Blanca, Hueca, Capitana, etc., which form the western boundary of the valley of the Rio Pecos. W. of the Rio Grande the Sierra Madre is divided into numerous chains and some isolated peaks. The principal of these mountain chains are the Sierra San Mateo, the Zúñi Mountains, the Sierra del Datil, and the Sierra Mimbres. Still farther W. the San Juan Mountains enter New Mexico from Colorado, and the heavy masses of the Mogollon Mountains and the Pinaleno, Peloncito, and Chiricahua Mountains from Arizona. The principal river of New Mexico is the Rio Grande, which has a general direction from N. to S., but is not navigable in any part of its course through New Mexico. It re-





comes from the W. two tributaries, the Rio Chama and the Rio Puerco, and from the E. a very strong stream, the Rio Pecos, a large tributary of the Rio Grande, which is situated about 100 miles from the mouth of the Rio Grande, and two or three of its branches the northeastern. The western portion is drained by the Rio Grande, and the Rio Grande river and its tributaries, and the Rio Grande is the San Juan, the Colorado, and the Gila, and the Rio Grande has three or four considerable tributaries.

Soils and Vegetation.—The country is generally richly covered (where they are not basaltic) with pine, cedar, spruce, and other evergreens. The foot-hills have extensive tracts of piñon or nut-pine and a smaller cedar, and in the river-bottoms are belts of cottonwood, sycamore, and other deciduous trees. In the southern part there are numerous groves of oak and walnut; in the Llano Estacado the mesquite, *Prosopis juliflora*, is found to the height of 20 feet. In the southern and southwestern portions the tree-cactus is a marked feature in the landscape. There are many indigenous grasses, the most widely spread and valuable of all being the nutritious *mesquite* or *grama* grass, which grows during the rainy season of July and August, ripens in the autumn, and dries on its stalk, furnishing to cattle, in its stalks and rich seeds, a valuable and natural hay of which they are exceedingly fond. The arable soils, under the influence of irrigation, yield fair crops. The U. S. census of 1890 showed a total of 3,085 farms under irrigation in New Mexico, not including those of Pueblo Indians. The irrigated area actually in crop amounted to 91,745 acres. The average value of products per acre was \$12.80, and the average annual cost of water \$1.54 per acre. The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in New Mexico:

FARMS, ETC.	1880.	1890.	Percent.
Total number of farms	1,428	3,085	214.8
Total acreage of farms	78,882	78,882	100.0
Total value of farms	\$8,400,000	\$8,400,000	100.0

* Decrease.

* Increase.

The following table shows the average yield, and value of the principal crops in the calendar year 1893:

CROPS.	Acre.	Yield.	Value.
Corn	2,700	60,422 bushels	\$10,800
Wheat	1,100	64,100 "	108,000
Oats	11,000	23,408 "	107,000
Indian corn	1,100	1,000 "	1,000
Peas	1,000	1,000 "	1,000
Hay	20,000	82,880 tons	704,480
TOTALS	117,948		\$108,800

On Jan. 1, 1894, the farm animals comprised 92,963 horses, value \$1,468,597; 3,747 mules, value \$117,530; 18,400 milch cows, value \$368,000; 1,224,546 oxen and other cattle, value \$11,556,533; 2,921,188 sheep, value \$3,689,169; and 27,521 swine, value \$204,590; total head, 4,288,365—total value, \$17,044,329.

Minerals.—Gold and silver are abundant. The oldest mining districts are the Old and New Placers, Pinos Altos, Cimarron, Arroyo Hondo, Manzano, and Moreno, and tracts in the Organ Mountains, the Sierras Blanca, Carriza, Jicarilla, and the Mogollon and Magdalena Mountains. The director of the U. S. mint estimated the product of gold from New Mexico mines in 1892 at 45,956 fine ounces, valued at \$950,000, and of silver at 1,075,000 ounces, having a coining value of \$1,389,899. The output of silver and lead decreased, while that of gold increased, since 1890. Copper is found in very rich ores in several parts. The product in 1891 was 1,233,197 lb. Galena mines in the Organ Mountains yield 80 per cent. pure lead, and are estimated to be worth of silver to the ton. Iron and salt are abundant. Anthracite coal is found in the Placer Mountains on the east border of the Rio Grande valley, 30 or 40 miles S. S. W. of Santa Fé, and bituminous in nearly every county. The production in 1892 was at Gallup, 292,650 tons; at Blosburg and Raton, 244,955 tons; at Cerrillos, 18,717 tons; at Monero, 20,000 tons; and at Carthage, 49,529 tons—total, 625,881 tons. Gypsum is found in several counties, and a remarkably large and pure deposit exists on the San Augustin Plains in Donna Ana County, near an extinct volcano and a salt lake. A large deposit of pure and extra fine sand

is found in the Rio Grande valley, and in the Rio Grande river or lake. Valencia, Mora, and Taos Counties also contain carbonate of soda. Valuable deposits of fine clay have been found near Socorro and near Santa Fé, and there is a bed of superior kaolin in the suburbs of Santa Fé. Large beds of alum have been discovered, and some of them worked, on the Gila river. New Mexico is rich also in precious stones, and the production is steadily increasing. The most valuable are emeralds, turquoise, euclase, sapphires, garnets, milk and fire opals, peridots, and agates. The petrified woods are largely used by jewelers for inlaid work. There are numerous mineral springs in New Mexico, and the hot springs, about 5 miles from Las Vegas, and at Ojo Caliente, in Taos County, have a very high reputation. The temperature varies from 80 to 140 F.

Climate.—The climate, though varied, is dry. In the N. the range of the thermometer is between 10 and 75 F. In the S. the temperature is very mild, the thermometer rarely indicating as low a temperature as 32°. The rainy season in the southern part is in July and August. The amount of annual rainfall is 15-80 inches. The prevalent winds are E. S. E., S. W., W., and N. The climate has justly a high reputation for healthfulness.

Divisions.—For administrative purposes New Mexico is divided into eighteen counties, as follows:

COUNTIES AND COUNTY TOWNS, WITH POPULATIONS.

COUNTIES.	* REG.	POP. 1880.	POP. 1890.	COUNTY TOWNS.	POP. 1890.
Bernalillo	10-Q	17,225	20,913	Albuquerque	3,785
Chavez	12-U	1,000	1,000	Las Alamos	1,383
Colfax	9-T	3,398	7,974	Raton	1,255
Donna Ana	14-R	7,612	9,191	Las Cruces	1,255
El Paso	14-U	1,000	1,000	El Paso	1,000
Grant	14-P	4,650	9,657	Santa Fe	2,102
Guadalupe	11-U	1,000	1,000	Puerto de Luna	1,000
Huerfano	12-S	2,513	7,081	Laguna	1,000
Mora	9-T	9,751	10,618	Mora	1,000
Rio Arriba	9-R	11,024	11,534	Tierra Amarilla	1,000
San Juan	9-P	1,000	1,000	Aztec	1,000
San Miguel	10-S	2,000	21,504	Las Vegas	1,000
Santa Fé	10-S	10,867	14,562	Santa Fé	6,185
Socorro	11-R	1,000	1,000	Hillsboro	1,000
Sueño	12-Q	7,871	9,595	Socorro	1,000
Taos	9-R	11,029	11,029	Taos	1,000
Terrace	9-U	1,000	1,000	Canyon	1,000
Valencia	11-Q	1,000	13,876	Los Lunas	1,000
Totals		117,948	209,000		

* Registered for location of counties since 1890.

* Estimated since 1890 census.

* Estimated since 1890 census.

Principal Cities and Towns, with Population for 1890.—Santa Fé, 6,185; Albuquerque, new, 3,785; Las Vegas, 2,385; East Las Vegas, 2,385; Silver City, 2,102; Albuquerque, old, 1,733; Socorro, 1,601; Raton, 1,255; and Deming, 1,136.

Population and Races.—1860, 93,516; 1870, 91,574; 1880, 119,565; 1890, 153,593 (native, 142,334; foreign, 11,259; males, 83,055; females, 70,538; white, 142,719; colored, 10,874, comprising 1,956 persons of African descent, 361 Chinese, 3 Japanese, and 8,554 civilized Indians).

Industries and Business Interests.—The principal industries are silver, gold, and coal mining, stock-raising, and agriculture. Manufacturing is in its infancy. The census of 1890 showed that 127 manufacturing establishments reported. These had a combined capital of \$965,938, employed 1,944 persons, and produced goods valued at \$601,420 for materials, and had products valued at \$1,516,195.

Finance.—In 1893 the assessed valuation of taxable property was \$41,602,198. The wealthiest counties in their order were: Bernalillo, assessed valuation, \$6,430,243; San Miguel, assessed valuation, \$4,985,605; Grant, assessed valuation, \$4,341,208; Colfax, assessed valuation, \$3,828,900; Socorro, assessed valuation, \$3,433,016; and Donna Ana, assessed valuation, \$3,022,044. The bonded debt on Feb. 1, 1894, was \$920,000; floating, \$5,000. There were also old militia warrants outstanding aggregating \$650,000, a portion of which was believed to be fraudulent, and none of which is officially included in the statements of public indebtedness.

Banking.—In 1893 there were 10 national banks with combined capital of \$750,000, surplus and profits of \$228,298, and individual deposits of \$1,381,547; 2 other banks with capital of \$113,800, surplus of \$10,402, and deposits of \$304,347; and 2 savings-banks with capital of \$80,000, surplus of \$13,770, and deposits of \$186,923.

Production and Exports.—On the 1st of January,

276 post-offices, of which 11 were presidential (2 second-class, 9 third-class) and 265 fourth-class. The newspapers and periodicals comprised 7 daily, 48 weekly, 1 semi-monthly, and 1 monthly; total, 57.

Libraries.—In 1892 there were reported 5 public libraries of 1,000 volumes and over, which contained 11,154 bound volumes and 3,230 pamphlets. The libraries were classified as follows: College, 3; law, 1; and garrison, 1.

Means of Communication.—The total railway mileage of New Mexico on June 30, 1891, was 1,401. In 1893 the Legislature passed an act exempting from taxation for six years after completion any new railway lines or extensions of existing ones begun and partially opened for traffic within three years.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organizations.	Churches and halls.	Members.	Value of church property.
Roman Catholic	317	347	100,576	\$296,755
Methodist Episcopal	32	22	1,750	71,200
Presb. in the U. S. of America	39	39	1,275	45,675
Methodist Episcopal South	25	25	518	32,600
Church of Jesus Christ of Latter-day Saints	5	5	442	1,432
Baptist	15	5	355	23,000
Congregational	4	4	175	17,800

Schools.—In 1891 the Legislature passed an act establishing a common-school system under direction of a board of education, consisting of the Governor, the superintendent of public instruction, and the presidents of the university, of the Agricultural College, and of St. Michael's College. According to the official report of Dec. 31, 1892, there were 43,999 children of school age, of whom 23,151 were enrolled in the public schools, and 15,832 were in average daily attendance. There were 532 school districts, 508 schools, and 557 teachers, many of whom taught both in English and Spanish; but English is required to be taught by law, and is taught in every public school in New Mexico. The total receipts for public-school purposes were \$247,688. The institutions for advanced instruction are the University of New Mexico, at Albuquerque; Agricultural College, at Las Cruces; School of Mines, at Socorro; and the New Mexico Military Institute, at Roswell. Under the supervision and control of the Roman Catholic Church are public schools in Albuquerque, San Miguel, and Los Alamos; parochial and select schools in Albuquerque, San Miguel, Santa Fé, Mesilla, Los Alamos, and Las Vegas; St. Vincent's Academy, in Albuquerque; an academy in Silver City; Academy of Our Lady of Light, in Santa Fé; St. Joseph's Convent, in Fernandez de Taos; Annunciation Convent, in Mora; Academy of the Immaculate Conception, in Las Vegas; Academy of the Visitation, in Las Cruces; Convent of Our Lady of the Sacred Heart, in Bernalillo; Convent of Our Lady of Mount Carmel, in Socorro; and St. Michael's College, in Santa Fé; and a number of schools for Indian children.

Charitable, Penal, and Reformatory Institutions.—An orphan asylum, a hospital, and a sanitarium are maintained in Santa Fé under the direction of Roman Catholic Sisters of Charity. Silver City has a hospital conducted by the Sisters of Mercy. The New Mexico penitentiary and a public deaf and dumb asylum are maintained in Santa Fé.

History.—At the time of the discovery of the American continent New Mexico had a large and industrious population, either Aztec or Toltec, who had their walled towns, their stone dwellings several stories in height, their manufactures of cotton and wool, their rude but effective weapons of war, and who cultivated and irrigated the soil and gathered therefrom large crops. They were idolaters. The Spanish adventurers Alvar Nuñez, Marco de Niza, and Coronado penetrated to this region in 1537, 1539, and 1540. In 1581-82 the country was explored by Spanish adventurers, from whose account it was named New Mexico. Between 1595 and 1599 Juan de Oñate was sent thither by the Viceroy of Mexico to establish forts, colonies, and missions, and to take possession of the whole country in the name of the King of Spain. Oñate was successful, but in 1680 the Indians rose and drove the Spaniards out of the country. In 1698 the Spaniards regained a portion of their former power. In 1822 the inhabitants of New Mexico united with those of Mexico in throwing off the yoke of Spain, and thenceforward, until 1846, they were governed in the same way with the other states of Mexico. In 1846 Gen. Stephen

Kearny, with a small U. S. force, captured Santa Fé, and soon after conquered the whole Territory and raised the U. S. flag there. In 1848 the region was ceded to the U. S. by the treaty of Guadalupe Hidalgo. By the treaty of Dec. 30, 1853, what was known as the Gadsden purchase was added to the Territorial area, which then comprised the whole of Arizona and a portion of what is now Colorado. Arizona was set off from it in 1863 and the portion of Colorado in 1865. During the early part of the civil war New Mexico was the scene of a protracted and bloody strife. In 1859 the Legislature passed a law recognizing the existence of slavery in the Territory, but this was repealed in 1861, and with it was abolished the system of peonage—a modified slavery which had existed for two and a half centuries.

Efforts to secure the admission of New Mexico into the Union as a State were begun prior to its creation as a Territory. In 1874-75 both Houses of Congress adopted a bill to provide an enabling act for the admission of the Territory as a State, but some Senate amendments were not voted on in the House, and the bill failed. In 1876 the Senate again adopted its bill, but it was not acted on by the House during that Congress. Nothing further was done till the summer of 1894, when both Houses passed an enabling act. This bill made the usual provision for the formation and ratification of a constitution and the organization of a State government. It provided for the guarantee of perfect toleration of religious beliefs, for the assumption and payment by the State of the debts and liabilities of the Territory, and for the establishment and maintenance of a system of public schools free from sectarian control. The bill also appropriated 64,000 acres of land for the erection of public buildings at the capital; 100,000 acres for the support of an agricultural college; 500,000 acres for permanent water-reservoirs; 46,000 acres for the support of a State university; 100,000 acres for an insane asylum; 200,000 acres for State normal schools; 100,000 for a State school of mines; 100,000 for a deaf and dumb asylum; 100,000 for a State reform school; and 8,600,000 acres for miscellaneous purposes—in all, 9,910,000 acres.

GOVERNORS OF NEW MEXICO.

James S. Calhoun	1851-52	Lewis Wallace	1878-81
William C. Lane	1852-53	Lonel A. Sheldon	1881-85
Solon Borland	1853	Edmund G. Ross	1885-89
David Merriwether	1853-57	L. Bradford Prince	1889-93
Abraham Kencher	1857-61	W. L. Thornton	1893-97
Henry Conolly	1861-65		
Robert B. Mitchell	1865-67		
W. F. M. Army (acting)	1867-69		
William A. Fife	1869-71		
Marsh Giddings	1871-76		
Samuel B. Axtell	1876-78		

Revised by ANTONIO JOSEPH.

New Milford: town (founded in 1703); Litchfield co., Conn. (for location of county, see map of Connecticut, ref. 9-D); on the Housatonic river, and the N. Y., N. H. and Hart. Railroad; 16 miles N. of Danbury, 36 miles N. by W. of Bridgeport. It contains five churches, several public and private schools, library (founded 1886), a national bank with capital of \$125,000, a savings-bank, a private bank, and a weekly newspaper. It is the center of the tobacco industry of the Housatonic valley, and has two hat-factories, a pottery, and minor industries. Pop. (1880) 3,907; (1890) 3,917.

EDITOR OF "GAZETTE."

Newnan: city; capital of Coweta co., Ga. (for location of county, see map of Georgia, ref. 3-F); on the Atlantic and W. Point and the Cent. of Ga. railways; 29 miles S. of Atlanta. It contains 7 churches, 2 national banks with combined capital of \$150,000, Walker High School, College Temple Library (founded 1853), and a weekly newspaper. There are harness, furniture, and cigar factories, marble-works, cottonseed-oil mill, ice-factory, cotton-mills, distilleries, a manufactory of engines, boilers, saw and grist mills, cotton-presses, and several tanneries. There are large fruit interests in the vicinity. Pop. (1880) 2,006; (1890) 2,859; (1894) estimated, 3,300, with suburbs, 4,500.

EDITOR OF "HERALD AND ADVERTISER."

New Nantucket: See BAKER ISLAND.

New Netherlands: the old name of the country situated between Delaware and Connecticut rivers. The exclusive right to trade here was granted Oct. 11, 1614, by the states-general to the explorers. In 1623 New Netherlands was made a province or county of Holland, and the states-general granted it the armorial distinction of a count. In Sept., 1664, the colony of New Netherlands, which Charles



It had granted to his brother, the Duke of York, was conquered by the capture of New Amsterdam.

Newnham College: an institution at Cambridge, Eng. land, formed by the amalgamation of the old and new visiting hostesses for women at Cambridge and the college for providing a hall of residence for women attending lectures. It was incorporated in 1880. The college stands on a site of about 80 acres, and contains a large building for the principal and vice-principals, with resident lecturers, and about 140 students. The main buildings are Great Hall, Old Hall, and Sidgwick Hall. The library numbers 7,400 volumes. The number of resident ladies, 1894, is ten, of students 152. In 1881 the University of Cambridge opened to students of Newnham and Girton Colleges its tripos and previous examinations. There is a system of instruction by correspondence in connection with the college. Instruction is provided for partly by lectures given at Newnham College, and partly by lectures of the university and the colleges of the university that are open to students. A complete course of study involves preparation for a tripos examination for which the usual length of residence is three years. There are a considerable number of scholarships of the annual value of £50. The first principal, Miss A. J. Clough, died in 1892, and was succeeded by Mrs. Henry Sidgwick, the wife of Prof. Sidgwick. Miss Helen Gladstone and Miss Jane Lee are the vice-principals. The college is governed by a council, most of the members of which are connected with Cambridge University. C. H. THURBER.

New Orleans [named in honor of the Duke of Orleans]; city; capital of Orleans parish, La. (for location, see map of Louisiana, ref. 10-F); second city in exports and twelfth in population in the U. S.; on both banks of the Mississippi river, 107 miles from its mouth. It is 960 miles in direct line S. W. of Washington, and 700 miles from St. Louis. From the fact that it was originally built within a great loop of the Mississippi, the city derived its sobriquet of the Crescent City. The present form, due to gradual expansion along the banks of the river, is rather that of the letter S. The city embraces nearly the whole of the parish of Orleans, or about 155 sq. miles; but the settled area hardly exceeds 40 sq. miles. The Mississippi in front of the city has a width in places of 3,000 feet, and a maximum depth of 208 feet; total length of actual harbor, 7 miles on each bank. The jetties at the mouth of the river permit vessels of the highest tonnage to come directly to the city. By a canal in the rear New Orleans has water communication with Lake Pontchartrain. The chief railways are the Illinois Central, Southern Pacific, Louisville and Nashville, Texas and Pacific, New Orleans and Northeastern, and the Yazoo and Mississippi Valley. Of street-railways there are about 115 miles.

Plan and General Appearance. New Orleans was laid out in rectangular form, with ramparts on three sides and a fort at each corner. The plan of the city is now very irregular, as the streets follow the curving lines of the river. The land is low and flat, its greatest elevation being 10 ft. 8 in. above sea-level. It is protected from the waters of the river by a high levee; but during the spring floods these waters occasionally overflow and submerge portions of the city. The drainage is toward the lake, which in times of high wind overflows the settlements in the rear of the city.

The city is divided by Canal Street into two portions, the Creole and the American. In the Creole quarter or *Vieux Carré* the streets are narrow and the houses are welded into compact blocks, except at the lower extremity, or Esplanade Avenue. It is, however, the most interesting portion of the city, for here are the old cathedral, the Cabildo, and many other relics of French and Spanish domination. In the American quarter, besides the business portion, are residences surrounded by stretches of green turf, beds of flowers, and clustering trees, among which are the great magnolia, the pulmetto, the palm, the fruit-bearing banana, the fig, and the orange-tree. The climate is tropical. The proximity of the lake and the river renders the atmosphere very moist and equalizes the temperature. The highest average summer temperature is 94° F., and the lowest average in winter is 27° F. The total length of the streets is about 560 miles, of which only about 125 miles are paved.

The area of public squares and parks within the inhabited portion is about 660 acres, but only the squares can be regarded as improved. Chief among the parks are the old City Park and Audubon Park, at the western end of the city, which contains 250 acres and was the site of the Cotton

Exposition of 1884-85. There are, besides, numerous well-kept open squares, among them Congo Square, where the slaves once held the voodoo rites, Lafayette Square, which fronts the city-hall, and Jackson Square, the old Place d'Armes, which was the scene of some of the most important events in Louisiana history.

Buildings.—Among the notable buildings are the U. S. custom-house and post-office, covering a whole square and built of granite; city-hall, of granite, modeled after the Temple of Minerva at Athens; the cathedral on Jackson Square, the Supreme Court buildings (old Cabildo), the mint, the cotton exchange, the archbishop's palace, the Howard Library, and the new buildings of Tulane University. The St. Charles Hotel, the most famous hostelry in the South, was destroyed by fire in 1894. The old St. Louis Hotel, now reconstructed, and the State Capitol, is now the Hotel Royal.

One of the most remarkable features of New Orleans is the system of disposing of the dead. As water is generally found at a depth of a few feet, it is customary to place the remains of the dead, except those of the poorest classes and the Jews, in tombs of brick or marble rising in several tiers above ground.

Churches.—New Orleans has 145 churches, divided denominationally as follows: Baptist, 35; Roman Catholic, 32; Methodist Episcopal, 22; Presbyterian, 13; Methodist South, 11; Protestant Episcopal, 11; Congregational, 7; Jewish, 6; Swedish Lutheran, 5; Christian, 1; Unitarian, 1; Greek, 1.

Schools and Colleges.—In 1894 there were 48 public schools for white children and 12 for colored, and 126 private schools for the former and 17 for the latter. The public-school enrollment was 19,728 whites and 5,976 colored; the schools for white children had 482 teachers and those for colored 48, and the total cost of the public schools was \$351,000. The private-school enrollment was 14,154 whites and 2,456 colored. There are no mixed schools.

The only university for white people is **TULANE UNIVERSITY** (*q. v.*). There are four universities for colored people: Southern University, a State institution which receives \$10,000 a year from the State; Straight University, Congregational, established in 1869 by the American Missionary Association; New Orleans University, opened in 1865 and supported by the Freedman's Aid Society of the Methodist Church; and Leland University, Baptist, incorporated in 1870. Among the colleges for white people are Soule's Business College, College of the Immaculate Conception (Jesuit), and Ursuline Convent for Women (Roman Catholic).

Charitable Institutions.—The most noted charitable institution is the Charity Hospital, built in 1832, which receives from the State \$80,000 annually. The Touro Infirmary was endowed by a Hebrew philanthropist, Judah Touro, and costs for maintenance about \$30,000 annually. There is also a Jewish Home for Widows and Orphans, maintained by Israelites. The institutions supported by the city are the Home for Aged and Infirm, House of Refuge for Boys, and an insane asylum. There are twenty asylums for orphans and friendless children. The chief public libraries are the Fisk Free, containing 12,000 volumes; the State, 39,000 volumes; and the Howard, 29,000 volumes.

Finances.—The city comptroller's reports for 1893 gave the following figures: Receipts (including sale of railway franchise for \$700,000), \$4,459,340; expenditures, \$3,741,950; total bonded debt, \$15,335,037; valuation of real estate, \$95,047,560; personal property, \$41,920,097—total, \$136,967,657. Tax-rate, \$2 per \$100.

Commerce.—The commercial receipts and shipments for the year ending Sept. 1, 1893, were:

RECEIPTS AND SHIPMENTS.		Value.
By railroads	1,000,000,000	\$1,000,000,000
By water	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
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By post-office	1,000,000,000	\$1,000,000,000
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By telegraph	1,000,000,000	\$1,000,000,000
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By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
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By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
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By telegraph	1,000,000,000	\$1,000,000,000
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By post-office	1,000,000,000	\$1,000,000,000
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By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
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By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
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By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
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By express	1,000,000,000	\$1,000,000,000
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By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
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By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
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By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
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By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
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By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000,000,000	\$1,000,000,000
By post-office	1,000,000,000	\$1,000,000,000
By express	1,000,000,000	\$1,000,000,000
By mail	1,000,000,000	\$1,000,000,000
By telegraph	1,000,000,000	\$1,000,000,000
By telephone	1,000	

Manufactures.—The chief manufactures in 1892 were: Tobacco, \$3,243,708; lumber, \$8,964,320; sugar, refined, \$8,352,500; cottonseed products, \$7,368,800; rice-cleaning, \$5,233,312; malt liquors, \$4,285,450; foundry and machine-shop products, \$2,459,625; cotton goods, \$1,426,280; cooperage, \$1,190,041; and furniture, \$1,483,000.

Banking.—In 1894 there were 9 national banks with combined capital of \$3,125,000; 7 State banks with combined capital of \$2,230,000; 2 private banks; and a commercial bank. The bank clearances in the previous year aggregated \$527,830,300.

The Mardi-gras Carnival.—A unique feature of New Orleans is the annual celebration of the carnival, which takes place on Shrove Tuesday, or Mardi gras. It originated some twenty years before the civil war, but since then the celebration has been on a grander scale. It is far more splendid than the carnivals of Nice, Rome, and other continental cities, and annually attracts to New Orleans thousands of visitors. Though Mardi gras itself is the most important occasion, the festivities begin on the previous Thursday with a ball given by a secret organization called the Knights of Momus. On the following Monday evening there is a street parade and a ball given by a similar organization called the Knights of Proteus. On Mardi gras itself the whole city is given over to gaiety. Thousands of maskers throng the streets from sunrise to sundown, when the law requires all masks to be laid aside. At 11 o'clock in the morning occurs the parade of Rex, the king of the carnival, and in the evening the king and queen hold a reception. On Tuesday evening there is a second parade and ball, given by the Mystic Krew of Comus, both the ball and the parade being the crowning events of the carnival season. The parades consist of series of floats drawn through the streets by mules, and representing scenes taken from myth, history, and fiction. While the organizers of these pageants are not known with absolute certainty, it is generally understood that they are the members of the two most prominent clubs, the Boston and the Pickwick.

History.—The city was founded in 1718 by Sieur de Bienville, second governor of Louisiana under the French domination; was named in honor of the Duke of Orleans, regent of France; and was the capital of Louisiana in 1722-1852 and 1865-80. For many years the city experienced the usual vicissitudes of French colonial settlements. When Louisiana became a royal province and restrictions on commerce were practically removed, New Orleans began to increase in population and trade. On the transfer of the province to Spain, the city was the scene of an unsuccessful conspiracy to establish a republic. In the last decade of the eighteenth century the invention of Whitney's cotton-gin and the successful granulation of sugar by de Boré gave a vast impetus to the progress of the State and city. In 1801 the production of sugar rose to 5,000,000 lb., and of molasses to 250,000 gal., and the exports of cotton were 34,000 bales. The purchase of the Louisiana territory by the Government further stimulated local development.

The early settlers were a motley collection. All classes and conditions were represented, from the French and Spanish officials to the sturdy *coureurs de bois*, or Canadian adventurers. At first some women from the houses of correction in France were sent over as wives for the colonists; but fortunately these were supplemented by the famous *filles à la cassette*, or casket girls, who were of good family and good morals, and who made excellent wives. Soon after Louisiana became a part of the U. S. there was an influx of persons from other parts of the republic seeking their fortunes, as well as a large number of French planters and their slaves from San Domingo. The creoles, or descendants of French and Spanish ancestors, gradually assimilated themselves to U. S. institutions, and fought bravely against the British in the battle of New Orleans.

The battle-field of Chalmette lies 5 miles below the city. When the approach of the British forces was announced, Gen. Andrew Jackson had been busy in New Orleans for three weeks in reviewing and disciplining the militia and other troops, and as he had been informed that there were spies in the city he proclaimed martial law. On Dec. 23, 1814, he marched out of the city and boldly attacked the enemy on the evening of the same day. The British had nearly 5,000 men, while Jackson had only 2,100, though the latter received material assistance from the Carolina, a U. S. gunboat, which anchored opposite the British camp and bombarded it. The action was indecisive, but it retarded the progress of the British and gave Jackson the necessary

time to fortify the plain of Chalmette. On Jan. 8, 1815, the British made a final attempt to storm Jackson's breast-works, and were repulsed with great slaughter.

The city experienced great losses during the years 1812-15 from the suspension of banks and other financial troubles, but from 1816 to 1840 there was a period of marvelous expansion. The arrival in 1812 of the first steamboat marked the beginning of an immense trade with the Mississippi valley, and large crops of sugar and cotton were raised. The only impediments to growth were the almost annual overflows of the Mississippi and the terrible epidemics of yellow fever. In twenty-seven years fifteen of these epidemics occurred, together with a visitation of the cholera in 1831. In 1834 gas was introduced, and in 1836 a system of water-works. In 1837 New Orleans suffered greatly from the financial panic. Fourteen of its banks suspended in one day; but with a return to more cautious business methods there came a restoration of confidence and more prosperity than before. The cotton exports rose to 1,000,000 bales, and the population was tripled in ten years, causing an enlargement of the corporate limits. In 1841-42 a system of free schools was established; in 1853-55 there were terrible visitations of yellow fever, and out of a population of 150,000 nearly 37,000 persons died; in 1860 the city reached the acme of its prosperity, the exports, imports, and domestic products amounting in value to \$324,000,000.

In 1862 Louisiana was closely blockaded by a Federal fleet under Admiral Farragut. On Apr. 24 he succeeded in passing the forts that defended the river, and on the following day he anchored in front of the city. In order that the enemy might not profit by the stores laid up in the city, 12,000 bales of cotton had been piled upon the levee and set on fire, and hundreds of barrels of sugar and molasses were added to the burning mass. After a few days of negotiation the city surrendered and was handed over to Gen. B. F. Butler, who had followed Farragut with a large army. As the military governor of New Orleans, Butler was the object of much adverse criticism from the Southern people, who maintain that he treated the inhabitants with great indignity. The claim that he kept the city in the best sanitary condition it has ever known was afterward disproved by the official sanitary reports. After the period of "reconstruction" New Orleans renewed its career of prosperity. Moreover, the manufacturing interests, which before the war were insignificant, now rapidly grew more important, so that in 1894 the money invested in factories, machine-shops, etc., amounted to \$25,000,000. Pop. (1880) 216,090; (1890) 242,039; (1894) estimated, 260,000. JOHN R. FICKLEN.

New Philadelphia: city; capital of Tuscarawas co., O. (for location of county, see map of Ohio, ref. 4-H); on the Tuscarawas river, the Ohio Canal, and the Cleve., Lorain, and Wheel, and the Penn. railways; 24 miles S. by W. of Canton, 98 miles N. of Marietta. It is in a coal, iron-ore, and salt region; contains a national bank with capital of \$50,000, 3 private banks, and 5 weekly newspapers; and has manufactories of agricultural implements, sheet and muck iron, woolen goods, roofing tile, wire nails, cast-iron pipe, sewer-pipe, brooms, flour, carriages, paper, and machinery. Pop. (1880) 3,070; (1890) 4,456.

EDITOR OF "OHIO DEMOCRAT."

New Philippines: another name for CAROLINE ISLANDS (q. v.).

New Pomerania (in Germ. *New-Pommern*; native *Birara*), formerly **New Britain**: the largest island of the Bismarck Archipelago. It lies off the northeast coast of New Guinea, from which it is separated by a strait 50 miles wide, extends E. and W., and is about 300 miles long, with 75 miles of greatest breadth; area about 9,000 sq. miles. It is composed of several mountainous masses connected by low land, and the isthmus that connects the body of the island with the northeastern part, called Gazelle Peninsula, is very narrow. The mountains are more or less volcanic, especially at the ends of the island. Several volcanoes are active, and a severe eruption occurred in 1878. The island is very picturesque. The contours of the mountains are attractive, the vegetation is luxuriant, and the foliage rich with a variety of tints. The climate is like that of New Guinea. The southeastern monsoon occurs from May to September, and is accompanied by heavy rains. The dry season is with the northwestern monsoon during the rest of the year, but it is frequently broken by rain. The inhabitants are Melanesian, less attractive than these people generally are. They are

warlike, and the latter, the peaceful. They possess a few towns, are faithful, and have a very high opinion of themselves, and of their religion. The S. coast is the most fertile and populous. The population is estimated at 100,000. They were visited by G. B. S. on his voyage in 1884. (M. W. Allen, 1888.)

[illegible]

Newport: town (settled in 1763); capital of Sullivan co., N. H. (pop. 1,000 in 1900), situated on N. H. coast (see ref. 8-D); on the Sugar river, and the Boston and Maine Railroad; 40 miles W. by N. of Concord. It contains 5 churches, the Richards Free Library, Antiquarian building, public high and graded schools, and 2 weekly newspapers, publishes 4 magazines, 1 book store, 1 drug store, 1 ladies' underwear, woolen goods, and lumber. It is a summer resort, and 5 miles distant is Austin Corbin's noted Blue Mountain Park. Pop. 1880, 2,612; 1890, 2,633.

Newport: formerly known as *Port of the Juniata*, and *Port of Rider* and named *Ridersville* in 1805; name changed to its present name in 1829; population in 1840, 1,399 (1849). Perry co., Pa. (for location of county, see map of Pennsylvania, ref. 5-16); on the Juniata river, the Pennsylvania Canal, and the Penn. and the Newport and Sherman Val. railways; 6 miles N. E. of New Bloomfield, the county-seat; 28 miles N. W. of Harrisburg. It is in a grain-growing region; contains 6 churches, 7 public schools, 2 hotels, a national bank with capital of \$50,000, a private bank, water-works completed in 1893, and 2 weekly newspapers; and has plantations, saw-mills, and 24 mills; (1840) estimated, 1,399; (1890) 1,399; (1890) 1,417; (1894) estimated, 2,000.

Newport: city; one of the capitals of the State of Rhode Island, capital of Newport County, and port of entry (for location, see map of Rhode Island, ref. 5-II); on Narragansett Bay, and the Newport and Wickford and the N. Y., N. H. and H. V. R. R. 5 miles N. of Fall River, Mass., 30 miles S. of Providence. It was settled by colonists from Roger Williams's party in 1638 and by Quakers in 1643; was chartered with Providence and Portsmouth under the name of Providence Plantations in 1643; was one of the most important commercial points in the colonies prior to the Revolutionary war, and for some years preceding 1769 had a larger foreign commerce than New York; was captured by the British on Dec. 6, 1776, and occupied till Oct. 25, 1779; and was the headquarters of Rochambeau's French fleet in 1780. It has become one of the most popular places of summer resort in the U. S. Besides its location on a grand and commodious harbor, its bathing facilities, its superb drives, large hotels, and costly summer residences, it has many natural attractions and several objects of large historical interest. The harbor is defended by Fort Adams, one of the strongest fortifications in the country. At its entrance are the ruins of Fort Louis, and near by the Dumplings rocks. The Hanging Rocks, Spouting Cave, the Glen, and the chasm, 70

tourists. On Conan's Harbor island is the U. S. Naval War College, which was established in 1884 and consolidated with the torpedo station in 1889, and with the Naval Training-school in 1894. Newport claims, and the claim

church building erected in America (1640). The city also claims to have had the first public school opened in America (1640) and the first synagogue (1762), and to have the

James Franklin, a nephew of Benjamin, in 1758. Among the notable buildings are the Old Stone Mill, or Round Tower, in Tourou Park, said by some antiquarians to have been built by the Norsemen 500 years before the arrival of Columbus, and by others to have been the stone windmill of Gov. Benedict Arnold, mentioned in his will; Trinity church (Protestant Episcopal, erected 1725); First Baptist church; Central Baptist church (erected 1735); the Redwood Library (erected 1750); State-house (erected 1742); city-hall (erected 1763); synagogue which, with its ancient cemetery, is cared for from the income of a special trust fund, though there are no Jews in the city and the building is unused; the Channing Memorial church; the Perry mansion; the Public Library and the Home for Friendless Children (both founded by Christopher Townsend); and the Industrial School. Tourou Park contains a bronze statue of Com. Matthew C. Perry, the gift of Mrs. August Belmont; Washington Square, a similar one of Com. Oliver H. Perry; and Equality Park, a Soldiers' and Sailors' Monument. The city has regular steamboat communication with New York and Providence. There are 26 wharves, 16 churches, 10 public-school buildings, the Rogers High School (endowed by William S. Rogers with \$100,000), 14 public fountains, 5 libraries (People's, Newport Historical Society, Redwood, Circulating, and Fort Adams Post) containing over 70,000 volumes, 6 national banks with combined capital of \$795,250, 2 State banks with capital of \$175,000, 3 savings-banks, electric street-railways, public park (land presented by Levi P. Morton in 1886), and 3 daily and 3 weekly newspapers. In 1893 the assessed value of the city was \$1,157,000; population, 87,000; 800—total, \$34,853,800; and on Jan. 1, 1894, the net bonded debt was \$387,793; floating, \$72,457. The city owned property valued at \$671,421. Pop. (1880) 15,693; (1890) 19,457; (1895) 21,537. Editor of "News"

Newport (*see* NEWPORT, N.H., 1781; *see also* 1796) chartered under the name of Ducashow in 1802, name changed to present one in 1816); capital of Orleans co., Vt. (for location, see map of Vermont, ref. 2-D); on LAKE MEMPHREMAGOG (*q. v.*), and the Boston and Maine and the Canadian Pac. railways; 44 miles N. by W. of St. Johnsbury. It contains 5 churches, 1 high, 2 graded, and 15 district schools, several manufactories, and a weekly newspaper; is a popular summer resort; and is in an agricultural region. Pop. (1880) town, 2,426, village, 920; (1890) town, 3,047, village, 1,730. P. HENDERSON C. INDEXES NEWSPAPERS.

Newport News: town, port of entry, and capital of Warwick co., Va. (for location, see map of Virginia, ref. 7-1); on the James river, Hampton Roads, and the Ches. and Ohio Railway; 14 miles N. of Norfolk, 70 miles S. E. of Richmond. It is in a rich peanut-growing region, has one of the best harbors in the world, and is connected with Hampton and Old Point Comfort by electric railway. It has an extensive ship-building plant, with dry dock large enough to take in the largest steamships; extensive warehouse piers; a grain elevator with a capacity of 1,750,000 bush.; improved saw-mills, flour-mills, and grist-mills; a large cotton-ginning and pressing mills, ice-factory, a national bank with capital of \$100,000, a State bank with capital of \$100,000, a private bank, and several guarantee and trust companies, and a weekly and 2 daily newspapers. The foreign commerce of the port is carried on principally by the Chesapeake and Ohio Steamship Company's line, making direct connection with England, and in grain shipments the port has become the fourth in the U. S. In the calendar year 1893 the imports of foreign merchandise amounted in value to \$55,219, and the exports of domestic merchandise to \$10,580,265. Pop. (1890) 4,449; (1894) estimated, 5,000.

New Red Sandstone: an important geologic formation of Great Britain. The rocks included under this term belong partly to the Triassic period and partly to the Permian epoch, which is usually regarded as part of the Carboniferous period. For many years the name of the British formation was used to designate a unit of the geologic time scale, and formations in other countries, especially America, received the same name. This usage survives to a great extent in Great Britain, but is

American formation to which the name was most frequently applied is now called NEWARK SYSTEM (*q. v.*). See also OLD RED SANDSTONE. G. K. GILBERT.

New Richmond (RICHMOND JUNCTION Station): village; Clermont co., O. (for location of county, see map of Ohio, ref. 7-C); on the Ohio river, and the Cin., Portsmouth and Va. Railroad; 20 miles E. of Cincinnati. It contains 7 churches, a Roman Catholic and 2 public schools, a national bank with capital of \$80,000, and a weekly newspaper, and has woolen, saw, and grist mills, 2 furniture-factories, foundry, and brick and cooperage factories. Pop. (1880) 2,545; (1890) 2,379, with suburbs, 2,825.

EDITOR OF "INDEPENDENT NEWS."

New Richmond: city (settled in 1855, incorporated as a city in 1885); St. Croix co., Wis. (for location of county, see map of Wisconsin, ref. 4-A); on the Willow river, and the Chi., St. P., Minn. and Omaha and the Wis. Cent. railways; 18 miles N. E. of Hudson, the county-seat, 35 miles N. E. of St. Paul, Minn. It is in an agricultural region, is a milk, cream, and butter center, and the principal industries are lumbering, flour and feed milling, and the shipping of live stock, grain, and farm produce. There are 8 churches, a public and a Roman Catholic parochial school, each graded and with a high-school department, 2 State banks with combined capital of \$85,000, electric-light plant and water-works owned by the city, and 2 weekly newspapers. Pop. (1880) 729; (1890) 1,408; (1895) 1,680.

EDITOR OF "REPUBLICAN."

New Rochelle: village; Westchester co., N. Y. (for location of county, see map of New York, ref. 8-J); on an inlet of Long Island Sound, locally known as New Rochelle harbor, and on the N. Y., N. H. and Hart. Railroad; 20 miles N. E. of the New York city-hall. Its situation and proximity to the metropolis make it the place of permanent residence of many New York business men and a popular summer resort. The village contains several colonial Dutch and English mansions, public-school property valued at over \$100,000, a State bank with capital of \$30,000, and four weekly newspapers. Pop. (1880) 5,276; (1890) 8,217; (1892) State census, 9,990.

New Siberian Islands: an archipelago N. of Asia and N. E. of the mouth of the Lena delta, so called from the name given to one of them (1806) by a Russian merchant. Being not far distant from the mainland and often connected with it by an ice-bridge, the fauna of these Arctic islands is particularly rich, and includes white bears and foxes, reindeer, and many birds. The islands are also rich in fossil woods and the remains of extinct animals, notably those of the mammoth. In the island of New Siberia is a range of hills, partly composed of carbonized wood, apparently belonging to the Jurassic period. See De Long, *The Voyage of the Jeannette* (2 vols., 1883); Nordenskjöld, *The Voyage of the Vega* (1886). C. C. ADAMS.

New South Shetland Islands: See SOUTH SHETLAND ISLANDS.

New South Wales: the oldest of the seven Australasian colonies of Great Britain. It is the middle colony on the east coast of Australia, with Queensland on the N., South Australia on the W., and Victoria on the S. It lies between lats. 28° and 38° S. and the meridians 141° and 154° E. The western boundary is the meridian of 141° E.; most of the southern is formed by the Murray river, and of the northern by the parallel of 29° S. lat. The area is given officially at 310,700 sq. miles, but planimetric measures make it 308,560. It is a fifth larger than Texas and larger than any state of Europe, Russia only excepted. Three distant and isolated islands—Norfolk, Pitcairn, and Lord Howe—are politically under the supervision of the governor. Their combined area is less than 15 sq. miles.

The name of New South Wales was given to Southeast Australia by Capt. Cook, on his exploratory voyage in 1770, from a fancied resemblance of the coast to that of South Wales. It was afterward applied to the first colony, which took in all Australia E. of the 135th meridian, and was later cut down to its present limits.

Physical Configuration.—The coast is over 700 miles long, with numerous capes, headlands, and bays. It extends N. to Point Danger and S. to Cape Howe. Many of the bays are excellent natural ports. Of these, Port Jackson, about the middle of the coast, has attained the greatest commercial importance, as on it is situated Sydney, the capital. A little farther S. is BOTANY BAY (*q. v.*). Many rivers

from the mountains inland empty at the coast, where their mouths give a series of ports capable of improvement by the removal of their sandbars. At the mouth of the Hunter river is Newcastle, the port second in importance.

The surface of the colony falls naturally into three divisions—the coast lands, the table-lands just behind these, and the great interior plains. The coast lands embrace the strip between the coast and the Great Dividing Range of mountains, which runs nearly parallel to the coast, and is from 20 to 120 miles distant from it, farther at the N. than at the S. They are usually flat, fertile, and well adapted to agricultural operations. The eastern versant of the mountains is generally rugged and sometimes precipitous, while the streams that descend it are generally rapid and shallow, and flow through deep and rugged valleys. Of the fourteen rivers on this slope, the longest are the Hawkesbury (330 miles); the Hunter (300 miles); the Shoalhaven (260 miles); and the Clarence (240 miles). Many of these streams form large lagoons at their outlets.

The Great Dividing Mountains include several distinct ranges. At the S. the Australian Alps come in from Victoria. They are the highest mountains in Australia, and the culminating point is Mt. Kosciusko, 7,350 feet high, in the extreme S. of this colony near the headwaters of the Murray river. Though it does not reach the perpetual snow-line by several hundred feet, snow is seldom entirely absent from it. The next range on the N. is that of the Blue Mountains, so called from the tint of the eucalyptus forests which clothe their sides. They are not sharply divided from the Alps, but they are lower and their crest is broader, forming practically a series of table-lands. N. of the Blue Mountains is the Liverpool Range, striking a bold arc from the coast inland to beyond the Darling river. Farther N. is the New England Range, which resumes the direction, parallel to the coast, broken by the Liverpool Range. Inland from the New England Range is a mountain complex, of which the highest known is Ben Lomond (5,070 feet high). The chain is in places 60 or 80 miles wide.

W. of this is the great interior basin of the Darling river. Next the mountains it is well forested and well watered, but with progress westward it becomes smoother, the trees disappear, and the water becomes more scanty. This is the salt-bush country, consisting of red loamy plains with loose soil, with some grass which dries up and disappears in the dry season, and with abundant growth of ill-looking weeds and low brush. This area stretches in the N. into Queensland, and in the W. it is separated from the still more alkaline and arid interior of the continent by broken ranges of low mountains, called the Barrier or Stanley Mountains and the Grey Range. The interior basin is not far above sea-level (300 to 500 feet), but in it are found the great rivers of the continent. The Murrumbidgee (1,350 miles long) and the Lachlan (700 miles) are right-hand affluents of the Murray. The Darling river rises in the northeast angle of the colony, and empties into the Murray near the southwest angle after a course of 1,160 miles. Its right-hand tributaries are in several cases longer than it is itself above their respective mouths, and rise far N. in Queensland. Of the left-hand tributaries which lie in New South Wales the most important are the Macquarie (750 miles long); the Namoi (600 miles); the Bogan (450); and the Gwydir (445). These streams receive very few affluents after leaving the mountains in which they rise, and as they pass through an arid region they are commonly smaller below than above. Sometimes they fail to reach the stream to which they ordinarily contribute. In the N. W. there are many streams which are permanently lost in lagoons or in the sand.

Climate.—The climate is as distinct for the three districts of the coast, mountains, and the interior basin as are the physical features. The coast climate is warm and moist, and is rendered mild and agreeable by an ocean current which passes along it from N. to S., tempering both summer and winter. The mean annual temperature in the coast lands ranges from 60° F. in the S. to 68° in the N., and is somewhat higher a few miles inland than on the immediate coast, on account of the sea-breeze extending but a short distance inland. The summer mean temperatures range from 67° to 76° F., and the winter from 51° to 56°. At Sydney, lat. 33° 51' S., the mean annual temperature is 63°, that of summer 71°, and that of winter 54° 5'. The rainfall is heaviest on the coast, and increases from S. to N. from 36 to 73 inches annually. At the base of the mountains it is 10 or 15 inches less. The rainy season comes in late summer, and the fall is sometimes torrential.

In the mountain district the temperatures are as varied as the elevations. In inhabited altitudes the mean annual temperatures run from 46° around Mt. Kosciusko to 60° in the N. Frost and snow are well known in the S. The mean annual rainfall is more uniform from S. to N. and varies from 25 to 35 inches.

In the interior valley the rainfall varies from 25 inches in the E. to 9 or 10 in the extreme W., and this is likely to fall in heavy rains. The summers are hotter and the winters colder than on the coast, while the mean annual temperature is not very different. The drier air makes the extremes more endurable, and the climate is considered tonic.

In general, the winters throughout the colony are especially mild. Occasionally hot winds from the interior make a great discount on the character of the climate, as also do the "southerly busters," a wind like the Texan northers. On the whole, the climate is healthful and agreeable, and the only serious maladies depending on it are dysenteries and inflammation of the eyes.

Flora and Fauna.—These have the general Australian character and are not sharply divided from those of the adjoining colonies. The flora gives the impression both of novelty and monotony. The director of the Sydney Botanic Gardens has said that no country gives a greater variety and abundance of trees yielding strong, beautiful, and durable timber than New South Wales, and claimed that good timber can be obtained in all parts of the colony, except in some areas of the Monaro, Murrumbidgee, and Murray districts. The banks of the coast rivers, especially, are thickly covered with forest trees. In the W. they are reduced to scrub, except where the ground is subject to overflow. The forests are largely composed of *Myrtaceæ*, characteristic among which are a numerous species of eucalyptus. The members of the Pea family and the composites are especially common, and of the genus *Acacia* the colony has over 100 species. The alpine flora is less different from that of the rest of the world, and a considerable number of its species are the same as those of Europe. The grasses of the interior are especially nutritious for stock, which in cases of drought may find sustenance in the saltworts, composites, umbellifers, and plants of the Geranium family. Five species of palms extend southward into the colony, two of them beyond Sydney.

The native mammals are marsupial, with very few exceptions, and there are many fossil marsupials of enormous size. The domestic animals have all been introduced. A less desirable immigrant was the rabbit, which has multiplied so enormously as to have become a serious pest. Among the birds, many families elsewhere familiar, as the vultures and woodpeckers, are unknown. Among the more characteristic species are the emu, bustard, brush turkey, lyre-bird, honey-sucker, and morepork. Lizards are very numerous, crocodiles unknown, and while some families of well-known poisonous snakes are wanting, their places are taken by others equally dangerous. Insects are especially numerous and varied, though butterflies are represented by relatively few species. Fish are abundant, but the fisheries are little developed. One species of shark receives its name from Port Jackson. Oysters abound, are of good quality, and are for sale throughout the year.

Minerals and Mines.—Gold has been found at many places, especially in the mountain district. It had long been known to exist, but it was not until 1851 that it was found in such paying quantities as to attract general attention. This was in the Ballarat district, now in Victoria, which colony and Queensland now surpass New South Wales in the annual output of gold, but some remarkable finds have been made in the latter colony. About 1881 a nugget was found on the Temora which weighed 116 lb., and in 1851 one was found on the Turon which weighed 106 lb. In 1873 a mass of ore weighing 630 lb. was exhibited, which was estimated to contain £2,000 worth of gold. It was from Hill End. The total value of the gold coined and exported from 1851 to 1892 inclusive is £39,202,666, but the production is at present decreasing. Of silver and silver-lead ore, New South Wales produces more than 90 per cent. of all the silver in the Australasian colonies. The leading mines are at Boorook, in the New England district, near Bathurst, W. of Sydney, and in the Western Barrier Range. The last is a recent discovery and has already proved to be of immense value. In 1891 the output was 350,661 oz. of silver, and 133,355 tons of silver-lead ore. The total value of silver and silver-lead ore exported to the end of 1892 was £13,660,715, and the annual output is increasing. Copper

ore was discovered in 1858, and is known to come to the surface in many places. The total output to the end of 1892 has been to the value of £3,596,482. Tin is found in the granitic and basaltic regions in the extreme N., and has been profitably worked since 1872. The output to the end of 1892 was of the value of £5,828,657, but the annual production is now decreasing. The tin has so far been taken from alluvial deposits in existing or ancient stream beds, but this source has now been exhausted and lode-mining undertaken. The stanniferous area probably covers 10,000 sq. miles. Coal was discovered in 1797, but no serious attempt was made to mine it for fifty years. The coal measures extend along the seacoast from lat. 31° 30' to lat. 35° 30' S., and are exposed above sea-level at each end. The seams of coal are nearly horizontal and are from 3 to 40 feet in thickness. The total area underlain by the coal measures is estimated at 24,000 sq. miles. The output of coal is greatest at Newcastle, on the Illawarra coast, and at the western foot of the Blue Mountains. The Illawarra coal is more anthracitic. A sort of cannel coal, called kerosene shale, is mined for use in enriching illuminating gas. In 1847 40,732 tons of coal were raised in the Newcastle region, and this was the total output for the year. This has grown steadily, until in 1892 there were 101 coal mines employing 10,514 men, with an output of 3,780,968 tons of coal. The value of the total production to the end of 1892 was £27,271,429. Iron exists in abundance, and many of the rarer metals are known. The diamond, sapphire, emerald, ruby, opal, and many other precious stones have been found, and building-stones, limestone, fireclay, and clay for brick and pottery are abundant. In 1891 there were twenty smelting furnaces in operation, and 32,508 persons were employed in mining and smelting.

Agriculture.—The industrial life of the colony began in grazing, and pastoral pursuits still continue to form an important element of its wealth. West of a line drawn from lat. 36° S. and lon. 145° E. to lat. 29° S. and lon. 150° E. the land is almost exclusively pastoral, and there are many considerable areas of pastoral land E. of this line. In the pastoral district the climate is so mild that stock require no feeding in winter. The sheep district is to the W. of the line above mentioned. The chief limitations to the development of the flocks are the general aridity and the occasional droughts. Careful breeding for nearly a century has developed an especial race of Australian merino sheep with several good qualities, aside from adaptation to the climate. They are rather more free from disease than other breeds. The land in the pastoral region is largely owned by the state and rented to the graziers. The total number of sheep on Jan. 1, 1893, was 58,080,114. The chief dairy district is on the coast S. of Sydney. Pleuro-pneumonia has become epidemic among the cattle several times and proved very destructive. The total number of horned cattle on Jan. 1, 1893, was 2,147,074. Horses are raised for home use and for the supply of the cavalry in India. Swine are apparently reared only for domestic use.

About 0.5 per cent. of the land is under cultivation, and this is principally in holdings of less than 500 acres. The laws are favorable to *bona-fide* settlers for the acquirement of the title to lands in small holdings. The chief crops are wheat, maize, barley, oats, potatoes, hay, tobacco, sugar, wine, and oranges. Lucerne is much used for hay, and in the Hunter river district six crops are taken annually. Much wheat, oats, and barley is cut for forage. Wheat is grown less than formerly because of the rust, and the production is now insufficient for home needs. The average yield is 13 bush. per acre, while for all Australasia it averages 10, for the U. S. 12, and for Russia 7. The annual consumption of wheat per person in the colony is 6.5 bush., while in the United Kingdom it is 5, and in Russia 2. Maize is cultivated for horse food, especially on the coast N. of Port Stephens; the average yield is 31 bush. per acre. The tobacco-crop has decreased of late years. Sugar can be profitably raised in the extreme N. E., but the production is small. The vine flourishes generally in the coast and mountain districts, and the production of native wines is limited only by the demand. Most of the fruits of the warm and temperate zones are grown, but the orange is the principal fruit product. It does best on the west versant N. of Sydney. The production of 1893 was estimated at 700,000 cases. In 1891-92 there were 117,693 persons engaged in agriculture. A forest conservation department was created in 1887. There are twenty-one state forests and 1,058 timber reserves, with a combined area of about 5,800,000 acres.

The amount of lumber sawn increases slowly from year to year. In 1892 it was nearly 230,000,000 sq. feet.

The need of irrigation has not been very seriously felt because of the sparseness of population and the utilization of the arid area for grazing. A hydrographic survey was recently begun. Irrigation in 1891 was employed only for 23,106 acres, but this is rapidly increasing by private enterprise.

Population.—The aborigines have nearly all disappeared from this colony. The census of 1891 gave their number at 5,097 full blacks and 3,183 half-castes, or 8,280 in all, of whom 4,559 were males. By the same census the total population was 1,182,234, with 20 per cent. more males than females. On Dec. 31, 1892, the population was officially estimated at 1,197,650, an increase of nearly 6 per cent. More than 64 per cent. were born in the colony and nearly 72 per cent. in Australasia. The Chinese formed 1.16 per cent. of the population, and there were very few other aliens. Only 12,478 were dependent on charity. Of the total, 411,710 lived in Sydney, more than one-third of all. The next largest town is Broken Hill, with a population of 23,500, and there are only five other towns with more than 6,000. The average density of population is four per square mile when Sydney is included. Outside of Sydney the density is greatest in the counties to the W. of Sydney, E. of and over the Blue Mountains, next in the coast counties. Over much of the interior basin there is an average of less than one person to the square mile.

In 1892 there were 8,022 marriages, 40,041 births (2,289 illegitimate), and 14,410 deaths. The excess of births over deaths was 25,631, and this excess in the decade ending with 1892 gave two-thirds of the increase of population. The average annual death-rate is 14.65 per 1,000, while that of the United Kingdom is 19.07, and of Germany 25.31. From 1888 to 1892, inclusive, the average annual immigration was 65,000, but the number of emigrants was large, averaging 55,000. Assisted immigration became the policy of the colony in 1832, but practically ceased in 1887. The number of assisted immigrants in 1892 was only 179. The influx of Chinese became so embarrassing that in 1881 a poll tax of £10 was placed on each immigrant, and this was made £100 in 1888.

State aid to religion was abolished in 1862. About half of the population are classified as adherents of the Church of England, one-fourth Roman Catholics, one-tenth Presbyterians, and one-tenth Methodists.

Commerce.—The value of the total imports in 1892 was £20,776,526, and of the exports £21,972,247, somewhat less than the average for five years. Wool is the staple export—about half of the total in value—then come tin, copper, tallow, and leather. The chief imports are iron goods, clothing, and cotton and woolen cloths. The trade of the U. S. with Australasia is chiefly with New South Wales and New Zealand. The main exports to the U. S. are specie, coal, and wool, especially the first, so that the trade value is even less than the nominal valuation would indicate. About 10 per cent. of the total exports go to the U. S., and 5 per cent. of the imports are from that country. The tariffs in force in 1890 were less in this colony than in the others, and were on few articles and were specific. In 1891 the tariffs were changed in the direction of higher duties and more of them. The chief revenue from duties is derived from stimulants and narcotics. The total registered shipping consists of 60 sailing vessels and 46 steamers, with a combined capacity of 9,130 tons. About 3,000 foreign vessels annually enter and clear, of which over 90 per cent. are British. About one-third enter Port Jackson and nearly as many the port of Newcastle.

The colony is ill supplied with navigable rivers, and railway transportation is consequently of the highest importance. The construction of railways was begun in 1855, and they are now extended until connection with the neighboring colonies is complete. Intercolonial commerce is, however, hampered by the differences of gauges, that of New South Wales being the English standard of 4 ft. 8½ in., while that of Victoria is 5 ft. 3 in., and the narrow-gauge of 3 ft. 6 in. is often used. From Sydney and Newcastle the railways pass to the W. of the Dividing Mountains and then extend N. and S. One runs N. W. to Bourke, on the Darling. The important mining region in the Barrier Range is reached by a railway from Adelaide, in South Australia. The average cost per mile of railways in the colony is high, being £14,559. This is higher than elsewhere in these colonies, and £3,400 higher than the average in the U. S. The total mileage on June 30, 1893, was 2,351

belonging to the Government and 81 to private persons; also 419 miles of tramway belonging to the Government, built at a cost of £1,118,471. At the end of 1892 there were 26,443 miles of telegraph and telephone wire, with a service of 706 stations, receiving and sending 4,000,000 messages per year; net revenue, £185,014.

The money in circulation in 1892 was: Gold, £9,000,496; notes, £1,439,872; silver, £578,452; other, £139,095. The money coined during the year amounted to £2,852,970, and was mostly gold. The total bank assets were £53,317,892, of which 10 per cent. was in coin, and the total liabilities were £37,171,380. The number of depositors in savings-banks was 167,726, with an average deposit of £34 each. During a very severe financial crisis in 1893 eight banks failed, but reopened afterward on a reconstructed basis.

Administration.—The executive is vested in a governor appointed by the British crown, who is commander of the troops, has an annual salary of £7,000, and is assisted by a cabinet of ten ministers. The legislative power is intrusted to a parliament of two houses—the Legislative Council of 73 members (in 1892), appointed by the crown for life, and the Legislative Assembly of 125 members (1893), elected one each from the same number of districts, and receiving £300 per annum. The suffrage is restricted only by sex and residence. Education is under state control, and is compulsory between the ages of six and fourteen. It is free for the poor only. In 1892 there were 2,724 public schools (5 of which were high schools), with 210,461 pupils enrolled and 4,636 teachers; cost, £768,395; also 723 private schools, of which 243 were Roman Catholic. In 1891 the University of Sydney had 1,068 students and 44 professors and lecturers; the revenue for 1892 was £37,591. There is also a technical college, which with its branches had in 1892 an attendance of 6,205 pupils. A free public library in Sydney has 97,348 volumes.

In 1892 the colony had 60 jails, with 2,622 prisoners (on Dec. 31), and a police force of 1,756 men. During the year 56,350 persons were convicted before magistrates.

The public debt on Dec. 31, 1892, was £54,473,433, with an average rate of interest of 3.824 per cent. The money had been mostly expended in public works, which yield an annual return of 2.45 per cent. of the entire indebtedness. The total revenue for 1892 was £10,501,104, and the expenditure £10,536,820. The entire wealth of the colony at the end of 1893 was estimated at £593,286,500. The military and naval force contains 10,560 men, mostly militia. The postal department has 1,423 offices, with an income of £447,945, barely covering the expenditure.

History.—Capt. Cook and Sir Joseph Banks landed at Botany Bay Apr. 27, 1770. They made some inspection of the bay, and on Banks's recommendation the home Government finally decided to employ this remote spot as a penal colony. In 1787 Capt. Arthur Phillip was accordingly appointed governor of the new colony of New South Wales, occupying the whole of Australia E. of the meridian of 135° E. and some small islands. He was sent out with about 800 convicts and a small military force. They arrived at Botany Bay Jan. 19, 1788, but as Phillip did not find this bay suitable he removed seven days after to Port Jackson, 6 miles N., and founded the city of Sydney. Thus the colony began with a convict settlement and with the arbitrary government necessary to such a population. Convicts continued to arrive from time to time until 1841. The total number was about 83,000, of whom 43,000 were living when their importation ceased. Of these, 18,000 had become free either by expiration of sentence or by pardon. In the meantime there had been a large immigration of free men and women, and their number was increased by births in the colony. The census of 1841 gave a total population of 114,601, or a ratio of 8 persons without to 3 with convict history, or 9 free persons to every 2 convicts. The history from 1788 to 1841 is that of a penal colony with a rapidly growing ratio of free persons. After 1841 the convict peculiarities slowly, and after 1851 rapidly, disappeared until they were extinguished.

An important element in the history of the colony was the development of the production of wool, still its greatest staple, largely due to the importation of superior breeding animals by Capt. Macarthur.

On the cessation of convict importation the colony suffered from lack of labor, and this want became more urgent during ten years, when, happily, the discovery of gold-fields in 1851, of such a character as to attract worldwide attention, caused an enormous influx of strong and healthy men,

and put an end to the labor famine, while adding materially to the colony's wealth.

When the colony was established, in 1787, the instructions issued to Governor Phillip and the government established by him were thoroughly autocratic. In the course of time, and especially under arbitrary governors, they became intolerable to the free settlers. Agitation resulted in an investigation in 1819 by Burge of the judicial establishment and the appointment in 1823 of a Legislative Council of five persons appointed by the crown, and the number was afterward increased. In 1824 the liberty of the press was obtained, in 1828 the right of trial by jury, and in 1836 the principle of religious liberty was settled. In 1842 the right of municipal election was first exercised, and in 1843 the Legislative Council was made partly elective. In 1855 the Queen assented to an act conferring a constitution on the colony, and in 1856 came the first ministry under a responsible government. In 1857 Victoria and in 1859 Queensland were separated from the parent colony. Under its present institutions New South Wales has continued to prosper.

REFERENCES.—The official publications are numerous and useful. Besides the usual blue books and reports may be mentioned: Barton, *History of New South Wales from the Records*, vol. i., 1783-89 (1889). *The Statistician's Report on the Eleventh (1891) Census*, first installment (1893), contains a review of all the statistics of the population since the establishment of the colony. Russell has published separately (n. d., but probably 1893) a *Diagram of the Isothermal Lines of New South Wales*, and in his annual *Results of Rain, River, and Evaporation Observations made in New South Wales in 1892* (1893) an average rainfall chart of the colony. See also Robinson, *New South Wales, the Oldest and Richest of the Australian Colonies* (1873); Lang, *Historical and Statistical Account of New South Wales* (4th ed., 2 vols., 1874); Reid, *An Essay on New South Wales, the Mother Colony of Australia* (1877); Woods, *Fish and Fisheries of New South Wales* (1882); Liversidge, *Minerals of New South Wales* (1888); and Coghlan, *A Statistical Account of the Seven Colonies of Australasia* (1892).

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New Spain: See MEXICO (*History*).

Newspapers: printed sheets containing news, issued at regular intervals—usually each day or each week—and intended for distribution by sale or gratis. Modern journals convey intelligence of current events, report the transactions of public bodies, officials, etc., and contain also editorial comments on public questions, items of interest in the various fields of human activity, announcements, advertisements, market reports, communications from public and private persons, and in many cases short works of fiction.

The periodical collection and publication of the news of the day began in Europe with the weekly issue of *Das Frankfurter Journal*, by Egenolf Emmel, at Frankfort, Germany, in 1615, 163 years after the discovery of printing from metal types. There had been news-sheets long before; in Europe the earliest were manuscript papers prepared with some regularity, and known in Rome as the *Acta Diurna* and in Venice as the *Gazzetta*. According to tradition, the first printed news-sheet appeared at Nuremberg in 1457, and was called the *Gazette*, but no copy is extant. In 1534 a news-sheet was printed in the same city, of which there was a copy in the Libri collection, with a description in the catalogue. This sheet was entitled the *Neue Zeitung aus Hispanien und Italien*. Ulric Zell, it is believed, printed a news-sheet in Cologne as early as 1499, called the *Chronicle*; and in 1598 another, the *Mercurius Gallo-Belgicus*, was printed there. Some 800 of these occasional news-sheets, all issued before 1610, are preserved in libraries.

The issue of the *Frankfurter Journal* was followed the next year (1616) by that of the *Nieuwe Tijdinghen*, at Antwerp; and in 1622 by the first newspaper in the English language, *The Weekley Neues*, begun by Nathaniel Butter, on May 23 of that year. Butter is mentioned as early as 1611, occasionally printing a news-slip, and in 1621 he published one or two numbers of *The Courant* or *Weekley Neues from Forain Parts*. He served several of the nobility and gentry as a gatherer of news, which he regularly dispatched in written communications to his patrons in the country. This system of manuscript news-letters in England did not disappear with the establishment of printed newspapers. Those who insisted most on precise and full information continued, especially in the country, to depend more or less

upon them until nearly the middle of the eighteenth century. The first daily paper in England, *The Daily Courant*, was issued in 1702, and the first penny paper, *The Orange Postman*, in 1709.

Théophraste Renaudot issued the *Gazette de France*, the first French newspaper, on May 30, 1631. The *Gazette*, with an occasional interruption, has been published from 1631 to the present day, and is one of the oldest papers in the world. Renaudot was a physician and a gossip, and became one of the best-informed men of his day. Like Butter in England, he wrote news-circulars prior to the establishment of the *Gazette*, and, like Butter, he sold his papers in the streets by newsboys and newswomen, who were known as "hawkers" and "Mercury-women." The *Gazette* was under the patronage and control of Richelieu. The first daily paper in France, the *Journal de Paris ou Poste au Soir*, appeared in 1777. The *Journal de la Ville de Paris* was published a century earlier, but only once a week, with the daily occurrences recorded in the style of a diary of events.

The *Post och Inrikes Tidning* was founded in 1644 as the official organ of Sweden. The *Haarlemsche Courant* appeared in 1656. The *St. Petersburg Gazette* was established in 1703, and printed under the authority of Peter the Great, who took an active interest in its management. The first Spanish paper, the *Gaceta de Madrid*, appeared in 1704. There were a *Gazette* and a *Courant* in Amsterdam in 1705. The first paper in India was issued in 1781, and the first in Turkey was printed in Smyrna in 1827 by M. Blecque, just a century after the introduction of printing in the Ottoman empire. It was called the *Spectator of the East*.

A chronological list of a number of the earliest newspapers of Europe still in existence is appended:

NAMES.	When established.
Frankfort Gazette—first year called <i>Journal</i>	1615
<i>Gazette de France</i>	1631
Leipzig Gazette	1660
London Gazette	1665
Stamford (Eng.) Mercury	1685
Edinburgh Courant	1705
Rostock Gazette	1710
Newcastle (Eng.) Courant	1711
Leeds (Eng.) Mercury	1718
Berlin Gazette	1722
Berlingske Tidende	1749
Leicester (Eng.) Journal	1752
Dublin Freeman's Journal	1755
Morning Post (London)	1772
The Times (London)	1785
Journal des Débats	1789
Allgemeine Zeitung	1798

All the governments of Europe were early represented by newspaper organs, which are an easy means of communicating orders in council, special edicts, proclamations, and laws to the people. The *London Gazette* was the first of these; it was established in 1665, and is still published. It was originally *The Oxford Gazette*. *Le Moniteur Universel*, *Journal Officiel de l'Empire Français*, was started in 1789; but Louis Napoleon abandoned the paper in 1869, because it was owned by private individuals, and established another with the simple title of *Journal Officiel de l'Empire Français*. Italy is represented by the *Gazzetta Ufficiale*; Spain, by the *Gaceta de Madrid*, and Russia by the *Pravitel'staennii Vystaik*. The *Invalide Russe* of St. Petersburg was the organ of the Russian Government for many years. It was established in 1813 to raise a fund for the relief of wounded soldiers. Russia is also represented in Brussels by *Le Nord*, the utterances of which are considered semi-official. Austria is officially heard through the *Gazette of Vienna*.

Comment as an accompaniment of the news, and particularly of the political news, did not begin in England until about 1704, when Swift, Bolingbroke, De Foe, and others began political discussions in various newspapers, which ultimately developed into the "leaders" and "paragraphs" of the present day. The "editorial" as an essential feature of the newspaper did not appear in France until during the Revolution of 1789; in Germany, not till a few years later; and elsewhere in Europe, not until the nineteenth century. Editorial discussion has rarely been long conducted anywhere else with what would be regarded in the U. S. as legitimate and desirable freedom, excepting in Great Britain and her colonies. Great progress in these directions, however, has been made during the latter half of the nineteenth century in France, Italy, parts of Germany, and among the Scandinavian races. In the three countries in which the newspaper development has been greatest, it may be said that in general the most attention has been given in Great Britain to editorial discussion, in France to art, the drama,

light literature, gossip, and *persiflage*, and in the U. S. to news.

The leading English newspapers are those of London, among which the most important are *The Times*, *Daily Telegraph*, *Standard*, *Daily News*, *Morning Post*, and *Daily Chronicle*, all morning dailies; *The Pall Mall Gazette* and *The St. James's Gazette*, afternoon dailies; and *The Observer*, a Sunday newspaper. *The Times* has long been considered the most influential and profitable newspaper in Europe. Its circulation (for some time probably much above 60,000 copies daily) was affected by the growth of the cheap press after the repeal of the stamp-tax in 1855, and by its own adherence to the high price of fivepence for a long time after good eight-page journals were sold in London for a penny. Its circulation is thought to be below 50,000, but it is still justly recognized as the leading journal, and its advertising patronage is enormous. The most widely circulated of the cheap papers is *The Daily Telegraph*, closely followed by *The Standard*, *The Daily Chronicle*, and *The Daily News*; while *The Morning Post*, which was originally a high-priced journal of Tory politics, giving especial attention to social affairs, has, since reducing its price to one penny, made rapid strides. A number of the provincial journals in Great Britain have also large circulations and great influence.

French journalism deals less with news, and in many instances seems less successful in developing great permanent properties. Among the leading Paris journals are *Le Temps*, *La France*, *La Presse*, once conducted by Girardin, *Le Siècle*, *Le Constitutionnel*, to which Saint-Beuve was long a brilliant contributor, the *Débats*, which enjoyed the services of both Girardin and Prévost-Paradol, *La Justice*, the organ of Clémenceau, and *La République Française*, once identified with Gambetta. *Figaro*, a paper devoted chiefly to paragraphs, the drama, Paris gossip, and general flippancy, made the fortune of its founder, Villemessant, and attained a circulation greatly larger than that of any of the papers before mentioned. It now presents also acute political and literary criticism, and it is generally read by the educated classes of all parties. *Le Gaulois* is a younger paper, successfully following in part the same lines. The most widely circulated newspaper in the world is *Le Petit Journal*, which often prints over 1,000,000 copies per day, sold at five centimes. Several newspapers in Germany, although hampered by the restrictions on the press, have attained great prominence, notably the *Vossische Zeitung*, the *Norddeutsche Allgemeine Zeitung*, the *Neue Preussische Zeitung*, the *Volkszeitung*, the *Cologne Gazette*, and the *Hamburgische Correspondent*. In Russia newspapers are not permitted to discuss political questions, and a rigorous press censorship is maintained. Periodicals entering or leaving the empire are frequently mutilated or defaced in parts by the authorities. The *Journal de St. Pétersbourg*, established in 1824, is a semi-official organ, and the *Novoe Vremya* (New Times), and the *Novosti* (Latest News) are daily papers of large circulation. In Spain freedom of the press has been tolerated only since about 1855. The most influential papers are the *Correspondencia de España* and the *Imparcial*, both in Madrid. Holland has many newspapers of note, the best known being the *Allgemeene Handelsblad* and the *Courant*, of Amsterdam, the *Haarlemsche Courant*, and the *Journal de la Haye*, *De Nederlandsche Stoompost*, and the *Staats-Courant*, of The Hague. The most widely known newspaper of Belgium is the *Indépendance Belge*, which from a news point of view is one of the most important in Europe; next are the *Journal de Bruxelles* and the *Étoile Belge*. In Austria the most influential newspapers are the *Neue Freie Presse* and the *Neue Wiener Tagblatt*. The principal paper of Sweden is the *Stockholm Dagblad*; of Norway, *Den Morgenblad*; of Denmark, the *Aftenposten* of Copenhagen; and of Italy, the *Secolo* of Milan.

The oldest existing official journal is that known to foreigners as the *Peking Gazette*, but among the Chinese as *King Pao*, or Metropolitan Announcements. The exact date of its establishment is not known, but it is mentioned as early as the period Kai-yuen (713-741). It is issued daily, is printed from movable wooden type, and consists of ten or twelve leaves of thin brown paper ($7\frac{1}{4}$ by $3\frac{3}{4}$ inches), stitched with paper twine in pamphlet form, with yellow paper covers, and contains a brief abstract of the record kept by the imperial household of audiences, presentations, and imperial movements, the names of the officials on palace duty for the day, etc., followed by decrees, rescripts, memorials from the provincial governments and from the censorate, appeal cases, ordinances of appointments, promotions, etc.

The whole management of the *Gazette* is in the hands of sixteen post-officials, military mandarins nominated by and representing as many provinces and regions, who are charged with the transmission of official documents and correspondence to their respective districts. Their scribes attend daily at the chancery of state and copy such documents as the grand council of state (see CHINA) may see fit to give out for publication. As soon as printed, copies are dispatched to the provinces, where extracts are usually published locally for more general circulation, and many persons make a livelihood by furnishing written copies to subscribers.

Modern Chinese newspapers are few in number, and are found chiefly in Hongkong and the treaty-ports. Several of these are owned and conducted by foreigners, and all are the result of foreign influence. The most important are those published at Hongkong (4), Canton (2), and Shanghai (3 or 4). Of these the *Shin Pao* and *Hu Pao*, published at Shanghai, have a large circulation, even in the interior, though postal facilities are practically non-existent. The chief foreign papers are in English, and are published at Shanghai. The most important are *The North China Herald*, *The Celestial Empire*, and *The China Gazette*. Three dailies are issued at Hongkong—the *Press*, the *Mail*, and the *Telegraph*, and several Portuguese papers at Macao.

In Japan, as in China, vernacular journalism dates from the arrival of foreigners in the country. The first real newspaper, the *Nisshin Shinjishi*, was established by a Scotchman, J. R. Black, in 1872. Twenty years later there were 648 newspapers and periodicals in Japanese, all owned and conducted by natives. The most influential are published at Tokio, the capital, and include besides the *Kwampo*, or Official Gazette, the *Shimpo* and *Kokkai*, which are semi-official, the *Shū-sei* and the *Nippo* (conservative), the *Mainichi Shimbun* and the *Yomiuri Shimbun* (liberal), the *Jiyu* and the *Minken* (radical), the *Nichi-nichi Shimbun* (opportunist), and the *Chō-ya Shimbun* and *Kokumin Shimbun* (independent). The press laws are very severe, and suspensions, confiscations, imprisonment, and fines are almost daily occurrences. Indeed, so common is imprisonment that some newspapers maintain a "prison editor," whose duty it is simply to go to jail when the paper has been convicted (without trial) of some press offense. The chief foreign papers published at the treaty-ports are in English. The most important are the *Japan Mail* (weekly and daily), the *Gazette* and the *Herald* (dailies with large "mail" editions), and the *Kōbē Herald*. The *Echo du Japon* (in French) is published at Yokohama.

The most remarkable field for newspaper enterprise and newspaper literature has been the U. S.; and, in proportion to population, the development of newspapers has been far greater here than anywhere else. The colonial press first appeared in Boston, Mass., in 1690. On Sept. 25 of that year Benjamin Harris published a sheet with the title of *Publick Occurrences both Foreign and Domestick*. It was the intention of the publisher to issue this paper once a month. Its size was three pages of a folded sheet, leaving one page blank, with two columns to a page, and each page was about 11 by 7 inches. The effort failed, however, in consequence of the opposition of the provincial authorities, who suppressed it after its first issue. The only copy known to be extant is on file in the state paper office in London. A reprint of *The London Gazette* was issued in New York in 1696 which gave the news of an important battle in Europe leading to the Peace of Ryswick. This was done by William Bradford on the order of Gov. Fletcher, but it was not intended as a regular newspaper. In general, the colonists relied upon a few London papers, received by occasional vessels arriving from England, for news from Europe, and on the gossips at the coffee-houses for local intelligence. Meanwhile, John Campbell, the postmaster of Boston, became a news-gatherer, and furnished the New England governors and a few friends with periodical news-letters or circulars. These led on Apr. 24, 1704, to the publication of *The News-Letter*, which has often been called the first newspaper printed in America. This is Campbell's prospectus:

ADVERTISEMENT.

This News-Letter is to be continued weekly: and all persons who have any Houses, Lands, Tenements, Farms, Ships, Vessels, Goods, Wares or Merchandizes, &c. to be sold or let; or Servants Run-away, or Goods Stole or Lost: may have the same inserted at a Reasonable Rate. From Twelve Pence to Five Shillings and not exceed: Who may agree with John Campbell Post Master of Boston.

All persons in Town or County may have said News-Letter every Week, Yearly, upon reasonable terms, agreeing with John Campbell, Post-master for the same.

The News-Letter, in its early days, was sometimes printed on a single sheet, foolscap size, but oftener on a half sheet, with two columns on each side. It went out of existence when the British troops evacuated Boston in 1776. It enjoyed a monopoly of journalism in America for fifteen years, and yet had a circulation of only 300 copies. In 1719 William Brooker was appointed postmaster of Boston in the place of Campbell, and in consequence of some difficulty about *The News-Letter* and the mails the new postmaster thought it expedient to establish another newspaper. On Dec. 21 of that year he issued *The Boston Gazette*. The appearance of this sheet, added to the loss of office, fired the indignation of Campbell, and thereupon began in America a "war of editors" which has never ceased.

On Dec. 22, 1719, the day after the *Gazette* appeared, the initial paper in Philadelphia, *The American Weekly Mercury*, was issued by Andrew Bradford, a son of the first printer in Pennsylvania. A paper that attracted more attention was *The New England Courant*, established by James Franklin Aug. 7, 1721. Benjamin Franklin began his career as a printer's apprentice on this paper. The *Courant* created a sensation, and its publisher was soon in difficulty. First it had a wordy war with *The News-Letter*. Then James Franklin had a good deal of trouble with the clergy, especially with Cotton and Increase Mather, and finally the journalist and the Government officials had their differences. The communications in the *Courant* produced so much talk and scandal in the quiet town of Boston that its publisher was forbidden to issue his paper except under very arbitrary restrictions, and for attempting to evade these he was thrown into prison. On Feb. 11, 1722, Benjamin Franklin, then only sixteen years of age, was placed in charge as editor and publisher, and he remained for several months in this position. There continued to be the same independent spirit in the management of the paper, and its troubles finally induced James Franklin to abandon its publication. He went to Newport, R. I., where he established the *Gazette* in 1732.

The next paper that appeared in America was *The New York Gazette*, the first in that province. It was published by William Bradford, and the first number was issued on Oct. 23, 1725. In 1727 *The New England Weekly Journal* was published by Samuel Kneeland. *The Maryland Gazette* also appeared in 1727, the first in that colony. It was published till 1736, and revived in 1749. In 1728 Benjamin Franklin made his reappearance as a journalist. Samuel Keimer had started a paper in that year in Philadelphia, which he named *The Universal Instructor in all the Arts and Sciences, and Pennsylvania Gazette*. Franklin had contemplated such an enterprise, and had confided his intention to a fellow-printer, who treacherously informed Keimer of the plan, and the *Instructor* was the result. Franklin, in order to prevent the success of Keimer's journal, immediately began writing "several amusing pieces for Bradford's paper [the *Mercury*], under the title of Busy Body." In less than a year Keimer sold his paper, with its ninety subscribers, to Franklin, who condensed its name to *Pennsylvania Gazette*, and made it a success. On Jan. 8, 1731, *The South Carolina Gazette* was issued, the first in that province. It was printed in Charleston, and lived a year, but was revived in 1734.

The most important newspaper, politically, in early colonial times was started in New York in 1733. On Nov. 5 of that year John Peter Zenger issued the first number of *The New York Weekly Journal*. It was a rival of Bradford's *Gazette* professionally and politically, and Zenger was a fearless journalist. The *Journal* made war on the administration of Gov. Cosby, and in 1734 its editor was arrested for libel on the Government and thrown into prison, and in the hope of crushing the paper the authorities kept him nine months in confinement. In spite of the imprisonment of its editor, the *Journal* continued to appear regularly: and on Aug. 5, 1735, the case was brought before the court for trial. It was the first action for newspaper libel on the American continent. Zenger was acquitted, and the verdict was greeted with the utmost enthusiasm by an immense audience. *The Virginia Gazette*, the first in that province, made its debut in Williamsburg in 1736; and two newspapers printed in German, the pioneers in any foreign language in the U. S., appeared—one in Germantown, Pa., in 1739, and the other in Philadelphia in 1743.

Most of these colonial papers confined themselves strictly to the merest mention of the news of the day. If any opinions were uttered, they were subservient to the authori-

ties. The Franklins and Zenger were the exceptions, and they originated and practiced that independent spirit which was infused in a new class of papers that appeared subsequent to 1745. This new class was the Revolutionary press. It was still of the colonial stamp, because the country was yet composed of colonies, with governors appointed to rule over them by Great Britain, but the people and the press had become restless, more self-reliant, and more independent of the colonial authorities. The pioneer was *The Independent Advertiser*, issued in Boston on Jan. 4, 1748, under the inspiration of Samuel Adams. One of its contributors was Jonathan Mayhew, who, on the occasion of an election, preached a sermon strongly advocating the republican form of government. David Fowle, the printer of the paper, having issued a pamphlet which severely denounced the Legislature for certain acts, was arrested and imprisoned. On his release he quitted Boston and went to Portsmouth, N. H., where he started *The New Hampshire Gazette* in 1756, and the young patriots of the *Advertiser* had to bide their time. One or two new papers appeared in Boston and New York, and pamphlets were issued by the opponents of the Government in the next year; but the real organ of the Revolutionary party made its appearance on Apr. 7, 1755. It was named *The Boston Gazette and Country Gentleman*, and all the vigorous writers for *The Independent Advertiser* contributed to its columns. The *Newport (R. I.) Mercury* was established on June 12, 1758, by James Franklin, a nephew of Benjamin Franklin. The press on which the elder James Franklin and his brother Benjamin so often worked in Boston remained in the *Mercury* office for 100 years. It was then presented to the Massachusetts Charitable Mechanics' Association. On Feb. 16, 1759, the old *Gazette* of William Bradford was revived, and afterward immortalized by Freneau. On Oct. 29, 1764, *The Connecticut Courant* was issued in Hartford, and is still published there as a weekly.

In opposing the Stamp Act of 1765 the patriotic newspapers had a prodigious influence on the colonists. *The Maryland Gazette*, the *Newport Mercury*, and many other papers printed the resolutions of the Virginia House of Burgesses against it, and several suspended publication in consequence of the act—notably *The Pennsylvania Journal and Weekly Advertiser*. In 1766 a second *Gazette* appeared in Williamsburg, printed by William Rind. The first printed statement of the adoption of the Declaration of Independence on July 4, 1776, was made in the *Gazette* on the 19th of that month, and the document in full appeared in the same paper on the 26th. On May 29, 1767, *The New York Journal, or General Advertiser*, was brought out under the inspiration of George Clinton and Philip Schuyler. It was a revival of Zenger's paper, and was edited by Alexander McDougall. Alexander Hamilton, when only sixteen years of age, was a clever contributor to its columns.

Opposite in political sentiment to these patriot journals was *The Royal Gazette*, which was established in New York in 1762 by James Rivington. The leading contributors to the *Gazette* were Attorney-General Seabury, Myles Cooper, president of King's (now Columbia) College, the Rev. John Vardill, and the Rev. Samuel Chandler. Major André also wrote for the paper, and his well-known satire, *The Cow Chase*, appeared in the *Gazette* on the very day of his capture. It was subsequently called *Rivington's Royal Gazette*, with the royal arms over the office door. It was an ably conducted newspaper. Its office was twice mobbed for its zeal for the crown—once by the Sons of Liberty, and once by a party of Connecticut militia. After enjoying royal favor for many years, Rivington, in 1782, who then saw the "end of things," shaped his course to meet coming events. The title *Royal* was dropped, and the paper was afterward known as *Rivington's New York Gazette and Universal Advertiser*, and the royal arms were removed from over the door of the office. The circulation of the *Gazette* reached, in its best days, the large number of 3,000. Another organ of the crown was started in Boston in 1767. It was *The Chronicle*, and the handsomest journal, typographically, published in the colonies. It exhibited great pretensions to literature. John Mein, one of its publishers, assisted by a pre-Revolutionary wit of Boston named Joseph Green, and a few others, was very severe on the Whigs of those days, but popular sentiment became so inimical to him that he was compelled to stop the publication of *The Chronicle* and leave the country.

The Massachusetts Spy, "a creature of the revolutionary plan," was the next influentially patriotic paper started in the colonies. Its first number came out in July, 1770, under

the auspices of Isaiah Thomas, the author of the *History of Printing in the United States*. It was a power with the people, and early in 1771 urged a recourse to arms. On the night of Apr. 18, 1775, the material of the *Spy* was conveyed across the Charles river and carried to Worcester, where the paper was ever afterward printed, and where it is now known as *The Worcester Spy*. On May 3, 1775, it first appeared there with the motto in large type: "Americans! Liberty or Death! Join or Die!" The Government, to stem this revolutionary tide after the suspension of *The Chronicle*, resorted to the old *News-Letter*, which was then known as *The Massachusetts Gazette and Weekly News-Letter*.

In the first year of the Revolution eight newspapers were started—four in Philadelphia, where Thomas Paine and Philip Freneau lived and wrote. The first newspaper in New Jersey, the *Gazette*, was issued on Dec. 3, 1777; the first in Mississippi Territory appeared in 1779, a pioneer among the pioneers; and in 1781 the first, *The Gazette or Green Mountain Post Boy*, was published in Vermont. Forty-nine newspapers were established in the colonies from 1745 to 1783, but of all those publications not one appeared daily. While New York was occupied by the British troops four papers were published there, and an arrangement was made in their days of publication by which the public had a newspaper each day. The first daily paper in America was not issued till 1784. It was *The American Daily Advertiser*, and was published in Philadelphia by Clappoole, who was the first to introduce reporting on the continent. Of the 63 newspapers which had been started in America from 1690 to 1783, only 43 were in existence on the conclusion of peace with Great Britain.

When the Constitution went into operation in 1789 there were printed in each week, in the U. S., 76,438 copies of newspapers. Many foreign writers of ability were employed by both the great political parties on the press, and many of the political chiefs wrote for the journals. There were few or no regular editorial articles, but the topics of the day were warmly discussed in communications over all sorts of signatures. Most of the foreign writers were political exiles, and they naturally fell into the ranks of the Democrats and wrote for the papers of that party, strongly against Great Britain and in favor of aiding republican France; and they were very severe on the administrations of Washington and Adams. One of these papers, *The National Gazette*, was established in Philadelphia in Oct., 1791, by Philip Freneau while a clerk under Jefferson in the State Department. Jefferson placed a high estimate on his services as a journalist. *The Gazette* was published till 1793. In 1797 Freneau started *The Time Piece* in New York, which was afterward edited by Matthew L. Davis, and subsequently by John Daly Burk, one of the United Irishmen. Two influential journals were established in 1793: *The New England Palladium* in Boston, and *The Minerva* (afterward and still known as *The Commercial Advertiser*) in New York. Noah Webster, the lexicographer, previously a lawyer in Hartford, was induced to take charge of the latter, and thereby strengthen the Federal party. William L. Stone was subsequently and for many years its editor. It was afterward conducted by Thurlow Weed, and has since had a variety of changes in editors and politics. It is the oldest paper in New York. *The Palladium* was merged with *The Boston Advertiser*. The newspapers that attracted the most attention in the latter part of the eighteenth and the early part of the nineteenth century were *The Aurora* in Philadelphia and *The Evening Post and American Citizen* in New York. *The Aurora* was edited by Benjamin Franklin Bache, a grandson of Benjamin Franklin, till 1798, and then passed under the editorial care of William Duane, who had become very much embittered against Great Britain. It was a powerful organ of Jefferson's. *The Evening Post* was started on Nov. 16, 1801, and was strongly Federal in its politics. Alexander Hamilton, John Jay, and their friends established it, and placed William Coleman in the editorial chair, where he remained for nearly thirty years, and was succeeded by William Leggett and William Cullen Bryant. *The American Citizen* was a continuation of *The New York Journal and Argus*. James Cheetham became its editor in 1801, and acted with that portion of the Democratic party of which the Clintons were leaders. The bitterness of these three journals kept up the political excitement in New York to a high pitch and for a long time. Another Democratic paper was issued in New York in 1802 by the friends of Aaron Burr, in opposition to the *Citizen*. It was *The Morning Chronicle*, and edited by Dr. Peter Irving. Washing-

ton Irving made his first appearance as a writer in *The Chronicle*, over the signature of "Jonathan Oldstyle." It ceased to exist in 1805.

With the increase of population in the Northwest, the necessity of newspapers became evident, and on Nov. 9, 1793, *The Centinel of the Northwestern Territory* was founded in Cincinnati by William Maxwell, the first newspaper and the first printing-office beyond the Ohio. Nathaniel Willis, an old Boston printer, started *The Scioto Gazette* in Chillicothe in 1796, and in 1799 *The Western Spy and Hamilton Gazette* was issued. Singular as it may seem, some of these newspapers appeared in advance of any in Central or Western New York. *The Otsego Herald*, or *Western Advertiser*, was the first newspaper printed in Central New York. It appeared (18 by 21 inches in size, each of the four printed pages being 9 by 15½ inches) at Cooperstown Apr. 3, 1795, and was continued until 1821. Elihu Phinney was its founder, editor, and the pioneer journalist in that section of the country. William L. Stone, Thurlow Weed, and other distinguished journalists, worked at the case in his office, and J. Fenimore Cooper often "set type" there for amusement, and he described in *The Pioneers* the printing-establishment of the *Herald* in its days of infancy.

The Richmond Enquirer, edited for forty years by Thomas Ritchie, started on May 9, 1804, became a leading and powerful organ of public opinion for half a century. Among other prominent journals that appeared at that time was *The Albany Register*, established in 1803 or 1804, an influential paper, especially under the care of Solomon Southwick, who was its chief editor in 1808. In the overthrow of factions it succumbed to *The Albany Argus*, which was started in 1813, and managed with ability and skill by Edwin Crosswell till the defeat of Martin Van Buren in 1840. It was the mouthpiece of the Albany Regency, as the *Enquirer* was of the Richmond Junta. Another paper of note was *The Hudson Balance*, a leading Federal paper in 1804, edited by Harry Crosswell. It had to carry on the contest against the Democratic organs with *The Commercial Advertiser* and *The Evening Post* of New York. New party papers continued to make their appearance, and were at that time mostly Democratic. They grew out of the troubles and jealousies of the party-leaders. After the death of Cheetham, the Tammany Hall Democrats set up a paper named *The National Advocate*. Henry Wheaton was its editor for a number of years. It then passed into the hands of Mordecai Manasseh Noah; James Gordon Bennett was also one of its editors. Other influential party papers of that period were *The Portland (Me.) Argus*, established in 1803, *The New Hampshire Patriot* in Concord in 1808, *The Hartford (Conn.) Times* in 1817, *The Charleston (S. C.) Mercury* in 1822, *The Globe* in Washington, and *The Post* in Boston in 1831, the *Nashville (Tenn.) Union*, and *The Columbus (O.) Statesman*. The newspapers in opposition a large portion of this time, although some of these were originally Democratic, were *The National Intelligencer*, issued in Washington in 1799–1800; *The Providence (R. I.) Journal*, established in 1820; *The Boston Courier*, started by Joseph Tinker Buckingham in 1824; *The Richmond (Va.) Whig*, in 1826; *The New York Courier and Enquirer*, in 1827; *The Albany Evening Journal*, originally established by Thurlow Weed as an Anti-Masonic organ in 1830; *The Louisville (Ky.) Journal*, first issued in 1831, and edited for thirty years by George D. Prentice; *The Boston Atlas*, started by John H. Eastburn and the Webster Whigs in 1832; and *The New York Express*, set up by the Clay Whigs in 1836. These journals represented the National Republican and Whig parties, and made their mark on the pages of political history; but they were not confined wholly to politics. With the progress of the country, and with the discussions of the great questions that came up before the people, they expanded their field of discussion and enlarged their collections of news. Especially in New York, in order to obtain large circulations, efforts were made to acquire the earliest news in advance of one another. More attention was devoted to commercial and foreign intelligence, and they became large advertising mediums. Other papers were established during this long period which were not strictly party papers, but the number was small. One of the most valuable was *Niles's Weekly Register*, which was brought out in Baltimore in 1811, and continued till 1848.

The "organs" at the national capital were an important feature of the party journalism of the period. The first of this class was *The National Intelligencer and Washington Advertiser*. This paper had been removed from Philadel-

phia, where it was known as *The Independent Gazetteer*, on the removal of the seat of government from that city. This was in 1799-1800. *The Intelligencer*, then owned by Samuel Harrison Smith, became the organ of Jefferson. In 1810 it passed into the hands of Gales & Seaton, and these journalists introduced the full reports of the debates in Congress. On the advent of Jackson on Mar. 4, 1829, the *Intelligencer* ceased to be the organ of the Government, and became that of the Whig party, and *The United States Telegraph*, edited by Duff Green, was accepted as the organ of Jackson's administration; but a rupture between President Jackson and Vice-President Calhoun caused the establishment (in 1831) of *The Globe*, with Francis P. Blair and Amos Kendall as editors, and this journal became the organ of the Democratic party, continuing till the advent of Harrison in 1841, when the *Intelligencer* resumed its old position. The early death of Harrison, throwing the Whig party into confusion, led John Tyler to select *The Madisonian*, started in 1841, to be his organ. On the election of James K. Polk in 1844 *The Globe* did not return to power with its party, but a new paper, called the *Union*, was established, with Thomas Ritchie as editor, and that journal became the official organ. On the election of Gen. Taylor in 1848 a new paper was started for his organ, as the *Intelligencer* favored the Webster wing of the Whig party. The new paper, *The Republic*, was edited by Alexander Bullitt and John O. Sargeant. The *National Era* served the Free-Soil party in the national capital from 1847, and, besides other powerful contributions to the growing antislavery excitement, first gave *Uncle Tom's Cabin*, by Mrs. Stowe, to the world. When Franklin Pierce came into power in 1852-53, *The Union* resumed its position with the Government, but with Gen. Robert Armstrong as editor and Caleb Cushing and A. O. P. Nicholson as contributors, and continued, with John Appleton (previously editor of *The Portland Argus*) as conductor, through the administration of James Buchanan. *The Union* was the last of the official organs at the national capital.

The Rev. John Andrews established in Chillicothe, O., the first religious newspaper in the U. S. It was entitled *The Recorder*, and the initial number was issued in 1814. Nathaniel Willis thought and talked of such an enterprise in Portland, Me., in 1808, but did not receive sufficient encouragement to carry out his plans till 1816. On Jan. 3 of that year he issued the first number of *The Boston Recorder*. *The American Farmer* was the first of the agricultural press. It was published in Baltimore by John S. Skinner, and the first number appeared on Apr. 2, 1818. *The Plough-boy*, managed by Solomon Southwick, followed in 1821, and was published in Albany. *The New England Farmer* next appeared in Aug., 1822. As far back as 1795 *The Boston Prices Current and Marine Intelligencer* was published, but in a few years it became a political newspaper; and the first successful commercial paper was *The New Orleans Prices Current*, established in 1822.

Up to 1833 newspapers in the U. S., whether daily or weekly, were distributed almost exclusively by subscription, and at a price which, considering their size and the amount of reading-matter they gave, would now seem high. Their advertisements, however, were cheap, as was natural, considering that the circulations were small. It was only by becoming an annual subscriber that one could obtain a city paper for less than six cents. There were no street sales, no news-stands or news-agencies, and but small sales at the offices. No paper in the country in 1835 circulated over 5,000 copies; very few over half that number. With all the enterprise that James Watson Webb, of *The Courier and Enquirer*, and Hale and Hallack, of *The Journal of Commerce*, of New York, and Richard Houghton, of *The Boston Atlas*, displayed between the years 1830 and 1840 in news-shooners and pony expresses, not one of these journals could boast of a subscription-list of over 5,000 names.

The penny press appeared in New York in 1833. *The Morning Post* was started on the first day of that year. Horatio David Shepard was the editor, and Horace Greeley and Francis V. Storey were the printers. It was first sold for two cents, and then for one cent. In three weeks it was dead. On Sept. 3, 1833, *The Sun* was issued by Benjamin Day, and sold at one cent per copy. At first it depended for its success on local news, and largely on piquant police reports. It gradually gained a large circulation, and espoused the Democratic side in politics. In 1867 it was reorganized, and came for the first time under the direction of a forcible political editor, Charles A. Dana, who had en-

joyed large experience on political journals and as Assistant Secretary of War. Under him it became an influential political journal, and also by a careful selection and skillful condensation of news commended itself to many political opponents. For years it sold from 120,000 to 140,000 copies daily, adhering to its four-page size and two-cent price.

Nearly two years after *The Sun* (on May 6, 1835), another small, cheap paper, *The New York Herald*, made its first appearance, edited by James Gordon Bennett, who had also enjoyed large previous experience on other journals. Within twenty years it attained a circulation of 36,000 copies, and has since that time greatly increased, though with varying prices and success. It displayed great enterprise in the collection of news. In the latter years of his life Mr. Bennett gradually yielded the management of the *Herald* to his only son, bearing his name, who on his father's death succeeded to the absolute control. The son made a liberal use of a portion of the large fortune left him in equipping an expedition in search of Livingstone, which, besides discovering the African explorer, made important contributions to geographical science. He also fitted out a generous but unfortunate Arctic exploration enterprise. He gave great attention to yachting, coaching, base-ball, lawn tennis, racing, polo, and other sports, and continued the policy of his father in making the most energetic and far-reaching collection of all manner of news likely to interest a miscellaneous public his first object.

On Apr. 10, 1841, Horace Greeley, who had already attained distinction as the most forcible political editor then in the Whig ranks, issued the first number of *The New York Tribune*, which he continued to conduct until his nomination for the presidency in 1872, and of which he remained one of the proprietors until his death. *The Tribune* also was at the outset a penny paper, but it differed from the other cheap journals of that period in giving larger attention to politics, literature, and social discussions. Contributors to its columns set forth and advocated the system of Fourier. It encouraged efforts to establish communistic and educational associations. It gave almost the first serious attention to the Rochester knockings and other alleged manifestations of Spiritualism; it pressed upon workingmen the advantages of co-operation and arbitration, instead of trades-unionism and strikes, as a method for securing their best interests; and it became the most conspicuous champion of the warfare through political agencies upon the system of slavery. It made the first great use of the Atlantic cables for transmitting war correspondence. It translated the famous cipher dispatches relating to alleged illegal attempts by Mr. Tilden's partisans to secure electoral votes for him in the disputed election of 1876. It established and has conducted for many years the pioneer Fresh Air Fund, by which large numbers of poor children from the most destitute portions of the city are taken to country homes for a two weeks' vacation during the stifling heat of summer. This is of especial importance as the type of numerous charitable undertakings by other newspapers. *The Tribune* established, within a few months after its first issue, regular weekly and semi-weekly editions, and its weekly soon became the most widely circulated political journal in the U. S.

The New York Times was established by Henry J. Raymond, who had formerly been on the editorial staff of the *Tribune*, in Sept., 1851. It was designed to fill substantially the same field with the *Tribune*, but in a more conservative and moderate way. It also began as a penny paper, and attained success almost at the outset. Its greatest reputation was achieved after Gov. Raymond's death by its vigorous exposure of the Tweed ring, in which it displayed courage and pertinacity, and from which it derived great profit. During Gov. Raymond's life and for some years afterward it was Republican. It gradually displayed free-trade leanings, in 1884 supported the Democratic presidential ticket, and has since formally declared itself a Democratic journal.

On June 1, 1860, *The New York World* was established by a number of religious gentlemen, for the purpose of having a newspaper in the metropolis without the police reports and the theatrical advertisements and notices that occupied so much space in the other city journals, and with a distinctly evangelical tone. After spending a large sum of money this idea was abandoned, and the *World* passed into Democratic hands. On July 1, 1861, the *World* and *The Courier and Enquirer* were united. In the doubtful struggle, but at last under Joseph Pulitzer attained an unusually large circulation.

The *Herald*, *Tribune*, *Sun*, *Times*, and *World* all became large quarto or eight-page newspapers. As their system of collecting news extended, and the labor and expense bestowed upon its preparation increased, the price of all of them except *The Sun* was raised, first to three, and finally, during the civil war, to four cents. They also one after another began the issue of regular Sunday editions, for which the price was five cents, the *Tribune* being the latest to yield to this innovation. After some fluctuations the *World* fixed the price at two cents, and was followed in this for a time by the *Times* and *Herald*, but these returned later to the *Tribune's* price, three cents. All these papers also advanced again to five cents the price of their Sunday issue, which had now become a magazine in itself, ranging according to the pressure of news and advertisements from twenty to forty-eight pages for each issue. The size of the paper in the week-day issues was also gradually increased. It is rarely that any of these papers has now less than ten pages, while twelve, fourteen, and sixteen pages are more common. This great increase in size and in the quantity of reading-matter furnished has been made practicable by several causes: (1) The enormous reduction in the cost of the paper on which they are printed. In 1872 white news print cost from twelve to thirteen cents a pound; in 1894 it could be bought for two and a quarter cents. (2) The introduction in most of the papers of machinery for type-setting, which can be made to reduce greatly the cost of composition. (3) The introduction of improved printing-machinery, by which the papers are printed, cut, pasted, folded and counted, ready for delivery by a single machine, needing only three operators, at the rate of from 20,000 to 40,000 copies per hour. (4) Great reductions in the cost of telegraphing both on the ocean cables and by the domestic lines, coupled with the system of leasing telegraph lines between important news-points for an individual newspaper or a few associates, and the liberal use of long-distance telephone lines. (5) A vast increase in the number of newspaper readers, thus increasing the profit both on circulation and from the consequent advertising. Seventy columns of news and editorial comment, besides many pages of advertisements, are now often sold for two or three cents. Nearly all news is now received by telegraph, and a large part of it is specially collected for each paper by its own corps of correspondents. The expenses for the collection of city news have also immensely increased since 1860. Where eight or ten reporters formerly served a newspaper it now often has sixty to seventy. Counting "casuals" and "special assignment men," it is common for a New York newspaper of the first class to have 100 or more men serving almost every night in its city department. The editorial department has made a similar advance, while specialists are retained in large numbers for the treatment of literary, artistic, musical, dramatic, and other topics.

The same increase in labor and expense and improvement in the collection of news which have been noted in the New York papers, especially since 1860, may be observed proportionately throughout the press of the country. The great distances in the U. S., the excellent telegraphic service, and the facilities afforded by the United and the Associated Presses stimulate the growth of first-class newspapers in all large cities. Thus Philadelphia, Cincinnati, Chicago, St. Louis, New Orleans, and San Francisco have come to possess strong and enterprising journals, many of them as large as, or larger than, the New York papers, and sometimes conducted on a scale of equal expenditure. In Chicago, the *Tribune*, *Herald*, *News*, *Times*, and *Inter-Ocean* are of this class; in St. Louis, *The Globe-Democrat* and *Republic*; in Cincinnati, *The Commercial-Gazette* and *Enquirer*; in New Orleans, *The Times-Democrat* and *Picayune*; and in San Francisco, the *Chronicle*, *Examiner*, *Bulletin*, and *Call*.

A large number of the more substantial newspapers now erect large buildings of their own wherein they establish their machinery and offices, while they derive a handsome income from the rent of the portions of the building not occupied by themselves. In New York, the *Tribune* was the first to construct a large eleven-story fire-proof building of this class. It has since been followed by the *Times*, *World*, and some others; while the *Herald*, adopting a different idea, has constructed a large but low building in the heart of the up-town amusement and advertising quarter, entirely for its own use. In most of the great cities of the country the leading newspapers now own buildings, often the most conspicuous in the place, accommodating many tenants as well

as themselves. Even on the Pacific coast the buildings of *The San Francisco Chronicle*, *Portland Oregonian*, and *Seattle Post-Intelligencer* are of the most approved modern, high, fire-proof class, and among the most prominent in their respective cities.

The period since the civil war has been marked also by the rapid development of local journalism throughout the U. S. Nearly every city of 15,000 inhabitants must have its own daily paper—often, indeed, when not half that size. Nearly every county-seat must have its weekly paper, and in the more populous counties some village in almost every township will also have a weekly issue. An immense system of printing what are called "patent outsiders" for such papers has sprung up, under which two pages of news and miscellany are edited and printed at some central office for a great multitude of smaller papers, the half-printed sheets being then forwarded to the several offices, to be filled out, in each, with the local news and editorial comment of its own locality. Another economical device for the small country papers is the use of what is called "plate matter." Late news, correspondence, and miscellany likely to be generally acceptable for such papers is put in type in a central office, say in New York or Chicago, and stereotype plates of it are then made and sold to the country press. Thus a country paper often presents to its few hundred readers four pages of attractive reading matter, of which less than a page has been prepared and put in type in its own office.

The Daily Graphic of New York is believed to have been the first illustrated daily newspaper in the world. It regularly printed engravings, often of considerable merit, on four of its eight pages. Its system, however, proved too expensive, and it led a precarious existence, finally dying in 1888. Meantime many of the larger daily journals gradually adopted the plan of illustrating their news columns with portraits of the leading persons referred to, and this proved so popular that the system was largely extended. Many of the newspapers established art departments in their offices. Here they accumulated enormous collections of photographs of almost every prominent personage in America and Europe, together with engravings of public buildings, and every other species of information likely to be useful in enabling them suddenly to produce pictures in illustration of any news article. Various new methods of reproducing photographs on metal and then transferring them to the stereotype pages were introduced. Skillful artists were also employed to attend important public trials, conventions, sessions of Congress and of the Legislature, etc., and to make spirited sketches of the principal speakers and the surrounding scenes. In this manner a large number of newspapers not only in New York but in the other principal cities of the country are liberally illustrated every day. The system has also been seized upon by the offices furnishing "plate matter" to country papers, and the remotest rural weekly can now accompany its news of the latest nomination for Governor or Congress with a portrait of the candidate, or its mention of the latest noted death, whether of prince, or president, or opera-singer, with a tolerable representation of the features of the deceased. Illustrated weeklies are numerous, and some of them have great circulations, *Harper's Weekly* and *Frank Leslie's* being the most prominent in New York. Comic newspapers were for a long time unsuccessful in the U. S., but since 1880 several have become profitable, *Puck*, *Judge*, and *Life* being those best known in New York. Of class-papers the name is legion; half a dozen are devoted exclusively to the affairs of Wall Street. Every trade has its own organ, and often numerous competing organs. The growth of the religious press has been marked by great steadiness, and many of the journals belonging to the larger denominations are among the most stable and successful newspaper properties in the country.

An estimate of the number of newspapers in the world in 1891 showed a total of 41,000, of which 24,000 were published in Europe. The distribution was approximately as follows: The U. S., 12,500; Germany, 5,500; France, 4,100; Great Britain and Ireland, 4,000; Austria-Hungary, 3,500; Italy, 1,400; Spain, 850; Russia, 800; Switzerland, 450; Belgium, 300; Holland, 300. Of this total 17,500 were published in the English language, 7,500 in the German, 6,800 in the French, 1,800 in the Spanish, and 1,500 in the Italian. In 1893 the *Newspaper Press Directory*, of London, gave the number of newspapers in the United Kingdom as 2,268, and of magazines, including the quarterly reviews, as 1,961—a total of 4,229 periodicals.

The following table, from the *American Newspaper Directory* for 1894, shows the number and frequency of issue of newspapers and periodicals in the U. S. and in Canada:

STATES.	Daily	Tu. weekly	Wed. weekly	Th. weekly	Fr. weekly	Sat. weekly	Monthly	Quarterly	Yearly	Total
Alabama	19	1	166	1	4	16				207
Alaska			3			1		1		5
Arizona	2	1	29							39
Arkansas	16		144		4	17				241
California	93	6	418		4	86				607
Colorado	31	3	221		2	32				289
Connecticut	41	1	112	3	3	35		2	6	206
Delaware	6		27		1	5		1		40
D. of Columbia	4		33		2	2		4		65
Florida	15	1	103	1	1	8				131
Georgia	22		238		4	28		1		303
Idaho	3	2	47							52
Illinois	131	1	1,070	6	31	245		19		1,520
Indian Territory	2		34							38
Indiana	110	1	546	2	7	79		3		753
Iowa	60	2	814	3	10	70		1	4	978
Kansas	38		635	1	3	50		3		732
Kentucky	21	1	226	2	5	25				289
Louisiana	15	1	141	3	3	12				172
Maine	16	2	106	1	5	57				192
Maryland	13		135	2	4	37		1	5	197
Massachusetts	80		378	8	11	171		4	30	664
Michigan	54	11	565	3	15	76		3	1	727
Minnesota	47	3	438	3	11	54		2	1	549
Mississippi	9	2	150		2	7				170
Missouri	85	2	675	1	17	107		2	10	907
Montana	11	1	63		2	6				84
Nebraska	33	1	559		4	34				639
Nevada	9	1	17		1					28
New Hampshire	14		82			19			1	117
New Jersey	48	2	255	2	7	44		4	3	367
New Mexico	7		48		1	1				57
New York	177	2	1,114	2	43	554		23	50	2,001
North Carolina	18		163	1	5	29			1	208
North Dakota	9		118	1	1	6				135
Ohio	110	4	775	3	19	125		2	16	1,108
Oklahoma	10		73		1	5				90
Oregon	18		141		1	21				185
Pennsylvania	183	3	925	8	23	216		8	21	1,408
Rhode Island	16	1	37	2	4	13			1	70
South Carolina	8	1	97		4	8		1		125
South Dakota	16		224		1	18		1		261
Tennessee	17	4	222		4	26		2		275
Texas	54	1	551		4	36		1	1	656
Utah	10		34		5	8				64
Vermont	3		63		3	11				80
Virginia	30	2	184		1	40		3	4	270
Washington	18	2	189		2	21			1	225
West Virginia	12		144	1	1	8				166
Wisconsin	49		450	4	8	33		2		551
Wyoming	5		32							37
Totals, U. S.	1,853	29	14,077	62	290	2,501		70	197	19,302
Brit. Columbia	7		15		1	1				25
Manitoba	2		36		1	11				53
New Brunswick	8		27	1		10				48
N. W. Territories	1		12							15
Nova Scotia	7	2	45	1	1	7				66
Ontario	43		362	2	13	80		1		507
Prince Ed Isl'd	3		11			1				16
Quebec	16	1	75	2	5	28			1	132
Totals, Canada	87	3	583	6	21	138		2		862
Newfoundland	2		2							5
Grand totals	1,942	32	14,662	68	311	2,639		70	199	20,169

Revised by WHITELEW REID.

New Style: See CALENDAR.

Newt: a name applied to various small, tailed batrachians belonging to the genera *Triton*, *Salamandra*, etc., but particularly applicable to *Triton cristatus* of Europe. The newts have vertically flattened tails, and some have fleshy ridges along the back. They frequent ditches and sluggish water generally, feeding on insects and other animal matter. They are harmless, although they are popularly regarded as venomous.

F. A. L.

New Tacoma, Wash.: See TACOMA.

New Testament: See BIBLE, THE.

Newton: city (settled in 1826, made the county-seat in 1831); capital of Jasper co., Ill.; on the Embarras river, and the Peo., Dec. and Evans, and the Ind. and Ill. S. railroads; 110 miles E. N. E. of St. Louis and 229 S. of Chicago (see map of Illinois, ref. 8-G). It is in an agricultural, coal, and dairy region; has steam and water power saw, flour, and grist mills, creamery, and canning and egg-case factories; and contains 6 churches, public schools with grammar and high grades, a high-school library, a private bank, and 3 weekly papers. Pop. 1880, 1,168; 1890, 1,428; 1894 estimated with suburbs, 2,000.

EDITOR OF "PRESS."

Newton: city; capital of Jasper co., Ia. (for location of county, see map of Iowa, ref. 5-11); on the Iowa Cent. and the Chi., Rock Is. and Pac. railroads; 35 miles E. of Des Moines. It is in an agricultural, horse-breeding, and stock-raising region; has 2 foundries and machine-shops, 2 canning-factories, flour-mills, and harvesting-machine works; and contains 9 churches, Normal College (built in 1893 at a cost of \$25,000), a national bank with capital of \$50,000, a savings and 2 private banks, and 4 weekly newspapers. Pop. (1880) 2,607; (1890) 2,564; (1895) 3,213.

EDITORS OF "HERALD."

Newton: city; capital of Harvey co., Kan. (for location of county, see map of Kansas, ref. 7-G); on the Atch., Top. and S. Fé and the Mo. Pac. railways; 135 miles S. W. of Topeka. It is in a fruit and grain growing region, with valuable coal mines and stone quarries in its vicinity. There are 13 churches, public-school buildings that cost \$90,000, Free Library (founded 1885), 2 national banks with combined capital of \$100,000, a State bank with capital of \$41,000, and a daily and 4 weekly newspapers. The manufactories include railway machine-shops, iron-foundries, carriage and sugar factories, and brick-works. Pop. (1880) 2,601; (1890) 5,605; (1895) 5,148.

EDITOR OF "REPUBLICAN."

Newton: city (settled in 1630, separated from Cambridge and incorporated as a town in 1679, chartered as a city in 1873); Middlesex co., Mass. (for location of county, see map of Massachusetts, ref. 2-H); on the Charles river, and the Boston and Albany Railroad; 7 miles W. of Boston. It contains 13 villages, derives large water-power for manufacturing from the river, and is the place of residence of many people doing business in Boston. The city is noted for the healthfulness and beauty of its location. There are more than 30 churches, 2 academies, the Newton Theological Institution, Lasell Female Seminary, a lyceum, public library (founded 1869) containing over 35,000 volumes, a national bank with capital of \$200,000, a savings-bank, and a monthly and 3 weekly periodicals. The manufactories include rolling, paper, and print-cloth mills, and boot and shoe, hosiery, carriage, cordage, emery-cloth, glue, dye, ink, and soap factories. In the center of the city is a cemetery of about 90 acres. Pop. (1880) 16,995; (1890) 24,379; (1895) 27,590.

EDITOR OF "JOURNAL."

Newton: town; capital of Sussex co., N. J. (for location of county, see map of New Jersey, ref. 1-C); on the Del., Lack. and W. Railroad; 25 miles N. N. W. of Morristown, 62 miles N. W. of New York city. It is in an agricultural, copper, and iron region; contains a non-sectarian collegiate institute, the Dennis Library (founded 1873), 2 national banks with combined capital of \$300,000, and 2 weekly newspapers; and is principally engaged in mining and in the manufacture of shoes and paper boxes. It is a summer resort. Pop. (1880) 2,513; (1890) 3,003; (1895) 3,426.

EDITOR OF "HERALD AND DEMOCRAT."

Newton, ALFRED: ornithologist; b. at Geneva, Switzerland, of English parents, June 11, 1829. He is a fellow of Magdalene College, Cambridge, England, where he is Professor of Zoölogy and Comparative Anatomy. Prof. Newton has a wide acquaintance with ornithology, and his writings abound in numerous references to its literature, especially to that of an early date. His published papers are numerous; he is the author of the article *Ornithology* in the ninth edition of the *Encyclopedia Britannica*, as well as of the shorter ornithological articles, and—with Dr. Parker—of the article *Birds*. A more recent work, in conjunction with Dr. Gadow, is *A Dictionary of Birds*. F. A. LUCAS.

Newton, Sir CHARLES THOMAS, K. C. B., D. C. L.: archaeologist; b. at Bredwardine, Herefordshire, England, in 1816; was educated at Shrewsbury School and Christ Church, Oxford, graduating with honors in 1837. He was assistant curator of antiquities in the British Museum from 1840 until 1852, when he was appointed vice-consul at Mytilene. He explored the islands and coasts of the Ionian Archipelago, making extensive excavations at Budrum (Halicarnassus) on the site of the mausoleum erected by Queen Artemisia, and at Cnidus and Branchidae. At Constantinople he disinterred the Serpent of Delphi. His splendid collection of coins, inscriptions, sculptures, and vases, acquired by excavation or purchase, he deposited in the British Museum. He was named consul at Rome (1860), was keeper of the Greek and Roman antiquities of the British Museum (1861-85), and was appointed Professor of Archaeology at University College, London (1880). In Mar., 1861, he married Ann

Mary (1832-66), daughter of the painter Joseph Severn, the friend of Keats. She was an accomplished artist and made copies of the treasures discovered by her husband. He died at Westgate-on-the-Sea, England, Nov. 28, 1894. E. A. G.

Newton, Sir ISAAC: physicist; b. at Woolstrop, Lincolnshire, England, Dec. 25, 1642 (old style); posthumous and only child of Isaac Newton, a farmer of good family. Young Newton was early sent to the village school, and afterward to the free grammar school at Grantham. His mother's only wish was to give him sufficient education to enable him to fulfill with credit the duties of a country squire. She therefore removed him early from school, and intrusted him with some share in the management of his own estate of Woolstrop. The boy's passion for mechanics and science was so strong that he entirely neglected his less congenial duties. He constructed mechanical toys of great delicacy; one sun-dial, made in his boyish days, is still in the house at Woolstrop, and another in the Royal Society rooms. His mother, wisely regarding his passion for study, sent him again to school, and in 1660 he entered Trinity College, Cambridge. The same year Dr. Barrow was appointed Professor of Greek; Newton soon found in him a safe guide and cordial helper, not only in the classics, but also in mathematics. When Newton entered Cambridge the philosophy of Descartes reigned supreme; one of the first books read by the student was undoubtedly Descartes's *Analytical Geometry*. This new application of algebra to geometry had opened up a whole world of new possibilities. Yet, strange to say, Newton scarcely speaks of the Cartesian method, and later, in his *Optics*, fails to do simple justice to Descartes in regard to the theory of the rainbow. Newton had the habit of noting down, as he read, points which admitted of further development. His jottings and the subsequent developments of certain points in Wallis's *Arithmetica Infinitorum* led him to many remarkable discoveries. (See BINOMIAL and FLUXIONS.) These discoveries with which he enriched mathematical science were made before he had completed his twenty-fourth year. It would seem that he recognized the powerful instrument which lay in his hand for the solution of the many problems in physical science, for he neither published his discoveries nor made them known to his friends. Having secured these treasures, he turned his attention toward natural philosophy. In 1661 he had been made sub-sizar, and in 1664 scholar; in 1665 he took his degree as B. A.; in 1667 became junior fellow and M. A.; in 1668 senior fellow; and in 1669 he succeeded Dr. Barrow as Lucasian Professor of Mathematics. The plague in 1665 drove him to his country-seat at Woolstrop; while there he turned his attention to the subject of *gravity*. Whether the story of the falling apple be true or not, he certainly began to connect the mysterious force which draws bodies toward the center of the earth with that which holds the planets in their orbits. Taking the known velocity of falling bodies, he made a calculation upon the force necessary to deflect the moon from a right line and make it revolve in its orbit round the earth. One of the quantities in this problem is the semi-diameter of the earth, which he took too small by nearly one-sixth, supposing a degree on the earth's surface to be only 60 miles. There was a discrepancy between the results of his calculation and the known facts amounting to about one-sixth, which caused him to reject his theory as incomplete, and the magnificent discovery of *universal gravitation* lay neglected for sixteen years. In 1668 Mercator published his *Logarithmotechnia*. His quadrature of the hyperbola involved some of the first principles of the method long before perfected by Newton. Mercator's discovery was sent by Collins to Barrow, and shown by Barrow to Newton. At once the young mathematician laid before his master his own MSS. Barrow was struck by the riches of the collection, and wrote to Collins of it. The copy made at that time was found among Newton's papers at his death; the MSS. were sent to Collins, and their value at once acknowledged by the first mathematicians of the age; but he still refused to publish. Newton's attention was now directed toward the subject of light. By repeated experiment he showed that light is not homogeneous, but that a ray of white light is the resultant of innumerable rays of light possessing different colors, rates of vibration, and refrangibility. In 1672 he was elected a member of the Royal Society of London. Soon after a communication on light was read before that society, which stirred up a violent controversy. Newton advocated the material or corpuscular the-

ory; Hooke, the undulatory theory of light. Newton brought forward many remarkable experiments and much mathematical knowledge to his support. Hooke had little more than an hypothesis to offer. The undulatory theory has since been accepted as the true one, though its foundation is far deeper and surer than that laid by its earlier advocates. In 1671 Newton completed a reflecting telescope made with his own hands, which is still in the library of the Royal Society. About this time, in investigating the colors of thin plates, he invented his very ingenious hypothesis of "fits of easy reflection and transmission." In 1682 a new measurement of an arc of the meridian came to his knowledge; this gave him the information requisite to make again his calculation relative to gravity. As he approached its completion his agitation became so great that he was forced to intrust it to a friend to finish. The result justified his intense feeling; observation and calculation corroborated each other; the crowning glory of Newton's life, the magnificent theory of universal gravitation was complete. (See GRAVITATION.) His discovery was given to the world under the title *Philosophiæ Naturalis Principia Mathematica* in 1687. This work treats of unresisted motion, of resisted motion, and from them deduces the order of the physical universe. So new and startling an exposition of truth, and one so at variance with preconceived notions, roused vigorous opposition. It was half a century after the publication of Newton's *Principia* before the French mathematicians fully accepted its teachings. In Great Britain the Newtonian philosophy, in spite of its profundity, was early introduced. St. Andrews College adopted it in 1690, Cambridge in 1699, and Oxford in 1704.

For many years Newton's means had been very limited—so much so at times that it is upon the records of the Royal Society of 1674 that the usual dues were not required of him, on account of his inability to pay them. In 1689 he became M. P. for Cambridge. At the expiration of the year Parliament was dissolved. In 1692 an accident, by which he lost the fruit of twenty years of labor, undermined his health and impaired his intellect for a time. The story of this loss—that it was occasioned by a favorite dog which upset a burning candle among his papers and reduced them to ashes—is credited by Biot and pronounced a fiction by Brewster. In 1695 he was appointed warden of the mint, with a salary of from £500 to £600 per annum, and in 1699 he was promoted to the mastership of the mint, with a salary of from £1,200 to £1,500 per annum. The duties of this office he fulfilled with great ability. For twenty years before his death his niece, Mrs. Conduitt, took charge of his establishment in London. His health became greatly impaired, and in 1725 he went to Kensington to live, and the duties of his office were performed by Mr. Conduitt. On Feb. 28 he presided for the last time at a meeting of the Royal Society; the fatigue produced an accession of his disorder, and he died Mar. 20, 1727, and was buried with great pomp in Westminster Abbey. Two controversies which embittered Newton's life have not been mentioned—the one with Leibnitz in 1676 in regard to the authorship of the binomial theorem and the infinitesimal method, where both were independent discoverers; and another with Flamsteed, the first astronomer-royal, in his later years. The following is a list of his works, with the dates of their publication; (1) *Principia* (1687); (2) *Optics* (1704); (3) *Arithmetica Universalis* (1707); (4) *Analysis per Equationes Numero Terminorum Infinitas* (1711); (5) *Methodus Differentialis*; (6) *De Mundi Systemata* (1728); (7) *The Chronology of Ancient Kingdoms Amended* (1728); (8) *Table of Assays*; (9) *Optical Lectures* (1728); (10) *Observations on the Prophecies of Daniel and the Apocalypse of St. John* (1733); (11) *A Method of Fluxions and Analysis of Infinite Series* (1736); (12) *A Historical Account of Two Notable Corruptions of Scripture* (1754). The principal works of Newton have been collected and reprinted by Dr. Horsley under the title of *Newtoni opera quæ exstant omnia* (5 vols., 1779-85). There is also an English translation of the *Principia* which was reprinted in the U. S., but can now be found only at the antiquarian book-stores. His various communications to the Royal Society are to be found in vols. vii.-xi. of its *Transactions*. S. B. HERRICK.

Newton, JOHN: clergyman and author; b. in London, England, July 24, 1725; was the son of a sea-captain, with whom he made several voyages to the Mediterranean; was pressed into the navy as a seaman in 1744; became a midshipman; exchanged into a vessel engaged in the slave-trade

at Madeira; resided some time near Sierra Leone in the employ of a slave-dealer; returned to England in 1747, and for four years thenceforward commanded a Liverpool slaveship, feeling, as he subsequently said, no scruples as to the nature of his occupation; obtained the surveyorship of the port of Liverpool (then a small place) in 1755; taught himself Latin, Greek, and Hebrew; was deeply affected by the religious movement directed by Wesley and Whitefield; took orders in the Church of England in 1764; became soon afterward curate of Olney, Buckinghamshire, where he formed a close intimacy with the poet Cowper; published a *Narrative* of his early life and remarkable religious experience, and with Cowper wrote the *Olney Hymns*, many of which have passed into popular use in public worship; became in 1779 rector of St. Mary Woolnoth, London; was a leader of the Calvinistic or evangelical party in the Church of England, and author of numerous religious treatises, which at the time enjoyed great popularity, and were collected as his *Works* (6 vols., 1816). D. in London, Dec. 31, 1807. See his *Life*, by Rev. Richard Cecil (London, 1808).

Newton, Gen. JOHN: soldier and engineer; b. at Norfolk, Va., Aug. 24, 1823; graduated at West Point, and was appointed second lieutenant of engineers July, 1842; with the exception of some three years at West Point as assistant Professor of Engineering and while chief engineer of the Utah expedition of 1858, he was engaged in the construction of fortifications on the Atlantic and Gulf coasts, surveys and improvements of rivers and harbors, until the outbreak of civil war in 1861, when, after serving as chief engineer of the department of Pennsylvania and of the Shenandoah, he was, in Sept., 1861, appointed a brigadier-general of volunteers, and commanded a brigade in the defenses of Washington, at the same time performing the duties of an engineer in the construction of those works, until the spring of 1862. With the Army of the Potomac he led his command in the expedition to West Point, at Gaines's Mill, and at Glendale, Va., at South Mountain and Antietam, Md., and at Fredericksburg, Dec., 1862, where he commanded a division; promoted to be major-general Mar., 1863, he commanded the third division of the Sixth Corps in the storming of Marye Heights May 3, 1863. He served with great distinction at Gettysburg, where, after the death of Reynolds, he succeeded to the command of the First Corps July 2, 1863, which he led during the rest of the battle and commanded until the reorganization of the army Mar., 1864, when he was transferred to the West, where he led a division of the Fourth Corps in all the battles of the campaign which resulted in the capture of Atlanta, Sept., 1864; commanded various districts in Florida from Oct., 1864, to Jan., 1866. He was breveted lieutenant-colonel for bravery at Antietam, colonel at Gettysburg, brigadier-general for Peachtree Creek, and major-general for services in the field during the war. When he resumed duty with his corps, in which he had risen to be lieutenant-colonel, he was charged with important engineering duties—in removing the obstructions at Hell Gate and other points on the East river, the proposed enlargement of the Harlem river, the improvement of the Hudson from Troy to New York and of the channel between New Jersey and Staten Island, of many other rivers and harbors, and served upon numerous boards upon civil and military works. He was promoted to be colonel June 30, 1879, and appointed chief of engineers, with the rank of brigadier-general, Mar. 6, 1884. He was retired from active service in the army in Aug., 1886, at his own request. He was commissioner of public works in New York city Aug., 1886, to Nov., 1888, and became president of the Panama Railroad Company in Apr., 1888. D. in New York, May 1, 1895. Revised by JAMES MERROK.

Newton, RICHARD HEBER, D. D.: clergyman; b. in Philadelphia, Oct. 31, 1840; educated at the University of Pennsylvania and at the Philadelphia Divinity School; was ordained deacon in the Episcopal Church in 1862; became his father's assistant in St. Paul's church, and afterward in the Church of the Epiphany, Philadelphia; accepted the charge of Trinity church, Sharon Springs, New York, in 1863, but returned to Philadelphia, and became the rector of St. Paul's church in that city in 1866. In 1869 he was called to the Memorial (afterward All Souls') church, New York, where he became very popular as a preacher, and has built up a strong parish. A Broad Churchman of advanced views, he incurred the suspicion of heterodoxy on account of his alleged rationalism, but he defended himself with ability and continued in his pastorate. His works are *The Morals*

of Trade (1876); *Studies of Jesus* (1880); *Womanhood* (1880); *Right and Wrong Uses of the Bible* (1883); *Book of the Beginnings* (1884); *Philistinism* (1885); *Social Studies* (1886); *Church and Creed* (1890); and many articles in the leading magazines.

Newton's Rings: See THIN PLATES, COLORS OF.

Newton Theological Institution: an institution for the training of young men for the Baptist ministry; at Newton Center, Mass. It was the first Baptist theological seminary of high grade in America, and was founded in 1825. It has a fine location, 7 miles from Boston, with four buildings; the library has 20,000 volumes; the funds of the institution amount to \$400,000. The number of students in 1892 was eighty-six. President, Alvah Hovey, D. D., LL. D.

Newtown: town; Fairfield co., Conn. (for location of county, see map of Connecticut, ref. 11-E); on the Housatonic river, and the N. Y., N. H. and Hart, and the N. Y. and N. E. railways; 9 miles E. of Danbury, 19 miles N. by W. of Bridgeport. It has manufactories of flour, cider, lumber, carriages and wagons, combs, and buttons, and contains a public library (founded 1876), a savings-bank, and a weekly newspaper. Pop. (1880) 4,013; (1890) 3,539.

Newtown: borough (founded in 1687, incorporated in 1838, formerly the county-seat); Bucks co., Pa. (for location of county, see map of Pennsylvania, ref. 5-J); on the Phila., Newtown and N. Y. Railroad; 14 miles S. E. of Doylestown, the county-seat. It was laid out by William Penn; contains six churches, a public school with high-school department, a Friends school, a national bank with capital of \$100,000, and a weekly newspaper; and has a planing-mill, carriage-factory, iron-foundry, and machine-shops, artesian water, and electric lights. Pop. (1880) 1,001; (1890) 1,213; (1894) estimated, 1,700. EDITOR OF "ENTERPRISE."

New Ulm: city (founded in 1854, destroyed in a raid and massacre by the Indians in 1862, nearly destroyed by a cyclone in 1881); capital of Brown co., Minn. (for location of county, see map of Minnesota, ref. 10-D); on the Minnesota river, and the Chi. and N. W. Railway; 34 miles W. N. W. of Mankato, 100 miles S. W. of St. Paul. It contains 5 churches, 4 public and 2 parochial schools, Turner hall and gymnasium, Turnverein Library (founded 1864), St. Alexander's Hospital, a State bank with capital of \$50,000, a private bank, and 5 weekly newspapers; and has 4 flour-mills with daily capacity of 2,400 barrels, 3 breweries with annual capacity of 30,000 barrels, foundry, creameries, and vinegar-works. Pop. (1880) 2,471; (1890) 3,741; (1895) 4,790, mostly Germans. EDITOR OF "REVIEW."

New Westminster: city (formerly capital of British Columbia); British Columbia, Canada (for location, see map of Canada, ref. 8-D); on the Fraser river, 10 miles from its mouth, and on the Canada Pac. and the Great North. railways; 75 miles N. E. of Victoria, the present provincial capital. It is in an agricultural region, and contains the former provincial government buildings, a lunatic asylum, a penitentiary, the Bank of British Columbia and a branch of the Bank of Montreal, and a daily newspaper with weekly edition. The city has valuable facilities for general commerce, but since it ceased to be the provincial capital its principal industry has been the shipment of fish, lumber, grain, and furs. The climate is mild, the mean annual temperature is 47°, and rain is frequent and abundant. Pop. (1881) 1,500; (1891) 6,641. M. W. H.

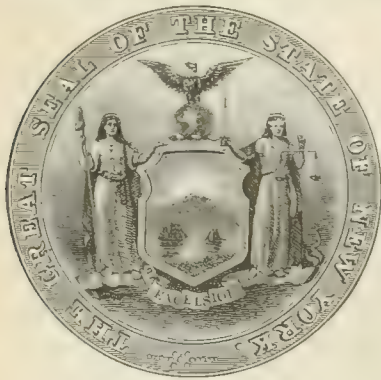
New Whateom: See WHATEOM, NEW.

New Year's Day: The custom of keeping the first day of the year as a day of festivity is a widely prevalent one, but the day on which the year begins varies much in different countries. In the Roman Catholic Church, since the establishment of the Gregorian year (or new style) it falls upon the festival of the Circumcision, a holiday of obligation, which also is the feast-day of several saints, of whom St. Sylvester is the most widely honored. In the other churches it has no specially religious character.

New York [named from *York*, in England, in honor of the Duke of York]: one of the U. S. of North America (North Atlantic group); an original State of the Union; the first in wealth and population; popularly known as the "Empire State."

Area and Location. It lies between 41° 30' and 45° 0' 42' N., and lon. 71° 51' and 79° 45' 51' W. For a

Atlantic Ocean bounds the State in part on the S. and E., while Long Island Sound is the boundary N. of the island, which gives the name. The rest of the southern boundary



Seal of New York.

tario. Lake Ontario, the St. Lawrence river, and Canada constitute the northern boundary. The outline of the State roughly resembles that of a shoe, with a pointed heel projecting into the ocean, a stub toe touching Lake Erie, and the ankle terminating on Canada. The area is 47,620 sq. miles, and the extreme measurements are 311½ miles from N. to S., and 412 miles from W. to E., including Long Island.

Physical Features.—Besides the navigable waters which form so large a part of its boundaries, and the East river, a strait of the sea separating Manhattan Island and Westchester County from Long Island, the State has facilities for navigation in Lakes George, Schroon, and Saranac in the N. E., in Otsego, Oneida, Cazenovia, Onondaga, and Skaneateles in the central region, and in Owasco, Cayuga, Seneca, Canandaigua farther W., and in Chautauqua Lake in the extreme W., while hundreds of smaller lakes are used for pleasure-boats. The Hudson river, near the eastern border, is navigable for 151 miles from the ocean, and is the chief feature in the river system, which is notable from the fact that the waters run to all points of the compass. The Mohawk flows 135 miles from the W. into the Hudson, carrying many branches, such as the East and West Canada creeks from the N. and the Schoharie from the S. Into the Oswego river, which has several affluents, the lakes from Oneida to Canandaigua discharge, and through that river into Lake Ontario, and thus into the St. Lawrence. The Genesee, rising in Pennsylvania, crosses New York, and falls into Lake Ontario. In the southern central region, the Chenango, the Tioga, and the Chemung empty into the Susquehanna, which seeks the ocean through the Chesapeake, while farther E. various streams contribute to the Delaware, finally emptying into Delaware Bay. In the N. E. the Chazy and the Saranac flow into Lake Champlain, while the St. Regis, the Raquette, and the Oswegatchie, with others, are affluents of the St. Lawrence. In the western counties, Cattaraugus creek runs into Lake Erie, while the Alleghany river, entering New York from Pennsylvania, returns to carry its waters into the Ohio, and thus into the Mississippi and the Gulf of Mexico. From this watershed the interior lakes and the larger rivers generally, except the Mohawk, cross the lines of latitude.

The trend of the interior waters of New York is determined mainly by its mountains and its hills. These belong to the Appalachian system. On the E. the Green and Hooac Mountains wall the Hudson, while on the W. the Helderbergs, the Catskills, and the Shawangunk Mountains shut in that river, and turn the affluents of the Delaware. Several ranges in the northeastern counties, of which the Adirondack is the most prominent, are the highest in the State. Mt. Marcy or Tahawas, in that range, is 5,379 feet high, and Dix peak 4,916 feet. The Chateaugay Range, extending from Lake Champlain to the Mohawk in Herkimer County, is dominated by Mt. Seward, 4,384 feet high. The Mohawk valley furnishes the single pathway from E. to W. between the hills and mountains.

Waters from such hills and mountains make falls which are grand and picturesque, like Niagara, on the river between Lake Erie and Lake Ontario; Trenton, on the West Canada creek; the High Falls of the Genesee, at Portage; the Taghanic and others, near Ithaca; and very many on streams

in various counties. Power for industrial uses is developed, as by the Niagara, at Little Falls and Cohoes on the Mohawk, at Fulton and elsewhere on the Oswego, at Rochester on the Genesee, at Waterloo and Seneca Falls on the Seneca, at Watertown on the Black river, in the northeastern region in many places, and at a number of other points.

Islands are abundant. Manhattan Island is occupied by the busy part of New York city. Long Island and Staten Island are the largest of groups in the waters adjacent to the ocean. Lake George is beautified by many islands varying in size. In the St. Lawrence the Thousand Islands are only a part of 1,500 lying between New York and Canada.

The groups in the St. Lawrence and Coney Island, on the southern shore of Long Island, are popular summer resorts. Saratoga, near the upper Hudson, Richfield and Sharon, in the central counties, are noted watering-places, while Chautauqua Lake has given name to a system of educational meetings. An increasing number of points in the Adirondack region attract visitors, and some of them are commended as winter sanitariums for pulmonary patients.

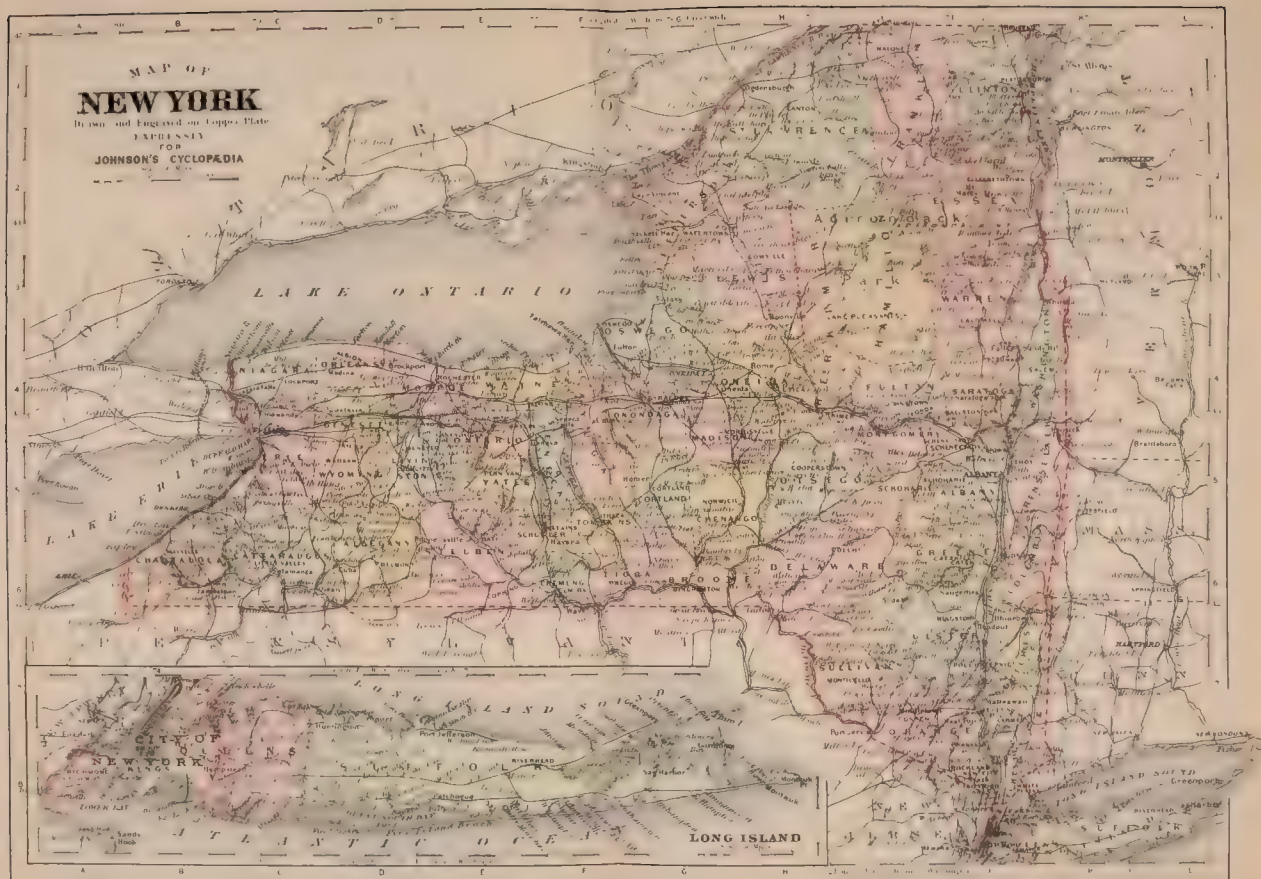
Geology.—This is described by Prof. Grove K. Gilbert, of the U. S. Geological Survey, as follows: The formations of the State represent nearly all parts of geologic time. Beginning with the older, an Archæan area is approximately coincident with the Adirondack Mountains, and a smaller body at the S. is the principal constituent of the Highlands of the Hudson. The rocks are chiefly gneisses and granites, and by their hardness and ability to resist decay have partially escaped the great erosion to which the country has been subjected. Against and about these ancient masses lie Palæozoic strata, constituting four-fifths of the rocky foundation of the State. Along the eastern border the Palæozoic rocks are plicated, crushed, and metamorphosed, so that a belt of schists and slates runs from Lake Champlain to New York city. For a short distance W. of this belt and S. of the Adirondacks the strata are disturbed by folds and faults, but without metamorphism, and they extend thence westward in gently undulating sheets to the limits of the State. The older Palæozoic rocks join the Adirondacks on the N., E., S., and S. W. in regular order. In the central and western parts of the State belts of outcrop trend from E. to W., and the rocks dip southward at an average of 25 feet per mile. In general these rocks have little influence upon the topography, producing only occasional ridges on the general plain; but near their eastern margin are massive sandstones which have resisted the eroding agents, preserving an upland tract known as the Catskill Mountains. The Palæozoic formations represent the Cambrian, Silurian, and Devonian periods. Beginning with the lowest they are as follows: (*Cambrian*) Georgia slate, Potsdam sandstone; (*Silurian*) Calciferous sandrock, Trenton limestone, Utica shale and Hudson slate, Medina group, Clinton group, Niagara group, Salina group, Waterlime group, Helderberg limestone; (*Devonian*) Oriskany sandstone, Corniferous and Onondaga limestones, Hamilton group, Portage group, Chemung group, and Catskill group.

Of periods later than the Palæozoic, the Jura-Trias is represented by the Newark sandstones and shales, which occupy a portion of Rockland County S. of the Highlands; the Cretaceous, by a few outcrops on Long Island; and the Pleistocene, by glacial drift and lacustrine and estuarine clays of wide extent. The ice-sheet of the Pleistocene covered the entire State, and produced many of the details of its topography. By its grinding action it gave smooth forms to all hills composed of soft rocks, and it deepened a number of valleys in the great Devonian shale formations in the central and western parts of the State. Cayuga and Seneca Lakes, and a number of smaller lakes lying approximately parallel to them, occupy some of these deepened valleys. The glacial drift lies in an irregular sheet over most of the surface, being in places so thin as hardly to be noticed, and elsewhere several hundred feet in thickness. The greater number of the wells of the State penetrate only this formation, and it constitutes most of the soils. About the shores of Lake Erie, Lake Ontario, and Lake Champlain, and in the St. Lawrence valley are clay deposits overlying the drift, and there is a similar deposit in the valley of the Hudson. These are sediments from great bodies of standing water which covered certain valleys while the ice was melting away. In the Erie and Ontario basins they are limited by a series of terraces and beach ridges marking the coast-lines of the lakes by which they were deposited. One of these old beaches, running from Lewiston to Sodus, has a height above Lake Ontario of from 125 to 200 feet.

MAP OF
NEW YORK

In iron and engraved on Copper Plate
EXPANDED

FOR
JOHNSON'S CYCLOPEDIA



Soil and Productions.—About one-half of the area of the State is adapted to cultivation, and the products include nearly all those of the temperate zone. The estimated value of the farm products is placed by the census of 1890 at \$161,593,000, giving New York second rank among the States, surpassed only by that of Illinois by \$23,166,004. In the number of farms, New York with 236,224 is exceeded only by Illinois, Missouri, Ohio, and Texas. In production of wool New York ranks seventh among the States. On June 1, 1890, there were 1,440,230 milch cows, a larger number than in any other State except Iowa, which had 58,188 more. New York was by far the first among the States in production of milk, with 663,917,240 gal., as also in butter with 98,241,813 lb., and in cheese with 4,324,028 lb. Butter is made in considerable part in creameries receiving milk from a number of farms, while cheese comes mainly from factories. The first rank belongs to the State in buckwheat. Out of 39,171,270 lb. of hops produced in the census year in all the States, 20,063,029 lb. were raised on 36,670 acres in New York. The dairy prospers chiefly in the central counties and on the lower Hudson. Hops are produced in Oneida, Lewis, Madison, Otsego, and Schoharie Counties. Onondaga and Wayne Counties and the Chemung valley cultivate some tobacco, while broom corn is a favorite crop in the lower Mohawk valley. Grain is raised in the western and south-western counties. Attention is given in Northern New York to peas, beans, and potatoes. On Long Island and in less degree near all the cities market-gardens thrive. In the central and western parts apples, plums, pears, and cherries are abundant in favorable years, and in the S. and W. peaches are raised, while grapes are cultivated along the Hudson and the interior lakes to the W., whence wines of acceptable brands are sent to market. For the calendar year 1893 the principal agricultural products are thus stated:

CROPS.	Average.	Yield.	Value.
Corn	517,135	15,255,483 bush.	\$8,390,516
Wheat	132,142	6,846,050 "	5,203,005
Oats	1,258,697	30,298,148 "	9,062,618
Rye	229,697	3,124,586 "	2,157,489
Barley	2,6612	5,193,124 "	3,296,054
Buckwheat	285,188	4,111,927 "	2,466,616
Tobacco	8,133	7,390,265 lb.	1,118,775
Potatoes	357,291	25,010,370 bush.	14,755,704
Hay	5,885,652	7,298,208 tons	\$7,688,697
Totals.	9,284,988		\$133,139,474

The farm animals, as reported on Jan. 1, 1894, were as follows:

ANIMALS.	Number.	Value.
Horses	702,821	\$50,466,294
Mules	4,819	376,334
Milch cows	1,572,143	40,537,581
Oxen and other cattle	706,597	18,484,989
Sheep	1,388,051	3,962,885
Hogs	658,605	5,940,680
Totals.	5,033,336	\$119,768,763

The following summaries from the U. S. census reports of 1880 and 1890 show that there has been a general decrease in farming operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.
Total number of farms	241,058	222,224	9.2
Total acres in farms	23,780,754	21,961,562	7.6
Value of farms, including buildings and fences	\$1,056,176,741	\$968,127,286	8.3

* Decrease.

Flora and Fauna.—The maple has been proposed as the State tree because it is so common. Sugar is made from maple sap in the northern counties and to some extent elsewhere. Ten species of oak are found, while a like number of the pine family is reported. The elm beautifies the landscape in most of the pastoral counties. The hickory, beech, birch, ash, hemlock, spruce, cedar, poplar, willow, whitewood, chestnut, basswood, butternut, sycamore, locust, ailanthus, black walnut, yew, and sumac may be enumerated. Of flowering plants 1,550 varieties are noted, and 54 species of ferns. The State includes portions of three faunal regions, the Canadian, Alleghanian, and Carolinian. The Canadian is restricted to the northern and more elevated parts, mainly to the Adirondacks and Catskills. The Alleghanian includes nearly all the more level parts, while the Carolinian occupies barely the lower Hudson valley and a small area

just eastward of Lake Erie. The number of indigenous land mammals is about 55; about 350 kinds of birds, not including stragglers, visit the State during their migrations, or spend the greater part of the year in it. Only a little more than one-third of these rear their young within the State. So far as known not a single species of bird or mammal is peculiar to this State. Many southern forms reach the southern border, extending a short distance up the Hudson. Others from the northward come to the mountains and to the higher districts of the Adirondacks and the Catskills. Most of these range outside of the State in all directions. Settlement and the removal of the forests have extirpated many of the larger mammals, such as the elk, which was known in most parts of the State, and the moose and the caribou, which were formerly found in the Adirondacks. The wolf and the beaver have also been practically exterminated, while the panther, wild cat, and black bear are restricted to the least settled mountainous regions. The larger water-fowl, the eagles, and the larger birds of prey, the herons, and the other wading birds, have become rare, while at least two species formerly common on Long Island, the heath-hen and pied duck, have become extinct. The wild turkey has shared the same fate, while only a few pairs represent the wild pigeons formerly present in hundred thousands.

Climate.—The climate of the State is temperate, with marked changes of heat and cold and variations of moisture. Four stations of the U. S. Weather Bureau show the following record for 1890:

LOCALITY.	TEMPERATURE.		Actual duration.	DAYS.			
	Max.	Min.		Clear.	Part.	Cloudy.	With rain.
New York	95°	6°	52.30 in.	82	150	133	144
Albany	98	4	44.89 in.	79	162	144	175
Cornwall	93	zero.	40.86 in.	74	161	194	167
Roseton	95	0	43.09 in.	56	116	133	208

Divisions.—For administrative purposes the State is divided into sixty counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Re- fer- ence.	Po- pulation 1890.	Po- pulation 1880.	COUNTY-TOWNS.	Po- pulation 1890.
Albany	3-J	154,890	164,555	Albany	94,923
Allegany	6-D	41,810	43,240	Belmont	950
Broom	6-G	49,483	62,563	Binghamton	25,995
Cattaraugus	6-C	55,806	60,866	Little Valley	628
Cayuga	4-F	65,081	65,302	Auburn	25,858
Chautauque	6-B	65,342	75,292	Mayville	1,164
Chemung	6-F	43,065	48,295	Elmira	30,893
Chemung	3-G	39,891	37,776	Northway	5,212
Clinton	1-J	50,897	46,437	Plattsburgh	7,010
Columbia	6-K	47,928	46,172	Hudson	9,970
Cortland	5-G	25,825	28,657	Cortland	8,590
Delaware	6-H	42,721	45,496	Della	1,664
Dutchess	7-J	79,184	77,879	Poughkeepsie	22,296
Essex	5-C	219,884	322,981	Buffalo	255,664
Franklin	2-J	34,515	33,952	Elizabethtown	753
Franklin	1-I	32,390	38,110	Malone	4,986
Hamilton	4-I	30,985	36,650	Johnstown	7,768
Greene	4-D	32,806	33,265	Batavia	7,221
Greene	6-J	32,635	31,598	Catskill	4,920
Hamilton	3-I	3,923	4,762	Lake Pleasant	4,920
Herkimer	4-H	42,693	45,608	Herkimer	14,725
Herkimer	2-G	66,103	68,806	Watertown	806,343
Kings	8-B	599,495	808,447	Brooklyn	2,511
Lewis	3-H	31,416	29,806	Catskill	2,296
Livingston	5-D	39,562	40,881	Monticello	726
Madison	4-G	44,112	42,892	Monticello	133,898
Monroe	4-D	144,903	181,188	Oneida	1,130
Montgomery	1-I	38,315	45,000	New York	1,515,391
New York	8-J	1,206,229	1,515,201	Lockport	16,028
Nassau	4-C	54,173	62,491	Utica	44,007
Oneida	1-H	115,475	122,692	Saratoga	88,143
Orangeta	4-F	117,803	146,217	Canandaigua	5,828
Orangeta	5-E	49,541	48,453	Canastota	2,407
Orangeta	7-J	88,210	97,850	Northway	23,067
Orangeta	4-D	41,128	40,803	Albany	1,086
Orangeta	6-I	71,883	71,883	Orangeta	2,842
Orangeta	5-H	50,861	50,861	Orangeta	2,657
Putnam	7-J	15,181	14,819	Orangeta	5,361
Queens	8-C	144,174	128,059	Jamaica	4,906
Rensselaer	5-J	115,328	124,511	Tracy	1,026
Richmond	8-A	38,991	51,093	Richmond	1,026
Richmond	8-J	37,600	37,600	New City	2,580
St. Lawrence	1-H	85,997	85,048	Cattaraugus	19,902
Saratoga	4-J	55,156	55,156	Schenectady	1,028
Schenectady	4-J	21,188	21,188	Schenectady	1,028
Schoharie	5-I	32,910	32,910	Schenectady	1,028
Schoharie	5-I	18,842	16,711	Watkins	4,350
Schoharie	5-F	29,478	28,227	Watkins	4,350

* Reference for location of counties, see map of New York.

COUNTIES AND COUNTY-TOWNS—CONTINUED.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY TOWNS.	Pop. 1890.
Steuben.....	6-E	77,586	81,473	Bath.....	3,261
Suffolk.....	8-K	53,888	62,491	Corning.....	8,550
Sullivan.....	7-I	32,491	31,031	Riverhead.....	1,016
Tioga.....	6-F	32,673	29,935	Monticello.....	1,016
Tompkins.....	5-F	34,445	32,923	Owego.....	11,079
Ulster.....	7-J	85,828	87,062	Ithaca.....	21,261
Warren.....	3-J	25,179	27,866	Kingston.....	158
Washington.....	4-K	47,871	45,690	Lake George.....	4,475
Wayne.....	4-E	51,700	49,729	Argyle.....	4,042
Westchester.....	8-J	108,988	146,772	Lyons.....	3,120
Wyoming.....	5-D	30,907	31,193	White Plains.....	4,254
Yates.....	5-E	21,087	21,001	Warsaw.....	
Totals.....		5,082,871	5,997,853	Penn Yan.....	

* Reference for location of counties, see map of New York.

Cities.—The following table comprises all the cities of the State, and gives their population according to the U. S. census of 1890 and the State census of 1892:

CITIES.	1890.	1892.	CITIES.	1890.	1892.
New York..	1,515,391	1,801,739	Oswego.....	21,842	21,966
Brooklyn..	806,343	957,163	Kingston.....	21,261	21,495
Buffalo.....	255,654	278,796	Schenectady..	19,902	22,538
Rochester..	133,896	144,834	Amsterdam..	17,336	18,542
Albany.....	94,923	97,120	Jamestown.....	16,038	18,627
Syracuse....	88,143	91,944	Lockport.....	16,038	16,088
Troy.....	60,956	64,986	Rome.....	14,991	13,638
Utica.....	44,007	46,608	Watertown....	14,725	16,982
Binghamton..	35,005	34,514	Gloversville..	13,864	14,694
Yonkers.....	32,033	31,419	Middletown..	11,977	11,612
Elmira.....	30,893	29,911	Ogdensburg..	11,662	11,959
Long I. City..	30,506	35,745	Ithaca.....	11,079	13,160
Auburn.....	25,858	24,737	Hornellsville..	10,996	11,805
Newburg....	23,087	24,536	Hudson.....	9,970	9,633
Cohoes.....	22,509	22,224	Dunkirk.....	9,416	10,040
Poughkeepsie.	22,206	23,196	Corning.....	8,550	10,025

Government.—The Legislature consists (1897) of a Senate of 50 members chosen for three years, and an Assembly of 150 members elected annually. Senators are chosen by districts formed on the basis of population without dividing counties, while Assembly districts are also based on population, save that each county has at least one member, except Fulton and Hamilton. The Governor is elected for two years; he has the power to pardon, may remove certain officers, and has the right of veto extending to separate items of appropriation bills, but the veto may be overridden by two-thirds of the members elected to each house. The Lieutenant-Governor is president of the Senate, and his term of office corresponds with that of the Governor, whose place he fills in case of disability. The secretary of State, com-

State prisons. Many commissions and State boards are appointed in the same manner. The court of appeals, consisting of a chief judge and six associate judges, has appellate jurisdiction only in questions of law. The Supreme Court, composed of judges elected for fourteen years in eight districts, has general jurisdiction in both law and equity; and from it the Governor designates, for terms of five years, seven justices to constitute an appellate division for the hearing of appeals from the Supreme Court. The courts of oyer and terminer no longer exist, and the courts of sessions are abolished, except in New York County, the county courts taking the criminal jurisdiction of the courts of sessions. There is a surrogate's court in each county. In the counties supervisors representing towns and wards exercise general powers, partly legislative and partly relative to auditing accounts, control of county buildings, and care of the poor. The cities are governed under special charters from the Legislature varying in their provisions. In the towns, which all elect their own officers, the highways and bridges and immediate local concerns are directed by the town board, while justices of the peace pronounce upon minor civil and criminal cases subject to appeal.

Population and Races.—Since 1820 New York has had the first place among the States in population. Its elements have from an early day been much diversified. In 1890 the foreign born numbered 1,571,050, while in the whole U. S. the number was 9,249,547. Of the native whites in the State there were of foreign parentage 1,837,453. Of the total population, 2,976,893 were males and 3,020,960 females. The colored persons were 72,901, and Indians on the reservations in 1892, 5,064. The foreign born consisted of 498,602 Germans, 483,375 Irish, 144,060 English, 93,193 Canadians, 64,141 Italians, 58,466 Russians, 35,332 Scotch, 33,145 Austrians, 28,430 Swedes, 22,718 Poles, 20,443 French, 15,598 Hungarians, 11,557 Swiss, 9,129 Bohemians, 8,602 Norwegians, 8,366 Dutch, 8,108 Welsh, 6,238 Danes, 3,135 Chinese, and nearly all other countries had representatives.

Industries and Business Interests.—These surpass those of any other State of the Union in variety and magnitude. First in agriculture, its rank in manufactures is also at the head. While the total products of the U. S., according to the census of 1890, were in value \$9,370,107,624, those of New York were \$1,711,577,671, or \$380,054,570 more than those of Pennsylvania, the second in order. The capital invested in New York was \$1,130,161,195 in 65,840 establishments reported, employing an average of 850,084 persons, whose wages were \$466,846,642, an amount greater by \$161,290,413 than in Pennsylvania. Hardly any industry permissible in the temperate zone is unrepresented. The cities made the following exhibit:

CITIES.	Industries.	Establishments.	Capital.	Persons employed.	Wages paid.	Cost of materials.	Miscellaneous expenses.	Value of product.
Albany.....	133	1,294	\$16,441,365	14,670	\$7,817,564	\$11,362,017	\$1,767,707	\$24,430,396
Auburn.....	53	260	10,832,611	6,001	2,472,574	3,519,477	1,309,790	9,064,093
Binghamton..	33	702	9,022,851	10,077	4,306,862	7,583,413	826,468	14,392,001
Brooklyn.....	229	10,561	125,849,052	103,083	61,975,102	137,325,749	14,824,466	248,750,184
Buffalo.....	176	3,559	67,867,154	49,696	24,617,408	51,162,770	7,179,615	96,448,654
Cohoes.....	49	210	10,999,637	8,711	3,085,484	5,330,033	753,257	10,326,460
Elmira.....	84	521	5,732,959	4,506	2,212,144	4,025,057	485,452	7,719,243
Kingston.....	44	122	2,374,507	1,648	728,118	1,242,395	228,402	2,848,222
Newburg....	49	211	4,107,523	3,186	1,525,738	1,948,501	384,853	4,422,451
New York.....	292	25,399	420,238,602	351,757	228,537,265	357,086,595	60,223,425	763,833,923
Rochester.....	158	1,889	45,631,677	32,429	16,501,405	37,915,353	5,674,733	73,164,696
Syracuse.....	127	1,175	17,207,955	15,417	7,477,373	12,112,349	2,358,337	25,540,304
Troy.....	103	837	22,282,018	25,092	9,502,580	13,061,278	2,838,611	29,064,935
Utica.....	72	473	12,257,855	11,416	3,535,130	6,582,234	869,140	13,205,572
Yonkers.....	71	645	11,503,074	12,913	6,826,431	11,622,634	849,379	23,024,028

troller, attorney-general, treasurer, and State engineer and surveyor are elected for two years. The Governor, with

Some of the leading manufactures may be tabulated as follows:

CLASSIFICATION.	Establishments.	Capital.	Persons employed.	Wages paid.	Cost of materials.	Miscellaneous expenses.	Value of product.
Combined textiles	566	\$70,918,577	59,544	\$21,182,030	\$46,086,670	\$4,553,355	\$82,535,242
Cotton goods &c	42	13,290,745	8,401	2,563,730	5,554,993	733,603	9,777,295
Woolen goods	339	46,461,914	37,992	13,033,901	30,390,598	2,662,282	53,340,151
Silk goods	185	11,165,918	13,151	5,584,399	10,141,079	1,157,410	19,417,796
Dyeing and finishing	49	4,963,095	2,839	1,481,723	1,449,344	372,710	3,636,051
Clothing	2,357	75,697,050	70,593	37,164,217	56,033,725		118,087,027
Liquors, malt	158	53,090,639	8,961	7,206,778	18,322,817		43,064,193
Foundry and machine-shop products.	777	52,619,671	29,370	20,111,787	19,461,282		53,546,060
Boots and shoes	140	8,370,287	9,670	4,250,326	7,545,587		13,911,377
Tobacco	391	6,543,914	6,162	2,389,344	3,290,521		8,396,213

the advice and consent of the Senate, appoints the superintendents of public works, of banking, of insurance, and of

During the fiscal year ending June 30, 1893, the collections of internal revenue were: From the manufacture of

distilled spirits, \$4,841,338; tobacco, \$5,527,033; fermented liquors, \$9,311,661; oleomargarine, \$1,656; and penalties, \$10,433—total, \$19,696,276.

Mineral Resources.—The most important mineral products are clay, cement rock, building-stone, salt, and iron ore. All the clays proper are of Pleistocene age, the most important for economic uses being the lacustrine and estuarine clays of the Erie, Ontario, Champlain, and Hudson valleys, but numerous smaller deposits are locally used for brick-making. Shales of the Salina, Hamilton, and Chemung formations are also ground up for this purpose. As the greater clay deposits are readily exploited and practically inexhaustible, the magnitude of the industries in various districts depends chiefly on the demand of neighboring cities, and the Hudson river industries, supplying New York city, are the most important. In 1892 the output of bricks was estimated at 1,300,000,000, valued at \$8,500,000. Roofing tile, drain tile, etc., are also manufactured. Half the hydraulic cement of the U. S. is produced in New York, the productive formation being the Waterlime group. The yield in 1892 was 3,780,000 barrels, valued at \$3,075,000, and the greater part of this was obtained from Ulster County. Erie, Onondaga, and Schoharie Counties furnished smaller amounts. In the production of building-stone New York ranks sixth in the U. S. The limestone quarried in 1893 was valued at \$1,103,500; marble, at \$206,900; sandstone, at \$415,300; granite, at \$181,500; slate,

Clinton formation running E. and W. across Wayne, Cayuga, Oswego, and Oneida Counties. Siderite is found near the city of Hudson, associated with the Hudson slate.

Commerce.—The commerce of New York is in magnitude that of the nation, as its chief port serves not only for the State, but also for much of the continent. There are eleven customs districts and ports of entry, the business of which is thus reported:

CUSTOMS DISTRICTS AND PORTS.	IMPORTS.		EXPORTS.	
	1892.	1893.	1892.	1893.
Albany	\$116,410	\$219,000		
Buffalo Creek	4,449,968	3,366,214	\$702,467	\$3,826,743
Cape Vincent	273,795	247,524	200,885	203,171
Champlain	4,031,868	4,273,117	2,583,213	3,938,519
Dunkirk	13,993	3,579		
Genesee	644,682	650,367	520,222	747,687
New York	572,613,259	492,115,588	377,722,984	367,967,688
Niagara	2,998,570	2,467,421	94,985	3,890,737
Oswegatchie	1,673,132	2,123,616	1,318,467	4,019,308
Oswego	1,911,993	1,756,423	1,949,943	1,851,408
Sag Harbor	975			
Totals	\$58,728,645	\$507,222,848	\$385,292,163	\$376,482,161

The following table shows the tonnage movement in the foreign trade with the U. S. during the fiscal year 1892-93:

CUSTOMS DISTRICTS AND PORTS.	ENTRANCES.				CLEARANCES.				Total vessels.	Total tonnage.
	Sailing.	Tonnage.	Steam.	Tonnage.	Sailing.	Tonnage.	Steam.	Tonnage.		
Buffalo Creek	625	103,256	315	100,469	621	99,412	276	58,569	1,482	361,706
Cape Vincent	293	15,486	776	172,402	287	13,940	732	171,941	2,128	373,769
Champlain	1,043	101,976	38	3,380	1,000	97,829	25	2,172	2,106	205,357
Genesee	422	109,135	319	147,046	471	120,732	313	156,029	1,525	532,942
New York	2,121	1,183,186	2,906	5,831,844	1,830	1,035,061	2,735	5,604,363	9,652	13,654,464
Niagara	75	22,317	448	171,617	62	17,541	441	169,057	1,026	380,532
Oswegatchie	118	33,577	684	48,836	57	20,628	579	38,213	1,458	141,254
Oswego	1,263	279,379	663	111,673	1,238	268,290	406	59,396	3,372	718,738
Totals	5,962	1,848,312	5,951	6,587,267	5,589	1,673,443	5,607	6,259,740	23,109	16,368,762

at \$205,000. Limestone is obtained chiefly from the Trenton, Niagara, and the Onondaga formations. These are so widely distributed in the central, western, and northern parts of the State that they afford lime-rock and building-stone for local use at very many points. Along the eastern base of the Adirondacks certain beds of the Trenton limestone are of such texture as to take a high polish, and are extensively quarried and marketed under the name of marble. Crystalline marbles are also found in abundance among the metamorphic rocks in St. Lawrence, Columbia, and Westchester Counties. The Potsdam, Medina, and Catskill sandstones and various thinner beds of the Hamilton and Chemung groups are widely distributed, and, like the limestones, are quarried at many points for local use. Sandstone is also shipped to a distance from various quarries of the Potsdam N. of the Adirondack Mountains and of the Medina in Monroe, Orleans, and Niagara Counties. A special grade of sandstone, known as "bluestone," is obtained from the various layers of the Hamilton, Chemung, and Catskill formations in Albany, Greene, Ulster, and Schoharie Counties, and is carried to New York and other cities, where its principal use is as flagging. Granite is derived from crystalline rocks in Westchester County and in the Highlands, and there is an important quarry on one of the Thousand Islands. Slate, quarried in Washington County, is derived from the Hudson River formation. In the production of salt, New York is exceeded only by Michigan. The yield in 1893 was 5,662,000 barrels, valued at \$1,870,000. This was derived directly or indirectly from the Salina group, a part being mined and the rest obtained from brines. The Onondaga district, near Syracuse, was for many years one of the most productive in the country, but the Warsaw district, of Wyoming, Genesee, and Livingston Counties, which had rapidly developed, overtook the older district in 1887, and in 1893 doubled its output. In the production of iron ore the State ranks fifth in the U. S., the output of its mines in 1893 being 534,000 tons, valued at \$1,223,000. Magnetite is obtained in great amount along the eastern flank of the Adirondacks, and in less amount on the northern and western flanks, and in the Highlands. Limonite is associated with Lower Paleozoic rocks along the eastern border of the State, adjoining Massachusetts and Connecticut. Hematite is obtained from metamorphic rocks in Jefferson County, and also from a stratum of the

Wealth.—Of the total wealth of the U. S., placed by the census of 1890 at \$65,937,091,197, New York possessed \$8,576,701,991. Of the real estate with improvements amounting to \$39,544,544,333, the share of New York was \$5,817,704,667. Of the machinery of mills and their product on hand, stated at \$3,058,593,441, New York held \$594,476,039. Of railways and equipments, including street-railways, amounting in the U. S. to \$8,685,407,323, those in this State were valued at \$534,671,937.

In 1894 the total assessed value of real estate was \$3,761,679,384, and of personal property \$438,202,674, exclusive of \$102,506,261 corporate property not subject to taxation locally for State purposes. The tax-rate in 1894 was \$2.18 per \$1,000. The State public debt, Sept. 30, 1893, amounted to \$121,354,87.

Banking.—In Dec., 1893, there were 334 national banks, which had a combined capital of \$87,796,060, surplus and profits of \$83,523,851, and individual deposits of \$385,527,505. The State banks in Nov., 1893, numbered 203, and had a combined capital of \$33,175,258, surplus and profits of \$28,570,566, and individual deposits of \$178,886,734. The report on the savings-banks on Jan. 1, 1894, showed, number of banks 125, number of depositors 1,585,155, amount of deposits \$617,089,449, and surplus and profits \$87,141,452. The total banking interests showed, number of banks 662, capital \$120,971,318, deposits \$1,181,503,688, and surplus and profits \$199,235,869. There were also, on Jan. 1, 1894, 34 loan and trust companies, with combined capital of \$28,350,000, deposits \$266,092,954, and surplus and profits to the amount of \$41,435,530.

Insurance.—On Jan. 1, 1894, there were 32 regular or "old-line" insurance companies in operation, of which 12 were home corporations and 20 were corporations of other States authorized to transact business in New York. The home companies received as premiums during the previous year \$123,559,156 and paid dividends of \$257,277, and the other companies received as premiums \$69,147,682, and paid dividends of \$511,285. There was a total of \$75,903,820 paid in settlement of claims, of which the home companies paid \$47,329,075 and the other companies \$28,574,745. On the same date there were 39 fire-insurance companies of all classes belonging in the State, which received as premiums \$32,937,961, paid losses of \$21,906,980, and (excepting 4 companies) paid dividends of \$1,613,635.

Means of Communication.—The development of the railways of the State is shown in the following summary as reported on Dec. 31 in the several years: (1850) 1,361 miles; (1860) 2,682; (1870) 3,928; (1880) 5,391; (1890) 7,745.85; (1892) 8,116.10. The report of the board of railway commissioners to the Legislature in Jan., 1894, showed that the gross earnings from operations of roads in the State in the fiscal year ending June 30, 1893, were \$234,354,615; gross expenses, \$157,128,964; net earnings, \$77,225,650. The board also reported 47 street-railways in operation by the overhead trolley system and 3 by the cable system, and elevated railways in operation in the cities of New York and Brooklyn.

The canal mileage has been greatly reduced by the abandonment of a number of such waterways as had ceased to be profitable. In 1893 the principal canals wholly in the State were the Erie, extending from Albany to Buffalo, built in 1817-62; the Champlain, from Whitehall to Waterford, built in 1817-37; the Oswego, from Syracuse to Oswego, built in 1825-62; the Cayuga and Seneca, from Montezuma to Cayuga and Seneca lakes, built in 1825; and the Black River, from Rome to Carthage, built in 1836-41. The amount of freight carried by these canals in the year was: Erie, 3,235,726 tons; Champlain, 848,965; Oswego, 92,634; Cayuga and Seneca, 38,761; and the Black River, 115,877—total tonnage, 43,321,963. The principal canal, partly within and partly without the State, was the Delaware and Hudson, extending from Honesdale, Pa., to Rondout, N. Y., built in 1826-28.

Churches.—The census of 1890 gave the following statistics concerning the religious bodies having a membership of 2,000 and upward:

DENOMINATIONS.	Organiza- tions.	Churches and halls.	Members.	Value of church property.
Roman Catholic	959	967	1,153,130	\$25,769,478
Methodist Episcopal	2,123	2,136	242,492	16,944,350
Presb. Church in the U. S. of A.	784	943	154,083	21,293,992
Baptists, Regular	875	924	129,711	12,938,913
Protestant Episcopal	731	890	127,218	30,707,213
Reformed Church in America	302	260	52,228	7,445,280
Congregational	301	326	45,686	5,175,262
Lutheran, General Council	113	117	39,430	1,915,510
Jews, Orthodox	152	152	29,064	1,919,500
Lutheran Synod. Conference	67	65	22,642	1,065,455
Germ. Evang. Synod of N. A.	50	50	17,409	681,570
Jews, Reformed	27	27	16,743	2,305,700
Lutheran, General Synod	95	100	15,611	1,224,700
United Presb. of N. A.	65	66	9,719	707,400
Free-will Baptist	134	134	8,636	529,050
Universalist	168	154	8,526	1,598,350
Christian Connection	120	120	7,520	257,850
African Meth. Epis. Zion	47	47	6,668	371,400
Spiritualists	34	33	6,351	33,350
Evangelical Association	86	85	6,222	401,250
Methodist Protestant	90	93	4,750	293,000
Unitarian	18	23	4,470	1,117,500
Disciples of Christ	41	46	4,316	335,650
Wesleyan Methodist	114	112	3,913	135,950
Free Methodist	142	143	3,751	243,950
Reforms, Orthodox	50	51	3,644	203,900
Reformed Church in the U. S.	13	13	3,432	240,300
Friends, Hicksite	45	46	3,331	561,800
Seventh-day Baptist	28	27	3,274	71,025
African Methodist Episcopal	34	35	3,124	231,500
Ref. Presb. in the U. S. A., Synod	18	19	2,328	459,500
Lutheran, Buffalo Synod	12	12	2,268	48,010
Independent congregations	26	27	4,232	722,400

Schools.—The regents of the University of the State of New York have supervision of education; they are elected by the Legislature on joint ballot. Charters of academies, colleges, and universities, libraries and museums proceed from them. A university convocation is held annually under the auspices of this body, and examinations in various studies are conducted by its authority, while plans for "university extension" are promoted by it. The State library and State museum are under its care. Twenty-two colleges for men, 8 for women, and 6 for both sexes, with 7 law schools, 15 of medicine, 3 of pharmacy, 3 of dentistry, 1 of the eye and ear, 2 veterinary, 11 of theology, 3 of pedagogy, and 9 other professional and technical schools are regarded as members of this university. (See COLLEGES.) The superintendent of public instruction, elected by the Legislature, is the head of the common-school system. Superintendents in cities and commissioners over groups of towns have more immediate oversight. In 1893 there were 11,161 school districts and 12,015 public-school buildings, including 34 log structures. The sum of \$4,061,092 was expended for houses and sites, furniture and repairs, of which the cities spent \$2,688,966 and the country districts \$1,372,126. The

total valuation of public-school property was \$49,913,605—in cities, \$34,131,958; in towns, \$15,781,647.

During the year 1,083,228 pupils attended school for at least a part of the time—550,634 in cities, 532,594 in towns. In cities the attendance was 47 per cent. of the persons of school age, in the towns 74 per cent.; 32,475 teachers were employed—5,068 males, 27,408 females—and these received for wages \$11,883,094, making an average in cities of \$728.36 and in towns \$303.57. Institutes to the number of 110 were held during the year for teachers, of whom over 15,000 attended. Normal schools were maintained at Albany, Brockport, Buffalo, Cortland, Fredonia, Geneseo, New Paltz, Oneonta, Oswego, Plattsburg, and Potsdam, with a total of 7,625 pupils, property valued at \$1,915,235, and expenditures for the year of \$355,535. The American Museum of Natural History in New York furnishes instruction to the normal schools and teachers' institutes, and to teachers of common schools in cities near by, making reports on that branch of its work to the superintendent of public instruction.

Libraries.—In 1892 there were reported 511 libraries of 1,000 volumes and upward each, which contained 4,036,530 bound volumes and 379,544 pamphlets. The libraries were classified as follows: General, 99; school, 226; college, 27; college society, 4; legal, 21; theological, 10; medical, 14; Government, 1; public institution, 19; State, 1; Y. M. C. A., 20; social, 31; scientific, 12; historical, 5; garrison, 3; mercantile, 3; and miscellaneous, 4.

Newspapers and Periodicals.—In 1894 there were 2,001 newspapers and periodicals, of which 177 were daily, 2 tri-weekly, 36 semi-weekly, 1,114 weekly, 2 bi-weekly, 43 semi-monthly, 554 monthly, 23 bi-monthly, and 50 quarterly publications.

Post-offices.—The total number of post-offices on Jan. 1, 1894, was 3,615, of which 287 were presidential (15 first-class, 77 second-class, 195 third-class) and 3,328 fourth-class. There were 1,526 money-order offices, 69 money-order stations, and 7 postal-note offices.

Charitable, Reformatory, and Penal Institutions.—The board of charities exercises visitatorial powers over State hospitals, county poor-houses, and asylums, and over 241 incorporated and 157 licensed asylums, which in 1893 contained 18,879 inmates. The State asylums have also local boards of managers. The State institutions for the insane are located at Utica, Poughkeepsie, Middletown, Buffalo, Willard, Binghamton, Ogdensburg, and Rochester. The aggregate cost of the buildings was \$8,509,271. A State institution for feeble-minded children is maintained at Syracuse, and one for feeble-minded women at Newark. At Rome there is a State custodial asylum. Educational institutions for the blind are located at New York and Batavia, and for the deaf and dumb at New York, Fordham, Malone, Albany, Rochester, and Buffalo. There are reformatories at Elmira, Rochester, Canaan Four Corners, and Randall's Island, and for women at Hudson and Albion. For soldiers and sailors there is a home at Bath. The State paupers committed to the several public institutions in 1893 numbered 1,406. The total expenditures for charitable, correctional, and reformatory purposes in 1893 were for an average of 80,543 beneficiaries \$20,407,982; in 1880, for 47,701 beneficiaries, they were \$8,482,648. The ratio of beneficiaries to population was in 1880 1 to 107; in 1892, 1 to 85. A superintendent of State prisons has charge of institutions at Auburn, Clinton, and Sing Sing, containing in 1892 an average of 3,753 inmates and in 1893 3,679. The expenditures for the year 1893 were \$504,164.34. The earnings of convicts engaged in several industries left a deficiency of \$477,266.97. There are separate buildings at Auburn for women convicts, and a hospital at Matteawan for insane criminals.

History.—When in 1664 the English seized the colony of New Netherland, they called it New York, in honor of the Duke of York. The discovery of the coast belongs to Giovanni da Verrazano, a Florentine navigator, who at the close of Apr., 1524, anchored near what is now Sandy Hook, and entered the bay and the "very great river." French adventurers, Raulin Seculart and Jean Alphonse, about 1545 visited the same waters, and perhaps built works on Castleton Island below Albany, of which the ruins, it is claimed, still remain. The English title was at first based on the discovery of the North American coast by John Cabot, June 24, 1497, duly recorded on maps by his son Sebastian, but not otherwise. Jacques Cartier, under commission from Francis I. of France, on a second voyage in 1535 ascended the St. Lawrence to Montreal, and heard stories of the country to the S. and W. Actual entry in force by Europeans into the

territory now New York was first made from the N. by Samuel de Champlain, a favorite of the French king Henry IV., sent out to establish New France. In an expedition against the Iroquois he sailed down the lake that bears his name and attacked a party of Indians at Ticonderoga, Essex County. He was afterward repulsed in an attack on a village near Fenner, Madison County. While Champlain was engaged in conflicts with the Iroquois in the north, the Half Moon, a Dutch vessel commanded by Hendrick Hudson, an Englishman in the service of the Dutch East India Company, seeking a western passage to China, anchored Sept. 3, 1609, in the lower bay, and eight days later "went into the river," now the Hudson. On the 19th the Half Moon anchored at the point where Albany now stands. Dutch merchants commissioned a ship in the summer of 1610 for trade to New Netherland, and in 1612 other vessels arrived for a similar purpose. A few huts were built on the southern point of Manhattan Island, the beginnings of New Amsterdam. Even earlier Hendrik Christiaensen had erected a strong house on the west bank of the Hudson just below Albany and called it Fort Nassau. This became a center of traffic with the Indians, but it was so damaged by a freshet as to be abandoned in 1617. A new trading-house was set up at the mouth of the Tawasentha, near Albany, by a company of Amsterdam merchants; there an alliance was formed by this Dutch company on the one side and the Iroquois and other redmen on the other, and this treaty, renewed in 1645, was maintained during the entire period of the Dutch occupation. The Iroquois were thus arrayed against the French in Canada, and an impress given to the history of the colony. In 1621 the Dutch West India Company succeeded the earlier traders. The first colony came out by the New Netherland under the auspices of this company in 1623, and consisted in large part of Walloons, persons of French blood resident in Holland. Eight men were left on Manhattan Island, and another party made its home on the west shore of Long Island. The ship sailed up the Hudson, and most of the newcomers landed at Fort Orange, set out the year before, and eighteen families started the town which has grown into the city of Albany. Other vessels followed, and in 1635 the population had become 200. The next year the government was made more formal, with Peter Minuit as director-general, assisted by a council of five. The settlers engaged largely in the fur-trade, but tried to cultivate tobacco, and soon raised wheat for export.

During the administration of Kieft as director-general (1638-47) and of Peter Stuyvesant (1647-64) the colony was disturbed by Indian wars, by quarrels with the Dutch West India Company over the finances, and, when war broke out between England and Holland, by the aggressions of the English. Finally, in 1664, Col. Nicolls, the personal representative of the Duke of York, appeared in the bay with an English fleet and forced the Dutch to surrender Manhattan Island. He set up a government and summoned two delegates from each town to consider a code, "the Duke's Laws," which was accepted perforce. The Dutch temporarily reconquered the island in 1673, but this conquest was not known to the states-general when the Treaty of Westminster was signed, providing for the restoration by England and Holland of all lands captured during the war. Oct. 15, 1674, orders reached Colve, the director-general, to give up New Netherland, and so the Dutch rule, in the main prudent and beneficent, ceased to exist over what thenceforth was to be New York.

The transfer of the province from the Dutch took place Nov. 9, 1674. With Maj. Edmund Andros, the new governor of the territories of the Duke of York in America, was associated a council of ten appointed by him. "All persons of what religion soever" were to be treated alike, while special guarantees were accorded to the Dutch inhabitants, and efforts were put forth to hold the Iroquois in friendship by a board of commissioners. In response to urgent appeals the duke consented to an assembly of delegates from the freeholders, which met Oct. 17, 1683, and a Charter of Liberties was enacted, certain duties on imports were voted, and courts were established. Jurisdiction to Lake Ontario and the St. Lawrence was asserted by Gov. Dongan, while, to meet complaints of raids by the Iroquois E. and W. and S., a conference was held in Albany with the redmen at which, with the governor of New York, were present representatives of Massachusetts and Virginia, and July 30, 1684, an important treaty was negotiated. When James II., after whom the colony was named, ascended the throne he repudiated the Charter of Liberties, and objected to the powers

claimed "for the people met in general assembly." New York was restive under King James's consolidation of the northern colonies as the Dominion of New England. The settlers took kindly to the accession of William and Mary, but Nicholson, the lieutenant-governor, scouted at it, and when Gov. Andros was placed under arrest in Boston deemed it "most safe to forbear acting without definite instructions." His weakness gave opportunity for a revolt under the leadership of Jacob Leisler, a captain of militia, who organized a government in the absence of Gov. Nicholson, and declared in favor of the new sovereigns, but was afterward convicted and hanged for refusal to recognize the military representative of Gov. Sloughter. See LEISLER, JACOB.

Before the Declaration of Independence forty-four different persons served as the executive head of the province, counting the Dutch directors. With most of the governors the assembly had differences over the revenue, and some of them, notably Fletcher and Cornbury, and later Clarke and the first George Clinton, rest under allegations of corrupt use of public moneys. For the purpose of increasing the production of naval stores 2,584 immigrants were brought from the Palatinate in 1711, most of them settling on the banks of the Hudson. Eleven years later a hundred families from the same country found homes on the Mohawk, and in 1738 eighty-three Scotch families were brought over to defend Lake George. To provide funds for expeditions against Canada paper money was first issued. The settlers reached out for trade with their neighbors N. of the St. Lawrence and the lakes, and to extend it a trading-post was set up at Oswego in 1722. Relations with the Iroquois required frequent attention, the governors were inclined to arbitrary acts, freedom of religion was matter of discussion, efforts were put forth to promote education, while so urgent was the pressure for popular rights that in 1729 the Lords of Trade were notified that "most of the previous and open steps which a dependent province can take to make themselves independent at their pleasure are taken by the assembly of New York." That assembly was, in fact, asserting its control over the finances and struggling for the independence of the courts. Negro slaves had been imported, and belief in a plot by some of them led, in 1741, in New York city, to cruel persecutions and a most unreasoning panic.

The French and Indian war (1755-63) fell with especial severity on New York. With their Indian allies the French struck swiftly as far as the Mohawk, but in a sharp fight at Fort Edward near Lake George were repulsed by Gen. William Johnson. Hostilities raged on the upper Hudson, along the Mohawk westward to Oswego, then again on the shores of Lake Champlain. Disasters were the frequent lot of this province, and a defeat on Lake George in July, 1758, opened the door to Montcalm, but it was closed by the capture of Fort Frontenac in August, and the next year Fort Niagara surrendered to Gen. William Johnson, and the French were driven back from Ticonderoga and Crown Point. New York contributed its full share to the splendid victory on the Plains of Abraham in 1759. In the next few years the colony manifested much discontent with British rule. It led in the union of the colonies Oct. 18, 1764, by clothing a committee of correspondence with power to correspond with its neighbors on the oppressive acts of Parliament and "on the impending dangers which threaten the colonies of being taxed by laws to be passed in Great Britain." In the colonial congress held in New York Oct. 7, 1765, the members of this committee took active part, and petitions for redress of grievances were presented to the king. The Stamp Act provoked violent protests, the patriotic association known as the Sons of Liberty was organized, and at last on Jan. 18, 1770, a collision occurred in New York city resulting in bloodshed. This irregular fighting was the real beginning of the Revolutionary war. Yet this province, more engaged in commerce than any other, for a while abandoned the sacrifice involved in total non-importation and restricted itself to the exclusion of tea. On that line it was positive and bold, and "the Mohawks" were organized in Oct., 1773, for aggressive action; but the vessels expected were kept back by a storm and did not arrive until four months after the historic tea-party in Boston harbor; on their arrival "the Mohawks" repeated in New York the exploit planned for the earlier date.

Its situation and topography joined with political events to cast upon this province the brunt of the war of the Revolution, and an account of the important military events that took place within its boundaries will be found in the article

UNITED STATES (*q. v.*). From the seizure of Ticonderoga, May 10, 1775, and of Crown Point, immediately afterward, armies marched and countermarched on its soil. Its chief city could not be successfully defended even by Washington, and from the autumn of 1776 until Nov. 25, 1783, was in the hands of the British. In 1777 a constitution was adopted by the colony. The vast western domain which New York claimed by royal grant, by purchase from the redmen, and afterward by the British treaty, it voted Apr. 19, 1780, to transfer to the Union to become the Northwest Territory.

Parties divided on the powers of the confederacy, and afterward on the project of the national Constitution; the ratification of that instrument was in doubt until the convention actually voted, when the majority, 30 to 27, was secured through recommendation of amendments which in due time became part of the nation's fundamental law.

The population of the entire State in 1783 was 233,896, fifth in rank in the Union. Many Tories had emigrated, and the disposition was strong to drive out those who remained, but this prejudice was gradually dissipated. Settlers came in rapidly after the peace. Industries, trade, education, the amenities of life, developed with equal step. The Legislature, which had met in Kingston, Poughkeepsie, and New York successively, in 1790 chose Albany as its home. A brilliant galaxy of political leaders directed affairs these early days—Alexander Hamilton, George Clinton, Philip Schuyler, Aaron Burr, Rufus King, John Jay, the Livingstons, De Witt Clinton. Several of them fostered aspirations for the presidency of the U. S., but internal rivalries repelled the prize. These, however, did not prevent united action in the second war with Great Britain. The embargo act of 1807 struck severely the commerce of the chief city, and stirred up opposition; but when that was repealed, and Great Britain repudiated the project of a treaty to recall the orders in council while the impressment of seamen continued, the war spirit ran high. Great sacrifices were undergone, and in 1812 the tide of conflict rolled heavily upon the State. On its soil preparations were hurried forward for the invasion of Canada, and collisions of arms were frequent on Lake Ontario, the St. Lawrence, and Lake Champlain. Ogdensburg was captured by the British, but they were beaten at Sackett's Harbor, and both sides claimed the victory at Chrysler's Farm. Fort Niagara was taken, and Black Rock and Buffalo burned by the British, who in turn, July 5, 1814, suffered defeat by Gen. Winfield Scott at Chippewa, and July 25 at Lundy's Lane. An invasion by way of the Saranac and Lake Champlain was gallantly repulsed in September of the same year. A levy en masse of the militia of Herkimer, Oneida, Lewis, and Jefferson Counties was made for the defense of the northern frontier, while New York exhibited equal activity against expected attack. The treaty of peace was welcomed by the people who had suffered so much from the war. Initial steps had been taken for the construction of waterways, and the question soon entered into party politics, with De Witt Clinton as their leading advocate and Gov. Tompkins obstructing, in part out of rivalry toward Clinton. The canal policy triumphed, and gave vast impetus to population and business, to which also later the railway system contributed in large degree. Out of the patroon system (see PATROONS) and the concentration of lands in few hands agrarian riots sprang up in 1839 and 1845, and on a smaller scale in 1866. In the civil war (1861-65) New York bore its full share, in spite of resistance to the draft in the chief city and threats elsewhere. The State was credited by the War Department with 448,850 men sent into the field and 18,197 who paid commutation.

The first constitution of New York was in force forty-four years; that framed in 1821 for twenty-five years; that of 1846 with some amendments down to the adoption of the new constitution of 1894. Proposals for radical changes have often been rejected. A convention was held in 1867 and submitted a revised constitution, which, with the exception of the articles referring to the judiciary, was rejected by the people. Several amendments proposed by the Legislature, and in 1874 by a commission, were adopted by popular vote. A convention met at Albany in 1894 for a general revision. Most of the thirty-four amendments submitted by them were adopted by the people. Among others a secret ballot was provided for; the use of balloting-machines was permitted; local and municipal elections in the six largest cities were separated from State and national elections, the former occurring in odd-numbered years and the latter in even-numbered years; etc.

GOVERNORS OF THE COLONY AND THE STATE.

<i>Directors-General—Dutch.</i>		Robert Monckton.....	1762
Adrian Joris.....	1623-24	Cadwallader Colden (act.).....	1763-65
Cornelis Jacobson May.....	1624-25	Henry Moore.....	1765-69
William Verhulst.....	1625-26	Cadwallader Colden (act.).....	1769-70
Peter Minuit.....	1626-33	Earl of Dunmore.....	1770-71
Wouter van Twiller.....	1633-38	William Tryon.....	1771-74
William Kieft.....	1634-47	Cadwallader Colden.....	1774-75
Petrus Stuyvesant.....	1647-64	Peter van Brugh Livingston.....	1775

<i>Colonial Governors—English.</i>		William Tryon.....	1775-80
Richard Nicolls.....	1664-68	James Robertson.....	1780-83
Francis Lovelace.....	1665-73	Andrew Elliott (acting).....	1783

<i>Directors-General—Dutch.</i>		<i>Governors of the State.</i>	
Cornelis Evertse, Jr.....	1673	George Clinton.....	1777-95
Anthony Colve.....	1673-74	John Jay.....	1795-1801

<i>Colonial Governors—English.</i>		Morgan Lewis.....	1804-07
Edmond Andros.....	1674-83	Daniel D. Tompkins.....	1807-17
Anthony Brockholles*.....	1677-83	John Taylor (acting).....	1817
Thomas Dongan.....	1683-88	De Witt Clinton.....	1817-23
Francis Nicholson (acting).....	1688-89	Joseph C. Yates.....	1823-25
Jacob Leisler.....	1689-91	De Witt Clinton.....	1825-28
Henry Sloughter.....	1691	Nathaniel Pitcher (acting).....	1828-29
Richard Ingoldsby*.....	1691-92	Martin Van Buren.....	1829
Benjamin Fletcher.....	1692-98	Enos T. Throop.....	1829-33
Earl of Bellamont.....	1698-1700	William L. Marcy.....	1833-39
John Nanfan (acting).....	1699-1701	William H. Seward.....	1839-43
William Smith†.....		William C. Bouck.....	1843-45
Abraham de Peyster†.....	1701-02	Silas Wright.....	1845-47
Peter Schuyler†.....		John Young.....	1847-49
Lord Cornbury.....	1702-08	Hamilton Fish.....	1849-51
Lord Lovelace.....	1708-09	Washington Hunt.....	1851-53
Peter Schuyler†.....	1709	Horatio Seymour.....	1853-55
Richard Ingoldsby (act.).....	1709-10	Myron H. Clark.....	1855-57
Gerardus Beekman†.....	1710	John A. King.....	1857-59
Robert Hunter.....	1710-19	Edwin D. Morgan.....	1859-63
Peter Schuyler†.....	1719-20	Horatio Seymour.....	1863-65
William Burnet.....	1720-28	Reuben E. Fenton.....	1865-69
John Montgomerie.....	1728-31	John T. Hoffman.....	1869-73
Rip van Dam†.....	1731-32	John Adams Dix.....	1873-75
William Cosby.....	1732-36	Samuel J. Tilden.....	1875-77
George Clarke (acting).....	1736-43	Lucius Robinson.....	1877-80
George Clinton.....	1743-53	Alonzo B. Cornell.....	1880-83
Danvers Osborne.....	1753-55	Grover Cleveland.....	1883-85
James de Lancey (acting).....	1755	David B. Hill (acting).....	1885-86
Charles Hardy.....	1755-57	David B. Hill.....	1886-92
James de Lancey (acting).....	1757-60	Roswell P. Flower.....	1892-95
Cadwallader Colden†.....	1760-61	Levi P. Morton.....	1895-96
Robert Monckton.....	1761	Frank S. Black.....	1897-
Cadwallader Colden (act.).....	1761-62		

* Commanders-in-chief. † Presidents.
§ During the Revolution; not recognized by the patriots.

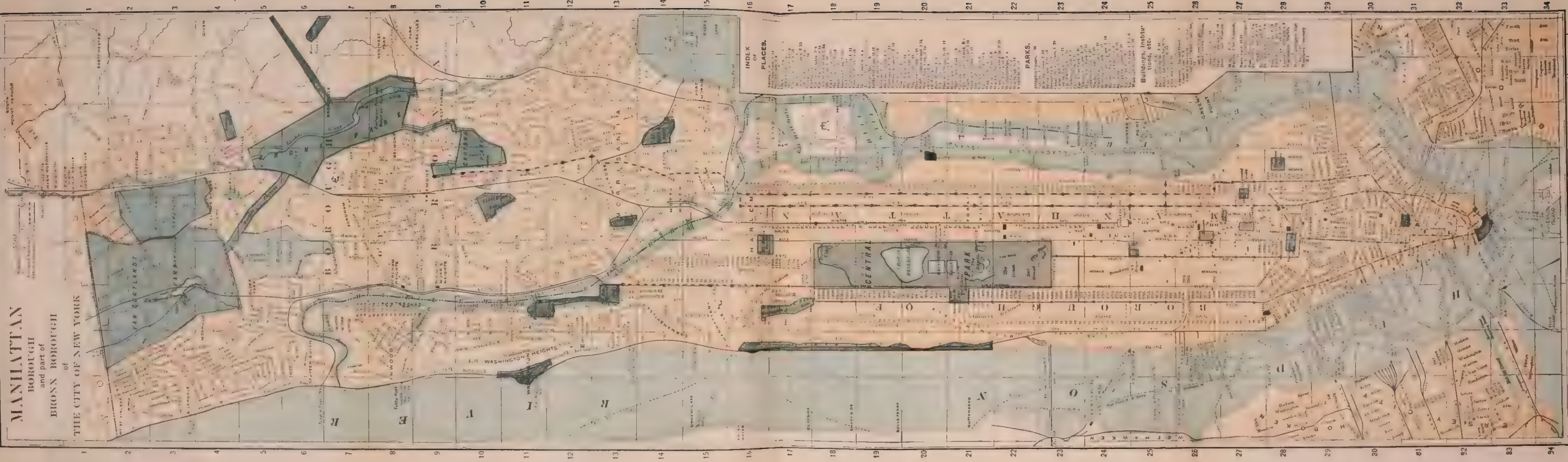
AUTHORITIES.—Of the early French writers editions have been published in Quebec, notably *Journals of Samuel de Champlain* (6 vols.); *Les Mœurs des Sauvages Américains*, by the Jesuit Father Lafitau; *Rélations des Jésuites*. Consult also Charlevoix's *New France*, translated by J. G. Shea, 6 vols.; *Five Nations*, by Cadwallader Colden; *League of the Iroquois*, by Lewis H. Morgan. J. R. Brodhead's *History* covers the period from 1609 to 1691. The State has published *Documentary History*, 4 vols.; *Documents relating to the Colony*, 11 vols.; *Geology and Natural History*, 24 vols.; *Addresses at Centennial Celebrations*, 2 vols. See also J. D. Hammond's *Political History*, 2 vols.; *Life of Joseph Brant*, of Red Jacket, of Sir William Johnson, by William L. Stone; *New York*, by Ellis H. Roberts, 2 vols., in American Commonwealth Series. Histories of many of the towns, cities, and counties are separately published.

ELLIS H. ROBERTS.

New York (the *Nieuw Amsterdam* of the original Dutch settlers): the chief city of the U. S. in population, commerce, manufactures, and finance. It lies in (reckoned from its city-hall) lat. 40° 42' 7" N., lon. 74° 00' 1" W. from Greenwich; at the junction of the Hudson, at this point called the North river, and the narrow strait forming the southwest extension of Long Island Sound and known as the East river. The boundaries of the city are identical with those of the county of New York, in the State of the same name, and include Manhattan Island and some of the adjacent mainland N. of it, Governor's, Bedloe's, and Ellis islands in the bay at the S. (these three the property of the U. S. Government), and Blackwell's, Ward's, Randall's, and a few minor islands in the East river or Sound.

Area and Plan.—Manhattan Island is 13½ miles long, and varies in width from a few hundred yards at each end to 2½ miles at Fourteenth Street, the area being about 22 sq. miles, or 14,080 acres. The mainland portion of the city covers some 12,000 acres, and the small islands 400 acres more. The total land area of the city is therefore nearly 26,500 acres. Its length, from the northern boundary to the southern end of Manhattan Island, is 16 miles, and its greatest width, from the mouth of the Bronx to the shore of the





MANHATTAN
BOROUGH
and part of
BRONX BOROUGH
of
THE CITY OF NEW YORK

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Hudson river, 44 miles. Numerous villages and towns have been absorbed by New York in its growth, the names of some of which are still applied to the corresponding parts of the city. Among these, on Manhattan Island, are Greenwich and Chelsea, on the Hudson river in the lower central portion of the city; Yorkville, on the east side at Eightieth Street, and Harlem, also on the east side, farther north; and Bloomingdale, Manhattanville, Carmansville, Fort Washington, or Washington Heights, and Inwood, on the west side, extending in a line along the Hudson river from the central part to the northern end of the island. The surface of the land is generally rolling, and in some places hilly, the highest point on Manhattan Island, at Washington Heights, being 238 feet above tide-level.

The substructure of the island consists of crystalline rocks of the Archaean period, flanked, and in some places deeply covered, with drift deposits of the Glacial era. The outcropping rocks are chiefly gneiss, mica-schist, and hornblende, and are part of a great belt extending from northern New England to North Carolina. Much of the city is built directly upon this foundation. In some quarters, however, the drift is too deep to be excavated, and the buildings rest either upon it or upon massive wooden piles driven into it. S. and E. of the city-hall there is a vast bed of beach sand, upon which some of the largest buildings in the city rest, and these, together with those that rest upon piles, are as stable and probably as secure as those bedded upon solid rock.

Street Plan.—The oldest part of the city, at the southern end of Manhattan Island, is irregular in plan, the streets being at unequal intervals, not always parallel or at right angles, and generally narrow. From Fourteenth Street northward to 155th Street most of the thoroughfares are laid out with mathematical precision, broad, straight avenues running on parallel lines N. and S., and cross streets at right angles to them running E. and W. N. of 155th Street, and indeed for some distance S. of it along the Hudson river, the streets are somewhat irregular, as are also those in the mainland part of the city, where they follow the lines of country lanes and village roads.

Broadway is the principal thoroughfare of the business region, a wide avenue extending lengthwise through the southern and central part of Manhattan Island. From Bowling Green to Tenth Street the cross streets abut upon it, or cross it, chiefly at right angles and at irregular intervals. At Tenth Street it deflects to the westward, and from that point to Fifty-ninth Street the streets cross it at slightly oblique angles and at uniform intervals. N. of Fifty-ninth Street its extension is known as the Boulevard, and pursues a somewhat winding course.

Fifth Avenue is a sort of "median line," dividing the cross streets, from Ninth to 140th into E. and W., the house-numbering of each half beginning at Fifth Avenue and running toward the rivers. Below Forty-second Street the avenue is largely devoted to business establishments of the highest class, clubs, hotels, etc.; above that point it is one of the most fashionable residence streets of the city. Other choice residence districts are found on Madison Park, West End, and St. Nicholas Avenues, Riverside Drive, Murray Hill, and Fifty-seventh, Seventy-second, and various other cross streets.

Wall Street and adjacent portions of New, Broad, Nassau, and William Streets are the seat of the financial interests of the city. The wholesale dry-goods trade is chiefly centered on Broadway and the streets immediately W. of it, from Leonard to Houston, while the fashionable retail shopping trade occupies Broadway from Tenth to Twenty-third Streets, and portions of Fifth and Sixth Avenues and Fourteenth and Twenty-third Streets.

Parks.—The most important of New York's pleasure-grounds is Central Park, in the very heart of the city. It is bounded by Fifth and Eighth Avenues and Fifty-ninth and 110th Streets, and is more than 2½ miles long and half a mile wide. Its area is 840 acres, and it contains 9 miles of carriage roads, 6 miles of bridle roads, and 30 miles of foot-paths. About half the area is devoted to woodland, more than 500,000 trees, shrubs, and vines having been planted, besides a considerable natural growth of timber. The park is entered through a score of gates, and fifty ornamental bridges and arches carry the roads and paths over other roads or over the lakes. Conspicuous among the features of the park are the Belvedere, a castellated observatory on the highest point of ground; the Mall, a broad promenade, lined with six rows of large elms, among which stand

many statues of famous men; the Terrace and Bethesda Fountain, fine pieces of stone-work and bronze at the northern end of the Mall; the lakes, six picturesque bodies of water, covering 43½ acres; the menagerie, an extensive collection of live animals, birds, etc., in the old arsenal building; the reservoirs of the Croton water system, 143 acres in extent; the Metropolitan Museum of Art; and the Obelisk, or Cleopatra's Needle, a monument which was made probably about 1500 B. C., and was given to the city of New York in 1877 by the Khedive of Egypt. Central Park was first planned in 1857; the landscape design was made by Frederick Law Olmsted and Calvert Vaux, and the architectural designs by Calvert Vaux and J. Wray Mould. It ranks by common consent among the most beautiful pleasure-grounds of the world.

Numerous smaller parks and squares are scattered about the city, such as the Battery, at the southern end of Manhattan Island; Bowling Green, at the lower end of Broadway; City-hall Park, now largely occupied by public buildings; Union Square and Madison Square, around which are clustered many of the great hotels and business houses; and Washington Square, with its imposing Memorial Arch at the foot of Fifth Avenue. Morningside Park is a long, narrow pleasure-ground on the steep eastern face of the high ridge W. of Eighth Avenue, between 110th and 123d Streets, and Riverside Park is a similar strip, twice as long, on the western slope of the same ridge, running down to the Hudson river. In the mainland part of the city are projected and partially laid out four large pleasure-grounds connected by broad parkways. These are Van Cortlandt Park, 1,069 acres; Crotona Park, 135 acres; Bronx Park, 653 acres; and Pelham Bay Park, 1,700 acres. The total park area of the city, exclusive of parkways is nearly 5,000 acres.

Harbor.—The landlocked harbor of New York comprises the lower bay, the upper bay, the East river, and the southern part of the North or Hudson river, and may be entered from the Atlantic Ocean either from the N. E., by way of Long Island Sound, or from the E. and S. by way of the channels at Sandy Hook. The latter is the more frequented course for ocean-going vessels. The lower bay, which includes also Raritan, Sandy Hook, and Gravesend Bays, affords 88 sq. miles of anchorage. It is entered by two channels near Sandy Hook, over a bar about 18 miles S. of the city, the depth of water on the bar being 32 feet at high tide. In this bay are two small islands of artificial construction, named Swinburne and Hoffman islands, and occupied by the hospitals, etc., of the quarantine station. The northern point of Sandy Hook is elaborately fortified for harbor defense. From the Lower Bay entrance is had to the upper bay through a picturesque strait called the Narrows, 8 miles from the city. This strait is scarcely a mile wide; on the eastern shore is Fort Hamilton; on the western, Fort Tompkins—an earthwork with batteries at the top of the bluff, overlooking Fort Wadsworth, which is situated at the water's edge and gives name to the whole garrison. A narrow and winding channel known as Staten Island Sound and the Kills also connects the two bays, but is used only by vessels of light draught. The upper bay, or harbor proper, has 14 sq. miles of anchorage, and contains Governor's island, used as a national military station, Ellis island, where all immigrants are landed, and Bedloe's island, crowned with Bartholdi's colossal statue of *Liberty Enlightening the World*, a gift from the French people. The North river is nearly a mile wide, deep enough for the largest ships, and affords the city 16 miles of available waterfront, of which more than one-third is now fully occupied with docks and piers. The East river is less than half as wide as the North, but is as deep, and the city has several miles of wharfs on it. The northeastern entrance to the harbor, from Long Island Sound, leads through HELL GATE (q. v.) into the East river. At Throgg's Neck is Fort Schuyler, an inclosed pentagonal casemated masonry work with exterior batteries. The harbor is yearly visited by about 16,000 seagoing craft, under steam or sail. The port of entry, or customs district, of New York, comprises New York, Brooklyn, Jersey City, Hoboken, Long Island City, and the minor adjacent cities and towns on the North river, East river, and New York Bay.

Climate.—The climate of New York, which is materially affected by the proximity of the ocean, is on the whole temperate and salubrious, although at times subject to sudden changes of temperature and other conditions. Thousands of visitors from the West and South spend much of every summer in New York for health and pleasure. The average

temperature (Fahrenheit scale) and rainfall, by months, from 1870 to 1894 have been as follows:

MONTHS.	Temperature.	Rainfall.
January.....	30.5°	3.98 inches.
February.....	31.5	3.92 "
March.....	36.7	4.04 "
April.....	48.0	3.40 "
May.....	59.2	3.22 "
June.....	69.0	3.16 "
July.....	73.6	4.25 "
August.....	72.3	4.71 "
September.....	65.2	3.65 "
October.....	55.2	3.38 "
November.....	43.5	3.78 "
December.....	33.9	3.27 "
Average annual rainfall.....		44.76 inches.

Architecture.—In no city is a more bewildering variety of architecture to be observed than in New York. The varying tastes of a hundred years of rapid and startling changes are there to be seen. Many streets are lined with monotonous façades of brownstone high-stoop houses of the fashion of a generation ago. A few show still older rows of brick with marble trimmings and quaint wrought ironwork. Mansard roofs are not uncommon, nor are high, steep, tiled roofs of Dutch and German pattern.

Business buildings are perhaps most varied of all. Granite, marble, brownstone, brick, terra-cotta, iron, and other materials are used. Such streets as Broadway, Wall Street, and lower Fifth Avenue present a constantly changing panorama, with no two buildings alike and scarcely any two even resembling each other. Structures of ten and twelve stories are seen on every hand, while those of fifteen and twenty and even more are rapidly increasing in number. Among the more attractive buildings in the central part of the city may be mentioned Madison Square Garden. This structure contains a theater, a concert-hall, a small assembly-room, together with restaurants and dressing-rooms, and an amphitheater capable of holding 17,000 spectators. The exterior of this building is of an ornate Renaissance style, and is adorned by the highest tower in New York, closely copied from the tower of the Giralda at Seville.

Some of the newer hotels are decorative in design. The Waldorf and the Holland House may be mentioned, also the Imperial at Broadway and Thirty-second Street. There are many others much larger than these. Of the apartment-houses, all built since 1870, perhaps the most interesting is the Dakota, overlooking Central Park. Several of the large clubs have showy edifices. The Union League Club, at Fifth Avenue and Thirty-ninth Street, is of Louis XV. style of architecture, and the Century Club, in West Forty-third Street, has a beautiful façade in Italian Renaissance. The Academy of Design, on Fourth Avenue, offers a serious study of Italian Gothic, and the building of the American Fine Arts Society, in West Fifty-seventh Street, is a reproduction of the house of Francis I. in Paris. Of the churches, Trinity, at the head of Wall Street, is pure English Gothic, as is also Trinity chapel belonging to the same parish. The Church of All Souls, on Fourth Avenue, is a massive building of an Italian Byzantine character, of red brick and cream-colored stone in stripes, and has an elaborate porch. St. Thomas's, on Fifth Avenue at the corner of Fifty-third Street, is of English Gothic. Its high tower is crowned by a lantern somewhat in the character of that at Boston, in Lincolnshire. The Judson Memorial church, fronting on Washington Square, is an interesting Italian design, with a square campanile. On Fifth Avenue there are two synagogues remarkable for their architecture—the Temple Emanu-El at Forty-fourth Street, and the Temple Beth-El at Seventy-sixth Street. St. Patrick's Cathedral (Roman Catholic), at Fifth Avenue and Fiftieth Street, is of the Decorated Gothic style of the thirteenth century. Its twin spires are 330 feet high.

Public Buildings.—The city-hall, standing in a park bounded by Broadway, Park Row, and Centre and Chambers Streets, is a small building of beautiful design, dating from 1803-12. It is built of white marble, excepting the rear wall at the N., which is of brownstone painted white, the builders having supposed the city would not extend N. of it, and that therefore the brownstone wall would seldom be seen. The style of architecture is a late revived Classic. Among the many precious relics preserved there are the chair in which Washington sat at his first inauguration as President and the desk on which he wrote his first message to the Congress.

Directly in front of the city-hall, occupying the southern corner of the park, is the U. S. post-office or Federal Building, a huge and ponderous edifice of gray granite in a mixed revived Classic style, with domes modeled somewhat after those of the Louvre. Its ground plan is an irregular quadrangle, the north side measuring 279 feet, the south 144, and the east and west 262½ feet each, and it is five stories high. It was completed in 1875 at a cost of nearly \$7,000,000.

The county court-house stands in the park at the rear of the city-hall. It is of white marble, in Corinthian style, with a wing in Romanesque, measuring 150 by 250 feet. The erection of it was begun in 1861, and it has been occupied since 1867, but never has been fully completed. In its construction and furnishing the city was swindled out of vast sums by the notorious "Tweed ring."

The criminal courts building is an imposing edifice of brick, terra-cotta, and granite, in Italian Renaissance style, on the block bounded by Centre, Elm, White, and Franklin Streets, first occupied in 1894. On the next block, to the S., connected with the criminal courts by a bridge over Franklin Street, is the city prison, best known as the Tombs, a low, massive structure of granite, in pure Egyptian design, the best example of such architecture built in modern times.

The U. S. custom-house is a huge, gloomy building of dark granite, on Wall Street, originally a merchants' exchange. It is noteworthy for its portico of eighteen monolithic granite columns, each 38 feet high and 4½ feet in diameter. At Wall, Nassau, and Pine Streets is the U. S. sub-treasury, modeled after the Parthenon. The U. S. barge office, at the Battery, and the Jefferson Market court-house and prison, at Sixth and Greenwich Avenues, are handsome edifices.

Churches.—Places of worship in 1893 numbered 537, including 52 Baptist, 11 Congregational, 53 Jewish, 25 Lutheran, 65 Methodist Episcopal, 58 Presbyterian, 80 Protestant Episcopal, 32 Reformed, 84 Roman Catholic, and 77 miscellaneous.

Education.—The system of public education in New York comprises (1894) the College of the City of New York, an institution of regular collegiate rank for boys; the Normal College for girls, 110 grammar schools, 120 primary schools, 30 evening schools, 1 nautical school (on school-ship St. Mary's), and 48 corporate schools (industrial, reformatory, etc.) under direction of the board of education: a total of 311. There is also a kindergarten system. The attendance of all children between the ages of eight and fourteen years is compulsory, unless they are otherwise under instruction, and 12 truant agents are constantly employed in looking up delinquents. The daily attendance of scholars is about 165,000. There are 4,250 teachers on salaries of from \$600 to \$3,000 a year, and the yearly cost of the entire department is about \$4,500,000.

Institutions of higher learning are numerous. Besides the two colleges of the public-school system, there are Columbia College, the University of the City of New York, St. John's College at Fordham, the College of St. Francis Xavier on West Sixteenth Street, Rutgers Female College, Union Theological Seminary, the General Theological Seminary of the Protestant Episcopal Church, the College of Dentistry, the College of Pharmacy, the College of Economics, five colleges of medicine, and a host more for general or special instruction. Schools of art, law, music, architecture, design, mechanics, business training, and industrial trades abound. The Cooper Institute, founded and endowed by Peter Cooper, gives free instruction in many useful and practical branches of learning, and the Ship-building Academy, similarly established by W. H. Webb, affords thorough tuition in ship-building and general seamanship. In the trade schools, founded by Col. Richard T. Auchmuty, at First Avenue and Sixty-seventh Street, instruction is given in carpentering, bricklaying, painting, blacksmithing, plumbing, and kindred practical vocations. The National Academy of Design, the Society of American Artists, the Art Students' League, and the schools connected with the Metropolitan Museum of Art are among the foremost seats of art study and teaching.

The Society Library, founded in 1740 and maintained by the annual dues of its members, is the oldest in the city. It has nearly 100,000 volumes for circulation and reference, and a good reading-room. The Astor Library, on Lafayette Place, opened in 1854, founded by John Jacob Astor, and liberally enlarged and endowed by other members of his family, has more than 250,000 well-selected volumes. Their use is free, but they can not be taken from the building. The Lenox Library, on Fifth Avenue, facing Central Park, was opened in 1877, and was the gift of James Lenox to the city.

Its collections of books, manuscripts, pictures, etc., are extensive and of great value, but partake more of the character of a museum than a practical working library. This is also true of the large and splendid store of literary and artistic treasures in the building of the New York Historical Society. The Mercantile Library, in Clinton Hall, on Astor Place, founded in 1820, is the chief circulating library. It has about 250,000 volumes, which are loaned out to subscribing members, who pay a small annual fee. It has also a particularly well-stocked reading-room of papers, magazines, etc. The Cooper Institute contains a large free library and reading-room. The Free Circulating Library, at 49 Bond Street, has a number of branches throughout the city, and loans about 500,000 volumes yearly. There are about fifty other public libraries, mostly free, including collections of law, medical, and other special works.

The principal museums of New York are the Metropolitan Museum of Art in Central Park and the American Museum of Natural History in Manhattan Square, adjoining Central Park. The former, a private corporation under State and municipal patronage, was founded in 1869. Its collections are free to the public, except on two days of each week, and comprise an array, unrivaled in America, of paintings, statuary, bronzes, glass and metal ware, pottery, Cypriote, Etruscan, Egyptian, and other antiquities, musical instruments, laces, tapestries, etc. The Museum of Natural History was founded at about the same time, on the same plan, and is similarly conducted. It contains magnificent collections of mounted specimens of mammalia, birds, fishes, reptiles, and insects; the Jesup collections of over 500 specimens of American woods and 1,500 of building-stones; the Edwards entomological collection of 350,000 specimens; the Tiffany collection of gems; ethnological and archaeological collections; and a fine library.

Publications.—Being the business capital of the U. S., the port receiving the bulk of foreign mails, and the point upon which the land and submarine telegraph systems converge, New York is the chief news center, and its newspaper press therefore has surpassing influence and importance. Among its best-known morning journals are the *Herald*, *Sun*, *Tribune*, *Times*, *World*, *Press*, *Recorder*, *Journal*, and *Advertiser*. Among papers in foreign languages are the *Courrier des Etats-Unis* (French); *Staats Zeitung*, *New Yorker Zeitung*, and *New Yorker Volkszeitung* (German); *Il Progresso Italo-Americano* and *L'Eco d'Italia* (Italian); *Las Novedades* (Spanish); and *Illas Lidu* and *New Yorks Lesty* (Bohemian). Evening papers are *The Evening Post*, *Commercial Advertiser*, *Mail and Express*, *Evening Telegram*, *Daily News*, *Evening Sun*, and *Evening World*. There are other daily papers devoted to commercial, financial, legal, and other special topics.

The weekly press numbers hundreds of journals, in many languages, conspicuous among which are the weekly editions of the great daily papers. *Harper's Weekly*, *Leslie's Weekly*, and the *Illustrated American* make a feature of illustrations. *Puck*, *Judge*, *Life*, *Truth*, and others are humorous and satirical. *The Outlook*, *Churchman*, *Independent*, *Observer*, *Examiner*, *Evangelist*, *American Hebrew*, *Christian Advocate*, *Freeman's Journal*, and others are representative religious journals of high literary quality. There are also scores of trade, technical, educational, juvenile, fashion, scientific, and other periodicals, including some in Greek, Arabic, Armenian, Hebrew, and Chinese. Among monthly publications such magazines as *Harper's*, *Scribner's*, *The Century*, *The Cosmopolitan*, and others have a worldwide reputation. All told, nearly 800 periodicals are published in New York.

In equal degree New York is the center and chief seat of the book-publishing and general printing trades. The names of Harper, Scribner, Appleton, Putnam, and Randolph have long been household words among readers of English the world over, while many younger firms have risen to almost equal eminence with those older houses. The book-importing trade is also principally conducted in New York, and most of the leading London publishers have branch houses or agents there.

Benevolent Institutions.—The charities of New York are founded and conducted on a scale commensurate with the requirements of its teeming population. The Municipal Department of Charities and Correction, at Third Avenue and Eleventh Street, maintains extensive hospitals, asylums for the insane, almshouses, etc., on Blackwell's, Ward's, and Randall's islands, besides doing a vast relief work for the general poor. The institutions and societies founded by

private beneficence are numbered by hundreds. Each religious society, trade, and profession has one, and there is one for every class of sufferers and unfortunates.

Bellevue Hospital, at the foot of East Twenty-sixth Street, is a large and admirable institution, maintained by the city at a cost of over \$100,000 a year. It has connected with it a dispensary for the relief of outdoor poor, a medical college of high rank, a training-school for male nurses founded by D. O. Mills, a similar school for female nurses, and various other important adjuncts. The Charity Hospital is on Blackwell's island. The Cancer, Mount Sinai, New York, Presbyterian, St. Luke's, Roosevelt, and Women's hospitals are among the best known private institutions. Beside these there are perhaps fifty more hospitals and as many dispensaries.

Places of Entertainment.—The size and vast business activities of New York make it the resort of myriads of visitors, for whose entertainment a great number of hotels have been erected. Among the best known of these are the Astor, Metropolitan, Fifth Avenue, Hoffman House, Waldorf, Murray Hill, Park Avenue, Savoy, Plaza, Holland House, New Netherlands, Central, Windsor, Buckingham, Brunswick, Brevoort, and Grand Union.

Proportionately numerous are the theaters, opera-houses, and music-halls. The Metropolitan Opera-house, at Broadway and Fortieth Street, ranks among the largest in the world. Leading theaters are Daly's, Abbey's, Palmer's, the Star, the Broadway, the American, the Empire, the Garden, the Lyceum, the Fifth Avenue, Hoyt's, etc. The total number exceeds forty.

Clubs and club-life form an important feature of New York. There are hundreds of such organizations, including a score or more of the first rank. Among these may be named the Union, Metropolitan, Union League, Century, Manhattan, Lotos, Colonial, Knickerbocker, St. Nicholas, University, Republican, Democratic, New York, Authors', Gentlemen's Riding, Grolier, Aldine, etc. There are also athletic, yachting, press, jockey, and other clubs devoted to special objects. Some of the great social clubs named have 1,500 or more members each, and houses fairly palatial in size and equipment.

Government.—The executive head of the city government is the mayor, who is elected by popular vote for a term of two years, and is removable from office for cause only by the Governor of the State. He appoints the heads of most of the executive departments. During his absence or disability the president of the board of aldermen is acting mayor, with full powers after ten days. The legislative powers of the city, restricted to minor matters, are exercised by a board of aldermen of thirty-one members meeting, usually weekly, in the city-hall. Aldermen are elected for a term of two years, one from each of thirty districts, and one, the president, from the city at large. The county officers elected are county clerk, sheriff, register, etc.

The civil courts sitting in New York are as follows: Federal—U. S. circuit, U. S. circuit of appeals, U. S. district; State—supreme, court of arbitration of Chamber of Commerce; county—common pleas, superior, surrogate's; city—city court, six judges; district—eleven district courts. The criminal courts are oyer and terminer, general sessions, special sessions, and six police courts. The law officers for the people in criminal actions are the district attorney (elected) and his staff of five assistants and nine deputies.

The magnitude of the yearly operations in some of the executive departments is indicated by the following statistics (1893): Buildings, 2,275 new structures planned, valued at \$54,859,318. Charities and corrections, expenditures, \$2,225,000. Fire, 4,132 fires, expenditures \$2,223,000, 76 companies, 85 engines, 1,073 men. Police, 3,654 men, about 90,000 arrests, expenditures \$5,300,000. Public works, expenditures \$3,000,000. Street-cleaning, about 1,890,000 loads of dirt, garbage, ashes, snow, etc., removed, and 62,650 miles of streets cleaned. Vital statistics: The health department reported 44,370 deaths, 51,516 births, and 16,144 marriages. The death-rate was 23.46 per 1,000.

Post-office.—New York not only has an enormous mail of its own, but it is the port of entry and departure for the bulk of the country's foreign mails. In the main post-office 3,000 men are employed, and there are forty branch and sub-stations. During the year ending June 30, 1894, there were delivered through lock-boxes and by carriers 455,191,631 pieces of ordinary mail matter. The total number of pieces of mail matter of all kinds handled was 1,336,225,767. The aggregate business of the money order department amounted to \$103,355,487.83. The total receipts of the office were

\$6,942,873.51, and the total expenditures \$2,791,951.05 (including \$1,218,785.28 expended for free-delivery service), giving a net revenue of \$4,150,922.46.

Markets.—The largest public market is Washington, on the block bounded by Washington, West, Vesey, and Fulton Streets, in which almost every imaginable commodity for food is sold. Fulton Market, at Fulton, Beekman, South, and Front Streets, is a large establishment, and is the chief fish-market of the city. There are a dozen more, scattered about the city, all under municipal control.

Water and Light.—The water-supply of New York is drawn chiefly from great reservoirs in the basin of the Croton river, in the upper part of Westchester County, about 40 miles N. of the city. Two underground conduits (see **AQUEDUCTS**) bring the water to four huge reservoirs in Central Park, with a capacity of nearly 1,250,000,000 gal. Thence it is distributed throughout the city by means of some 400 miles of underground iron pipes. The carrying capacity of the two aqueducts is 400,000,000 gal. a day. The first is 8 feet in diameter, and enters Manhattan Island by way of High Bridge over Harlem river; it was completed in 1842. The second is 12 feet in diameter, and was completed in 1890 at a cost of over \$25,000,000.

The streets and buildings of the city have a dual system of lighting—by gas and by electricity. There are about 25,000 street gas-lamps. Electric lights are less numerous, being confined to the principal streets and avenues, and some of the parks.

Finances.—The city debt in 1880 was \$142,447,400; in 1890, \$148,124,216. The assessed valuation of real estate in 1894 was \$1,613,057,735; of personal property, \$390,274,302—total, \$2,003,332,037. Appropriations for support of the city government, etc., in 1894 were \$38,664,257, of which more than \$35,000,000 was raised by taxation.

Immigration.—The vast majority of aliens coming to the U. S. are landed at New York. From 1855 to 1889 they were received at Castle Garden, at the Battery, under State supervision. Since 1889 they have been under charge of the Federal Government, and are received on Ellis island, in the bay. The following table shows the number of passengers landed from 1881 to 1892 inclusive, and the number of trips made by the ships:

YEAR.	Cabin.	Steerage.	Trips.
1881.....	51,229	441,604	937
1882.....	57,947	455,450	1,021
1883.....	58,596	388,267	972
1884.....	59,503	320,807	943
1885.....	55,160	281,170	843
1886.....	68,742	300,918	906
1887.....	78,792	371,619	885
1888.....	86,302	383,595	899
1889.....	96,686	315,227	891
1890.....	111,830	371,593	914
1891.....	105,025	445,290	964
1892.....	120,991	358,486	957
Totals.....	950,803	4,374,026	11,132

Manufactures.—New York was in 1890 the seat of 25,403 manufactories, in about 300 different branches of industry; the direct capital investment in these was \$426,118,273; the number of employees of all kinds 354,291, receiving in wages \$230,102,167; the cost of materials used \$366,422,722, and the value of products \$777,222,721. Among the leading industries were the following:

INDUSTRIES.	No. of establishments.	Capital.	Em- ployees.	Value of products.
Boots and shoes.....	2,796	\$4,151,127	9,514	\$13,088,672
Clothing.....	6,303	49,940,324	80,944	138,338,580
Coffee and spice.....	35	1,274,571	670	17,037,019
Electric apparatus, light and power.....	58	21,690,647	3,042	5,540,910
Foundries.....	343	15,036,597	10,381	19,543,794
Gas.....	6	57,605,812	2,633	12,672,963
Malt liquors.....	52	28,653,206	3,344	23,926,955
Military.....	389	4,539,206	7,657	12,873,387
Musical instruments.....	131	8,597,015	5,958	12,829,541
Printing and publishing..	1,166	35,469,979	22,311	54,488,179
Silk.....	146	7,771,030	9,460	13,579,462
Tobacco.....	1,295	16,392,842	22,096	35,560,025

Commerce.—Considerably more than 50 per cent. of the total foreign trade of the U. S. passes through the port of New York. The imports at New York for the fiscal year ending June 30, 1893, were \$581,829,741; and the exports, \$452,535,663—total, \$1,034,365,404. The total of the U. S. for the same year was \$1,907,851,912. For the fiscal year

ending June 30, 1894, the imports were: Free, \$234,040,555; dutiable, \$181,755,436—total, \$415,795,991. Exports for the same time amounted to \$359,192,983. The decrease was due to temporary depression of trade.

Exchanges.—The chief exchanges are the Stock Exchange, with a fine building on Broad Street; the Consolidated, also dealing in stocks; the Produce, whose great building on Whitehall Street is a conspicuous landmark of the city; the Cotton, the Coffee, the Real Estate, and the Coal and Iron. The Stock Exchange, in 1893, was the scene of these transactions: Government bonds, \$1,914,200; State and railway bonds, \$355,181,650; shares of stocks, \$80,013,902. At the Produce Exchange dealings covered 5,612,250 barrels of flour, 1,052,008,000 bush. of wheat, 177,428,000 bush. of corn, and 80,520,000 bush. of oats.

Banks.—New York contains 50 national banks with a capital of \$52,450,000, and 46 State banks with a capital of \$16,472,700. Most of the former and some of the latter form a Clearing-house Association, through which a daily exchange of checks and bills and payment of balances are effected. The Clearing-house began operations on Oct. 11, 1853, and in the first forty years of its existence, to Oct. 11, 1893, its exchanges aggregated \$1,021,018,593,454, and balances \$45,981,837,600—a grand total of \$1,067,000,431,054. The figures for the year ending Oct. 1, 1893, were: Exchanges, \$34,421,380,869; balances, \$1,696,207,175—total, \$36,117,588,045.

There are also twenty-five savings-banks with total deposits (1893) of more than \$346,000,000.

Insurance.—Both fire and life insurance have their American headquarters in New York, and the buildings erected by some of the companies are among the most notable in the city. Such are the buildings of the Equitable, Manhattan, Mutual Reserve, Home, and New York Life-insurance companies on Broadway, of the Mutual Life on Nassau Street, and of the Metropolitan Life on Madison Square. In 1893 there were invested in New York assets of domestic and foreign fire-insurance companies amounting to about \$240,000,000. Even more imposing are the figures reported by the thirty-one life-insurance companies doing business in New York, their assets aggregating in 1893 more than \$905,000,000, of which more than half belonged to New York companies.

Travel and Transportation.—Local transportation facilities include five lines of elevated steam-railways, and numerous surface street-railways, on which cars are propelled by horse-power, cables, and electricity. A uniform rate of five cents fare prevails. The number of passengers carried in 1890 was 408,963,266, of whom 189,974,848 were on the elevated railways. The East river bridge, connecting New York with Brooklyn (for description, see **BROOKLYN**), is traversed by about 115,000 persons daily. In 1893 42,615,105 passengers were carried in the bridge cars. The ferries on the North and East rivers and the bay convey scores of thousands daily from and to the suburbs. Harlem river, which separates Manhattan Island from the mainland, is crossed by a number of bridges, among them the lofty and graceful Washington bridge. (See **BRIDGES**.) General domestic travel is facilitated by the centering at New York of a dozen important trunk railways and numerous subsidiary lines, several important steamboat lines on Long Island Sound and the Hudson river, and a vast coasting trade between New York and Eastern and Southern ports. Foreign transportation is represented by nearly all the transatlantic steamship lines. Most of the railways have their termini in Jersey City, Hoboken, Brooklyn, and Long Island City, whence passengers and freight are transferred to New York by ferry. Three important lines, with their connections, enter the city directly, and have their termini in the Grand Central station, at Fourth Avenue and Forty-second Street. This is a great structure of brick, iron, and glass, with separate waiting-rooms, ticket-offices, etc., for each of the three railways. The principal train-shed is nearly 700 feet long and 240 feet wide, roofed with a single arched span of iron and glass 110 feet high, and will hold at one time 150 ordinary passenger cars; there is an additional train-shed half as large adjoining this on the E. About 150 trains arrive and depart daily by a four-track railway on Park Avenue, partly underground and partly elevated.

History.—The original Indian name of New York was Manhattan. The first European visitor was Giovanni Verazani, who entered New York Bay in 1525, but made no landing. The real discoverer and explorer of those regions was Hendrick Hudson, an English mariner employed by a

Dutch trading company. He explored New York Bay and the great river which bears his name in 1609, in his little ship the *Half Moon*. Two years later Adrian Block visited Manhattan, made a landing, and established a trading station. In 1614 the States-General of Holland chartered the United New Netherland Company to engage in trade at Manhattan, and a fort and trading-house were built on the southern point of the island and called Fort Amsterdam. A permanent village settlement was effected in 1623 under the name of New Amsterdam. The first white male child born on the island was Jean Vigne, in 1614, and the first white girl, Sarah Rapalje, was born in 1625. Peter Minuit, the first important governor of the new colony, arrived in 1626, and thereafter the growth of the place was rapid. In 1652 the place was incorporated as a city under the name of New Amsterdam, and the next year was enclosed at the N. by a wall of earth and timber 2,340 feet long, on the present site of Wall Street. On Mar. 12, 1664, the whole colony was granted by Charles II. of England to his brother, the Duke of York, and in August was forcibly seized by a British fleet. The place was now named New York, in honor of its new owner. In 1673 a Dutch fleet seized it again and renamed it New Orange, but a year later it was restored to the English. An organized government and code of laws were established in 1691, and on Apr. 9 of that year the first colonial assembly met in the city. In 1725 the first newspaper, *The New York Gazette*, was founded; in 1730 a fortnightly stage service to Philadelphia was established; in 1752 the Royal Exchange was opened at the foot of Broad Street; in 1754 King's, now Columbia, College was chartered; and in 1768 the Chamber of Commerce was organized.

The spirit of resistance to British rule made its appearance in New York at an early date. The Stamp Act Congress was organized in 1765; so was the league known as the Sons of Liberty. The Stamp Act was publicly burned, cargoes of taxed tea were thrown overboard, a liberty pole was erected on the common, now the City-hall Park, and vigorous public demonstrations were made against the British garrison. One of the earliest conflicts of the war occurred in John Street between Sons of Liberty and British troops. In the spring of 1776 the bulk of the American army was massed in New York, and on July 8 the Declaration of Independence was publicly proclaimed and read to the troops. On the same day the equestrian statue of George III., on Bowling Green, was pulled down and transformed into bullets for the use of the patriot army. After the battle of Long Island the American troops were gradually withdrawn from Manhattan Island northward, several skirmishes being fought on Harlem Heights. The city then passed into the hands of the British, who held it under rigid military rule until Nov. 25, 1783, when the last of their garrison evacuated the city, and the American troops took possession. A few weeks later Washington took farewell of his officers at Fraunces's Tavern, at the corner of Broad and Pearl Streets.

New York was soon chosen as the capital of the young republic. In Jan., 1785, Congress removed thither from Philadelphia and met in Federal Hall, at the corner of Wall and Nassau Streets, now the site of the U. S. sub-treasury. In the same building Washington was inaugurated as President on Apr. 30, 1789, and there the first Congress under the Constitution held its meetings. New York remained the national capital for five years.

The free-school system of the city was organized in 1805 on a small scale; in the following year steam navigation was first accomplished on the North river by Robert Fulton; in 1807 the steamer *Clermont* began regular trips to Albany, and in 1818 the first line of Sound steamers was established; transatlantic steam navigation began in 1819 with the *Savannah*, built at New York. In the war of 1812 New York sent out twenty-six privateers, with 2,239 sailors. The port was then blockaded by the British until the end of the war, but the city was defended against invasion. On Nov. 11, 1826, the first canal-boat arrived from Buffalo by way of the newly finished Erie Canal. In 1832 the city was ravaged by Asiatic cholera, and in Dec., 1835, a fire in the southern part of the city raged for three days, destroying 600 buildings and more than \$20,000,000 worth of property. Water was introduced through the Croton aqueduct in 1842. The electric telegraph was invented by Prof. Morse in the University of the City of New York, and a line completed to Philadelphia in 1845. In 1849 occurred the famous Astor Place riots, due to jealousy between the friends of the actors Forrest and Macready. The first American

World's Fair was opened in 1853 in the Crystal Palace, now what is now Bryant Park.

At the outbreak of the Southern secession movement, in 1860, the mayor of New York, Fernando Wood, proposed to make it a free city, on the plan of those of mediæval Germany. Such schemes were quickly dismissed when the war began in Apr., 1861, and New York thenceforth supported the national Government with great zeal. The local militia were hurried to the front, the U. S. Sanitary Commission, the U. S. Christian Commission, the Union Defense Committee, and other patriotic bodies were organized, and 116,382 soldiers were sent from the city to the Union army. In the summer of 1863 the disaffected and criminal classes of the city, especially those of foreign origin, formed mobs to oppose the enforcement of the Draft Act. For several days in July large bands of rioters roamed about the city, burning buildings, murdering citizens, and stealing whatever they could lay their hands upon. The office of the *Tribune* newspaper was set on fire, the Colored Orphan Asylum was burned, and Negroes were murdered by scores in various parts of the city, and it was not until the Seventh Regiment hurried back from Washington that order was fully restored. More than 1,000 men were killed and wounded, and about \$2,000,000 worth of property destroyed.

In the speculative days of the war, and the years immediately following it, political corruption became rampant in the municipal government. It reached its climax in 1870 and 1871, when the notorious Tweed ring was exposed and overthrown, after having robbed the city of more than \$20,000,000. In 1871 serious riots took place between the Orangemen and Ribbonmen, rival factions of the Irish population. In 1869 occurred the famous "Black Friday," arising from an unsuccessful effort to "corner" gold; and in 1873 there was another disastrous panic on Wall Street. May 24, 1883, witnessed the opening of the Brooklyn bridge. The funeral of Gen. Grant occurred on Aug. 8, 1885, with one of the largest and most impressive funeral processions ever seen in the U. S. Work was begun on Grant's tomb and monument in the presence of enormous crowds on Apr. 27, 1891, and exactly a year later the cornerstone of the edifice was laid. The four hundredth anniversary of the discovery of America was celebrated in New York in Oct., 1892, on a magnificent scale, the city being profusely decorated and thronged by hundreds of thousands of visitors. On one day, Oct. 12, the elevated railways carried 1,075,537 and the Brooklyn bridge cars 223,625 passengers. On Apr. 27 and 28, 1893, occurred further demonstrations in honor of the memory of Columbus, including a naval review of U. S., British, French, German, Spanish, Russian, Italian, Dutch, Brazilian, and Argentine ships of war, and a land parade of soldiers and sailors of all those nationalities.

The community of interests of New York, Brooklyn, and other adjacent cities led in 1890 to the promulgation of a plan for uniting them into a single municipality—a so-called "Greater New York." A State commission to consider the expediency of such consolidation, and to formulate plans for effecting it, was formed, and in Nov., 1894, the question was submitted to popular vote and carried, except in Mount Vernon, Westchester, and Flushing. An act of consolidation was signed by the Governor May 11, 1896, to take effect Jan. 1, 1898, and the commission appointed to draft a charter for the new city presented its report to the Legislature Feb. 22, 1897.

Population.—(1790) 33,131; (1800) 60,489; (1880) 1,206,299; (1890) 1,515,301. From 1790 to the present day New York has continuously ranked as the most populous city in the U. S. In 1890, of the inhabitants of New York, 875,358 were native born, and 639,943 foreign born; 23,601 were colored (of African descent); 747,579 were male, and 767,722 female; of male inhabitants of voting age, 177,729 were native and 269,069 foreign born; there were 312,766 families, housed in 81,828 dwellings; of the foreign-born inhabitants, 190,418 came from Ireland, 210,723 from Germany, 35,907 from England, 27,193 from Austria, 12,222 from Hungary, 48,790 from Russia, 39,951 from Italy, 10,535 from France, 8,099 from Bohemia, 6,759 from Poland, and 2,048 from China.

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W. F. JOHNSON. Revised by WHITELOW REID.

New York System: in geology, a division of the Paleozoic rocks in North America, including representatives of the Cambrian, Silurian, and Devonian periods. In the systematic work of the Geological Survey of New York, the most important single contribution ever made to American stratigraphy, it was found impossible to classify the formations in accordance with the categories which had been established by earlier work in Europe; and the geologists not only gave local names to the individual formations of the State, but grouped them under classic terms which were in part novel. The New York System, which was announced in various reports in 1842 and 1843, comprises all the formations of the State from the Potsdam sandstones below to the Chemung group above, both inclusive. It contains twenty-eight formations, grouped in four divisions, in which the Champlain division, as defined by Hall, extends from the Potsdam to the Oneida, the Ontario from the Medina to the Niagara, the Helderberg from the Onondaga to the Corniferous, and the Erie from the Marcellus to the Chemung. The system thus set forth constituted for many years the standard of reference for American rocks of corresponding age, and was of great utility as affording an independent basis for the taxonomy of American formations. It has largely fallen into disuse, first because the progress of stratigraphic study showed that no natural break determined its upper limit, the Appalachian rock series being continuous to the top of the coal-measures; second, because with the progress of paleontologic study it became possible to classify the formations under the categories afforded by the periods of European chronology, and thus give them a more definite place in the general geologic history of the globe. Consult *Geology of New York*, parts i. to iv., 1842-43, and *Bulletin No. 80, United States Geological Survey*. See also GEOLOGY and PALEONTOLOGY. G. K. GILBERT.

New York, University of the City of: an institution of learning chartered Apr. 18, 1831, and opened in 1832. Until 1883 the corporation was a council of thirty-two members elected by the subscribers to the endowment, together with five representatives of the city government. In 1883 the charter was changed so as to make the council self-perpetuating, one-fourth the members going out each year unless re-elected. The political element was dropped, as also a clause forbidding to any religious denomination a majority of the council. In 1832-35 a building was erected on Washington Square, E., and was replaced 1894-95 by a larger structure intended partly as a source of income and partly for the accommodation of the School of Law, School of Pedagogy, and the graduate department. In 1892 a tract of 20 acres at 200th Street, on the Harlem river, was purchased, on which new buildings for the undergraduate department have been erected. The faculty of arts and science dates from 1832; until 1886 its instruction was to undergraduates only. The college requires a four years' course for the degree of bachelor of arts or of science. A technical school is also supported, which gives the degree of C. E. to its students one year after they have become bachelors of science. In 1886 the Graduate Seminary was founded, which receives candidates for the degrees of master of arts or science and doctor of philosophy. In 1890 the School of Pedagogy (begun provisionally in 1887) was permanently established, giving degrees of Pd. D. and Pd. M. It is the first University School of Pedagogy in America. There are three professors besides numerous lecturers. The faculty of arts and science has 20 professors and over 400 students. It has included many names eminent in literary and scientific effort, as Henry P. Tappan, S. F. B. Morse, Davies, Loomis, Taylor Lewis, and the Drapers. The faculty of medicine, founded 1841, numbered among its earlier members Drs. Valentine Mott, Bedford, Paine, Post, and Draper. Its buildings, after several removals, are upon Twenty-sixth Street, opposite Bellevue Hospital. This faculty has over 20 professors and more than 30 lecturers and assistants; it enrolls about 550 students. Three full winter courses of eight months each are required for the degree of M. D. The faculty of law, founded 1858, comprises 4 professors and 7 lecturers. The course for LL. B. is completed in two years. In 1891 graduate courses were opened leading to the degree of LL. M. There are about 300 students. The

chancellors have been Drs. Matthews, Frelinghuysen, Ferris, Crosby, Hall, and MacCracken. The value of the property of the university approaches \$2,000,000 in value.

HENRY M. MACCRACKEN.

New Zealand: a British colony, in the South Pacific Ocean, S. E. of Australia. The northwest point, Cape Maria van Diemen, is 1,175 miles from Sugar-loaf Point, on the coast of New South Wales, and West Cape is 850 miles from Tasmania. The colony consists of three islands, lying N. E. and S. W., and many islets, between the parallels 33° and 53° S. and the meridians 166° 30' and 173° W. Of the three principal islands, or New Zealand proper, North island, or New Ulster, has a length of about 515 miles and a breadth of about 250 miles, with an area estimated at 44,467 sq. miles—about that of Pennsylvania. The South island, or New Munster, officially called Middle island, has a length of about 525 miles and a breadth of 180 miles. Its area is estimated at 58,525 miles. The southernmost island is Stewart island, or New Leinster. It is triangular, about 25 miles by 30, and has an area of 665 sq. miles. Attached to the colony are the Chatham, Auckland, Kermadec, Campbell, Antipodes, and Bounty islands. The last three groups are uninhabited. The Chatham islands lie 300 miles E. of New Zealand, and have an area of 375 sq. miles. The Auckland islands lie 180 miles S. of Stewart island, and have an area of 312 sq. miles. The Kermadec islands lie 660 miles N. N. E. of New Zealand, and have an area of 15 sq. miles. The total area of the colony is estimated at 104,471 sq. miles; it is a little larger than Colorado and a little smaller than Italy. The capital is WELLINGTON (q. v.).

Physical Configuration.—New Zealand lies on a great submarine plateau which in the N. E. joins that of Polynesia, N. W. that of New Guinea and Queensland, and to the S. that of the Antarctic seas. Between the islands and Tasmania lie the great depths called the Thomson Abyss. The coasts of the colony are more than 4,000 miles in length. There are many natural ports, especially on the northern ends of North and Middle islands, and on the east coast of Stewart island. The harbor of Auckland is especially commodious, and approaching within a mile of its waters, and only 2 or 3 miles of the city, is the greater harbor of Manukau, entering from the opposite coast. On the south-west coast of Middle island is a series of narrow fiords which are too deep to afford anchorage. A mountain range begins E. of the center of North island and extends S. W. to the southern angle of Middle island. On North island it is relatively low, not exceeding 6,000 feet. On Middle island it hugs the west coast from the middle southward, and culminates in Mt. Cook, 13,349 feet high (first ascended in 1882). This range is called the Southern Alps. Many of its mountains reach the altitude of perpetual snow, and have glaciers extending down their sides to about 1,000 feet above sea-level. The best known is the Tasman glacier on the southwestern slopes of Mt. Cook. The fiords of the extreme S. W. are surrounded by snow-capped mountains, and are very picturesque. Near the center of North island and to the S. E. of it are several volcanic cones of considerable height—Ruapela (9,100 feet), Egmont (8,300 feet), both now extinct, and Tongariro (6,500) occasionally active. In the northern half of North island mountains are less frequent and lower. The plains lie mostly in the southwestern quarter of North island, and Mt. Egmont is surrounded by extensive and fertile plains. Four-fifths of Middle island is mountainous, but the mountains are to a great extent open, grassy, and adapted to pastoral pursuits, while the backbone of the Southern Alps is crossed by many low passes. The bolder western versant is rich in minerals. The plains adapted to agriculture lie in the western part of this island. The rivers are usually rapid, short, closed by bars at their mouths, and not adapted to navigation. There are two lake regions in the islands; the first is on the eastern slopes of Middle island. These lakes are in the mountains, are long, slender, and picturesque, and two of them (Te Anau and Wakatipu) are of considerable size. The other is in North island, and its largest lake is Taupo, the largest in the islands, with an area of 250 sq. miles. It lies in the center of the island, and is drained by the Waikato river, one of the most important in the colony. From Lake Taupo in a northeasterly direction to the Bay of Plenty lies the area to which the name of Lake District is given, remarkable for its geysers, hot and sulphurous springs, and natural terraces. The terraces are marble-white or tinted, smooth, apparently artificial, but formed by deposits from the water. With

the warm blue water they form natural baths of great beauty, the curative properties of which are well established. At Whakarewarewa, near Lake Rotomua, in the county of the same name, and about 25 miles from the head of the Bay of Plenty, there is a group of eight geysers, of which one throws a column to the height of 30 or 35 feet. The geysers are varied with boiling springs, steam jets, and mud volcanoes. The geyser phenomena appear to be in decadence. Since their discovery many of the finest geysers have ceased action, and new ones are more seldom formed.

Climate.—The islands of New Zealand stretch through fourteen degrees of latitude, and possess a great variety of climate. In general the climate is mild, agreeable, and healthful, especially that of North island, but they are subject to occasional sudden changes of temperature and weather. The mean annual temperatures are about those of Virginia and Delaware near the coast, but the summers are as cool as those of New Brunswick and Nova Scotia. The mean difference between the temperature of the hottest and that of the coldest months is only 14°, or about that of Cuba. The North island is decidedly warmer than Middle island, the former being bathed by a warm ocean current from the N., while the south and west shores of the latter receive a cool current from the S. W., and each island shelters the other from its own current. Snow very seldom descends to sea-level on North island, and only occasionally on Middle island. The perpetual snow line is about 7,500 feet above sea-level, and is reached by Ruapela on North island and by many mountains on Middle island. Ice occasionally forms in winter in all parts of New Zealand. The annual rainfall averages 40 to 50 inches on Middle island and 30 to 40 inches on North island, and is heaviest on the west coast. At Hokitika, on the west coast of Middle island, in lat. 42° 41' S., the average annual rainfall is 102 inches. The prevailing winds are westerly, and gales are frequent.

Geology and Mining.—Volcanic action has played an important part in the geologic history of New Zealand, but has long ceased in Middle island and is visibly diminishing in North island. The surface covered still by volcanic rocks is considerable, and these with the non-fossiliferous crystalline and schistose rocks cover about half of the surface. The series of fossiliferous rocks is quite complete. In the upper part of the Cretaceous-Tertiary occurs a calcareous sandstone called "Damaru" stone, which is ornamental and very valuable as a building-stone, as it is easily worked, but hardens in weathering. Saurian remains of great size have been obtained from the Permian beds of Mt. Potts. Gold was discovered in the islands in 1857, but it was not until 1861 that it attracted general attention, and caused a large influx of miners. Placer-mining is to be found chiefly in Middle island, in the Otago, Westland, and Nelson districts. The easily worked placer-fields are probably now exhausted, but there is still much opportunity for hydraulic mining on a large scale. The principal quartz mines are on the northern end of North island, near Auckland, but several auriferous reefs are worked in the gold-fields of Middle island. In 1892, of the 238,097 oz. raised 237,393 were exported. The value of the total export of gold from the colony to the end of 1892 was £48,387,861. New Zealand stands second of the seven Australasian colonies in the total amount of gold produced, Victoria standing first. Queensland has, however, passed ahead of New Zealand in the annual production. In 1890 the average production of gold per man employed in mining it was, for this colony, nearly £393 in value, far surpassing that for the other colonies. Most of the mining is done on Government land. In the production of coal this colony stands second among the Australasian colonies. Most of the coal-beds are on the west coast of the Middle island, and the chief mines are at Otago, Greymouth, and Westport. The only important coal-measures of the North island are those of Waikato. The total output of coal in New Zealand to the end of 1892 was 7,638,724 tons, valued at £4,105,287, and the annual output is increasing. Lignite exists in large quantities, but is used only locally. Oil shales have been found, but the oil has not proved suitable for illuminating purposes, though good for lubrication. The mineral product of the colony next in importance is kauri gum, and this is peculiar to New Zealand. It is a resinous product of the kauri-tree, but is found in the soil where forests of this tree once existed, or at the base of living trees. It is much used as a base for fine varnishes and for other purposes. In 1892 the production of kauri gum was 8,705 tons, valued at £517,678. The total production of kauri to the end of 1892 was, in value, £6,349,421.

Flora.—New Zealand is remarkably rich in forests; one-third of its surface was covered by them in 1830, but this has been reduced to one-fifth. Some of the larger forests disappeared at the rate of 4 per cent. a year, but before the damage was complete the matter was taken up by the Government, and the principles of forest conservation were put in operation. The New Zealand forests are characterized not only by their extent, but by the relatively large ratio of forest species to the entire flora. The most valuable tree is the kauri, which now grows only on the North island and chiefly in the province of Auckland. It reaches 120 to 160 feet in height, 5 to 12 feet in diameter at the butt, and is unrivaled for spars, for which purpose much is exported. There are a score more of useful species of trees. Three-fourths of the species of the flora are endemic, and the number of species common to Australia and New Zealand is small. The North island has a flora in many respects distinct from the rest of the group, having peculiarities which it shares with the isolated islands lying between it and the groups of Melanesia and Polynesia. Among the valuable plants of the flora is the New Zealand flax or hemp, from which a valuable fiber is obtained. It is a liliaceous plant (*Phormium tenax*), and the leaves, from which the fiber is obtained, are from 3 to 9 feet long and 2 to 3 inches broad. The wild plant is chiefly relied on for the supply. The fiber, though nearly as strong as Manila hemp, is not suitable for ship's cordage, as it does not well stand exposure to alternate wetting and drying.

The fauna of New Zealand has several singular features. There are no indigenous land mammals except two species of small bats. There are no snakes; the few lizards are harmless; one species of frog only, and relatively few species of insects are to be found. Among the birds the most remarkable native species are the wingless and hairy species of apteryx or kiwi, of which there are four kinds, and the gigantic wingless moa. The last has been long extinct, but native tradition represents it as formerly hunted as food. Colonization has introduced many species, as the domesticated animals and birds, game birds, small birds, and rabbits. The last have become a serious pest in many districts.

Agriculture.—New Zealand is the best-adapted of the seven Australasian colonies to agriculture, including the pastoral industries, the climate and soil being both favorable for these pursuits throughout the islands. The average yield of crops per acre is generally higher in this than in the other colonies, but the average value per acre is lower. It is estimated that two-thirds of the land is suitable for cultivation or grazing. Of this about one-fifth is under actual cultivation. About one-half of the land in 1893 was still in the possession of the Government. The rural public lands are either sold on favorable terms or leased. In 1891 there were 43,777 holdings, comprising nearly 20,000,000 acres, of which about one-third was leased, and there were 68,607 persons engaged in agricultural and pastoral pursuits. The wheat produced is generally more than sufficient for home needs, and the average product is from 20 to 25 bush. per acre. Oats are extensively grown and yield 30 bush. per acre, and barley and hay are important crops. Maize is but little grown, likewise tobacco and the vine. Tasmania and New Zealand are the only ones of these colonies producing potatoes for export.

The number of live stock in New Zealand in Apr., 1891, was: Horses, 211,040; horned cattle, 831,831; sheep, 18,227,126; swine, 308,812; poultry, 1,790,070. In 1890 it shipped 896,914 cwt. of fresh and frozen meats, seven or eight times as much as all the other colonies together. The capital employed in the industry of preparing fresh meats for shipment was for that year £1,464,659—more than in any other manufacturing industry. The colony also takes the lead in dairy products, and in amount exported far surpasses all the other colonies. In the number of swine it is similarly pre-eminent, and exports a considerable quantity of pork to the other colonies.

Population.—The aborigines are of a Polynesian race called Maori, are fine looking, though short and rather squat. In 1878 the number returned was 43,595 and in 1891 43,642, of whom 2,119 were half-castes. There are about 20 per cent. more males than females among them. See MAORIS.

Aside from the Maoris, the total population in 1891 was 624,658, of whom 97 per cent. were British subjects and more than one-half were born in New Zealand. The alien population numbered 14,594, of whom 4,444 were Chinese. In 1896 the total population was 743,214, of whom 39,854 were Maoris. In 1892 there were 4,002 marriages, 17,876

births (of which 593 were illegitimate), and 6,459 deaths, giving a surplus of 11,417 births over deaths. The death-rate was 10.06 per 1,000. In the same year there arrived 18,122 immigrants and 13,164 emigrants departed, but in the five years 1888-92 inclusive there had been nearly 9,000 more emigrants than immigrants. There is no state aid to religion, except in a few cases of endowments obtained at the time of settlement. Over 40 per cent. of the population are adherents of the Church of England, 23 per cent. Presbyterian, 13 per cent. Roman Catholic, and 10 per cent. Methodist.

The chief towns (with population Apr., 1896) are: Wellington (the capital), 41,758 (with suburbs); Auckland (with suburbs), 57,616; Christchurch (with suburbs), 51,330; Dunedin (with suburbs), 47,280; Invercargill, 9,996; Napier, 9,231; Nelson, 6,659; and Oamaru, 5,225.

Commerce.—On Mar. 31, 1897, there were 2,181 miles of railway open to traffic, of which 167 miles were of private ownership, the remainder public. The telegraph system is entirely in the hands of the Government. On Dec. 31, 1896, the colony had 6,245 miles of line, comprising 15,764 miles of wire. The telephone is also in the hands of the Government, and there are 3,160 miles of wire laid, serving 3,811 subscribers. In 1893 the registered vessels of the colony numbered 493, with a combined tonnage of 74,581; 314 were sailing vessels, 179 steamers. In 1895 611 vessels entered and 597 cleared from the ports of the colony. About two-thirds of these vessels were colonial, less than one-third British. Auckland is the most important port, after which come Wellington, Lyttelton, Dunedin, and Bluff Harbor. Nearly all imports are taxed, and on luxuries, such as spirits, wine, and tobacco, the duty is high. The total imports in 1895 were valued at £6,400,129, and the exports at £8,550,224. The chief imports in order of importance were clothing and cloths; iron and steel goods; sugar, paper, books, and stationery; spirits, wine, and beer; and specie. Among the exports the wool equaled in value nearly all the others put together. Next in order was frozen meat, then gold; grain, pulse, and flour; kauri gum; hides, skins, and leather; and butter and cheese. Two-thirds of the imports and exports are with the United Kingdom, but only 5 or 6 per cent. with the U. S.

In 1892 there were 6 banks of issue in the colony, of which 3 were wholly New Zealand institutions. The value of the notes of these banks in circulation was £959,943. The average deposits in these banks were £13,587,335, and in the private savings-banks £3,580,544.

Administration.—The executive power is in the hands of the governor, appointed by the crown, with a salary of £5,000. He has the power of proroguing Parliament and vetoing legislation. The Parliament, here called the General Assembly, consists of the Legislative Council and the House of Representatives. The members of the first are appointed. Those in office before Sept. 17, 1891, are life members; those subsequently hold for seven years. They number 44 in 1897, and are paid £150 per annum. The members of the House number 74, including 4 Maoris, are elected for three years, and receive £240 per year. Electors may be male or female, must be twenty-one years of age, and have a freehold estate of £25 value. For Maori representation any adult native may vote in the 4 exclusively Maori districts.

Primary education is in public schools, and is compulsory between the ages of seven and thirteen in districts to be decided on by the education department. The University of New Zealand is solely an examining body granting degrees under a royal charter. With it are 3 affiliated colleges, viz., the Otago University, at Dunedin, the Canterbury College, at Christchurch, and the Auckland University College, with a total of 39 instructors and 695 students.

The total revenue in 1895-96 was £4,610,403, of which over one-quarter came from the railways and less than one-sixth from direct taxation. The amount of expenditure was £4,403,749, excluding the charges of the sinking fund met by debentures. The total expenditures for public works from 1870 to Mar. 31, 1893, was £27,736,153, including discount and charges for raising loans. The net public debt in 1892 was £38,154,962, making £58 13s. 3d. per head of population. The debt is slowly increasing. The outstanding loans of local governing bodies amounted to £6,081,934.

History.—New Zealand was discovered in 1642 by Tasman, who did not land on it. Cook visited the islands several times from 1769 to 1777, circumnavigated them, explored and surveyed their shores in part, and introduced several domesticated animals and plants. The country was little visited, however, because of the bad reputation of the

natives. In 1814 Rev. Samuel Marsden established a mission at the Bay of Islands, on the east coast of North island, 80 miles S. E. of North Cape. He was followed by many others, and within a generation the whole population had become nominal Christians. In 1839 the New Zealand Land Company dispatched a preliminary expedition to treat with the natives for the purchase of land. By the treaty of Waitangi in 1840 many of the native chiefs ceded the sovereignty to Great Britain, and in the same year five shiploads of immigrants arrived. Disturbances with the natives occurred from time to time afterward. The most serious was in 1863-64, when the colonial forces had to be supported by several British regiments and ships of war. Final and complete surrender of the natives occurred in 1875. In 1852 a royal act conferred constitutional government on the colony. The colony was divided into 6, afterward 9, provinces, each with its governing council. In 1875 this was abolished and the present system established. Since 1893 women may vote, but are not eligible as Representatives or in the Legislative Council.

REFERENCES.—The official publications of periodical character are numerous and full. Those of Sir James Hector are especially valuable for the geology and climate. See also Hochstetter, *New Zealand, its Physical Geography, Geology, and Natural History* (2 vols., 1868); Griffin, *New Zealand, her Commerce and Resources* (1884); Rusden, *History of New Zealand* (1885); Gudgeon, *History and Doings of the Maoris* (1885); Grey, *Polynesian Mythology and Maori Legends* (1885); Larnach, *Handbook of New Zealand Mines* (1887); Wakefield, *New Zealand after Fifty Years* (1889); Coghlan, *A Statistical Account of the Seven Colonies of Australasia* (1893).

MARK W. HARRINGTON.

New Zealand Flax: See FIBER.

Ney, MICHEL: Duke of Elchingen, Prince of Moskva, marshal and peer of France; b. at Saarlouis, Jan. 10, 1769; entered the French army in 1788; was made a brigadier-general in 1797 after the battle of Neuwied, general of division in 1799, after he had greatly distinguished himself by the capture of Mannheim and in Masséna's campaign, and marshal in 1804. He commanded in the Austrian, Prussian, and Spanish campaigns, and distinguished himself at Elchingen, Jena, Eylau, and Friedland. He was ordered to Spain in 1808, and was successful in maintaining French rule over Galicia, but in 1810, while under the command of Masséna, with whom he constantly quarreled, he met with some reverses in Portugal, especially during the retreat from Torres Vedras. His greatest exploits were the battle of Borodino while the grand army crossed the Moskva, his command of the rear guard during the retreat from Moscow, and his exertions in order to organize a new army. After the abdication of Napoleon he submitted to the Bourbons, and was well received by Louis XVIII. When Napoleon returned from Elba, Ney repaired to Paris, assured the king of his fidelity, and received the command of a corps of 4,000 men, with which he marched against the emperor, purposing to capture him and carry him to Paris; but when he saw the enthusiasm with which Napoleon was received everywhere he yielded to the demands of his soldiers and went over to the side of the emperor. In the Waterloo campaign Ney fought the battle of Quatre Bras against the British on the same day that Napoleon defeated the Prussians at Ligny, and at Waterloo he commanded the center with great bravery. After the second restoration he was captured, arraigned for high treason, and placed first before a court martial, which declared itself incompetent, and then before the Chamber of Peers, which by a large majority condemned him to death. He was shot Dec. 7, 1815, in the garden of the Luxembourg, where a monument now stands in his honor. See *Histoire complète du Procès du Maréchal Ney* (2 vols., 1815); Nouval, *Vie du Maréchal Ney* (1833); and Verronais, *Vie militaire de Michel Ney* (1853).

Nez Percé Indians; See SHAHAPTIAN INDIANS.

Ngornu, or Angornu: city of Bornu, Central Sudan; on the southwest shores of Lake Chad; 18 miles S. S. E. of Kuka. The great fluctuations of the level of the lake sometimes cause the flooding of the city, and sometimes leave a broad level plain between it and open water. The place is an important trade center, and its importance and population are periodically increased during the markets, when a large traffic is carried on in cotton, amber, metals, corals, and slaves. It is flimsily built, has been moved back farther from the lake shore than its early situation, and is subject to attacks from the predatory tribes which occupy the

islands of the lake. Its population is variously estimated at from 20,000 to 50,000.

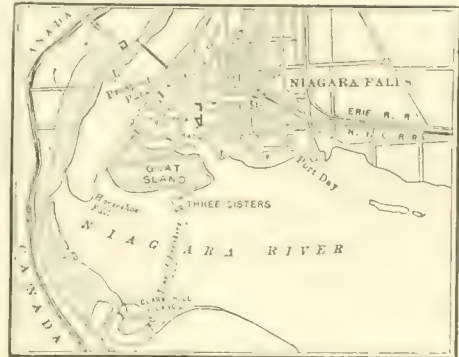
MARK W. HARRINGTON.

Niagara [from an Iroquois Indian word meaning thunder of water]: a river of North America, forming the boundary between the State of New York and the province of Ontario, Canada, and connecting Lake Erie with Lake Ontario. It is 33 miles long, and has a total fall of 326 feet. It is navigable in its upper course from its issue from Lake Erie to the beginning of the rapids at Niagara Falls, a distance of 16 miles, during which its fall is less than 20 feet; and in its lower course from Lewiston to Lake Ontario, a distance of about 7 miles, during which its fall is only 2 feet. Along its middle course, which contains the celebrated Niagara Falls and is crossed by two suspension bridges, on the Canadian side is the Welland Canal, through which the navigation interrupted by the rapids and falls of the middle course of the river is carried on. In its upper course it forms many islands, and its average depth is 25 feet. In its lower course, from Lewiston to its mouth in Lake Ontario, its depth varies from 100 to 150 feet.

Niagara Falls: cataracts of the Niagara river, discovered by Father Hennepin in 1678, and remarkable for volume of water rather than for height. The general features of the region about the falls looking S. W. are shown in the accompanying cut. Up stream (S.) from the falls the river flows smoothly in a broad channel, little depressed below the general surface of the limestone upland of Western New York. About a mile above the falls the river begins a descent of 50 feet in the upper rapids. At the falls it plunges 160 feet into a narrow gorge about 7 miles long, 200 to 350 feet deep, 800 to 1,500 wide at the top, and generally

forms from the spray beneath the falls, and the walls of the gorge and the trees near the falls are encased in ice.

In order to restore as nearly as possible the natural conditions of the falls, which had been seriously defaced by private owners, and in order to save visitors from annoyance and imposition, which had become extreme, the land on either side of the falls has been converted into public parks. The New York State reservation, containing nearly 107 acres (cost, \$1,433,429.50), was opened July 15, 1885; the Queen Victoria Niagara Falls Park on the Canadian side, embracing 154 acres (cost, \$436,813.24), was opened May 24,



Niagara Falls reservations.



Niagara Falls, from the U. S. side.

250 to 500 wide at the water-line. Except for the upper 2 miles, the river pursues a tumultuous course in swift rapids, with a descent of 100 feet, emerging from the gorge at the northern cliffed margin or escarpment of the upland between Lewiston, N. Y., and Queenston, Ontario. The volume of water passing the falls is 280,000 cubic feet per second (U. S. Lake Survey).

The river is divided by Goat island just above the gorge, thus making two falls: the Canadian or Horseshoe fall on the W., the "American" fall on the E. The former has a strongly incurved brink measuring 3,010 feet around the curved crest line, or 1,230 feet across the chord. The face of Goat island, separating the two falls, is 1,310 feet. The American fall, with slight incurvature, measures 1,060 feet from side to side. For 2 miles down the gorge, between the Canadian fall and the lower rapids, the waters flow with relatively smooth surface through a great pool 1,450 feet in greatest width and 189 feet in depth just above the upper suspension bridge, the exceptional depth being attributed to the pounding action of the water beneath the fall. Great blocks or tables of rock sometimes fall from the limestone cliff that incloses the gorge. In 1818 a block fell on the U. S. side; in 1828, 1855, and 1887 blocks fell from the Canadian side, one of these being the formerly well-known Table Rock. In winter-time a great mound of ice

1888. The gorge is spanned by three bridges, for which see NIAGARA FALLS (the city) and BRIDGES. The finest general views of the falls are to be had from the middle of the upper suspension bridge, and from the high terrace N. of the Horseshoe falls on the Canadian side. An electric railway follows the brink of the gorge from the falls to the escarpment above Queenston. The Cave of the Winds, a hollow behind the falling waters, is entered by many visitors. Engineering enterprise has constructed a tunnel from the bottom of the gorge just below the "American" fall, running back under the city of Niagara Falls for 7,000 feet. See TUNNELS and TUNNELING.

The geological history of Niagara is of great interest, because of the association of the age of the falls with one of the closing stages of the glacial period. The origin of the limestone upland in which the gorge is cut must be first considered. It consists of relatively resistant strata, 80 to 100 feet thick and dipping gently to the S., of heavy Niagara (Silurian) limestone. The surface of the limestone has been revealed by the gradual stripping off of overlying weaker rocks, and its former northward extension has been much reduced by the erosion of its margin. The retreat of the margin has been accelerated by the undermining of the weaker strata—Niagara, Clinton, and Medina shales and sandstones—beneath it; hence the upland is now terminated by a north-facing bluff or escarpment about 250 feet above the lowland plain that stretches northward from its base, and nearly 40 feet above the present level of Lake Erie.

After the present form of the upland had been essentially produced by the slow weathering of ages, the region was glaciated, the entire surface being buried under a heavy ice-sheet. It is commonly believed that the basin of Lake Erie in weaker rocks S. of the Niagara limestone upland and that of Lake Ontario in weaker rocks N. of the escarpment were in greater part excavated by ice action; but it is difficult to measure the results of this process, and to define how far other processes, such as the warping or obstruction of broad preglacial valleys, may have had to do with forming the basins. Be this as it may, it is known that when the ice-sheet evacuated the region the lakes occupied the basins, much as we now see them; and that wherever the former rivers of the region ran, the post-glacial discharge of Lake Erie took the course of the Niagara river across the plateau and fell over the escarpment on its way to Ontario; thus the cataract was formed at the face of the cliffs. Since then, the strong wearing of the river has caused the recession of the falls at a much more rapid rate than the general retreat of the cliff face under the weak attack of the weather; thus the narrow gorge has been formed, and the falls now stand about 7 miles back from their original position. Their recession continues, and eventually the gorge will be cut back to Lake Erie.

The gorge makes a peculiar bend at the whirlpool, which calls for special explanation. It is believed that at this point the receding falls, which were then working back to the S. W., came upon the drift-filled valley of a small pre-existing stream, which once carried the drainage of a small area of the upland out to the lowland on the N. The further recession of the falls proceeded southward, up the buried valley, from which the drift-filling was rapidly washed out; hence the abrupt angle at the middle of the gorge. The impetus of the river has excavated a basin northwestward from the angle, in line with the old drift-filled valley, but to a greater depth; and here the waters whirl around before escaping into the lower part of the gorge.

The time required for the recession of the falls has been the subject of much study. The falls have been carefully surveyed on four occasions. First in 1842 under James Hall, of the Natural History Survey of New York; in 1875 by the U. S. Lake Survey; in 1886 by R. S. Woodward, of the U. S. Geological Survey; and in 1890 by A. S. Kibbe, of the New York State Engineers. The fall on the U. S. side shows moderate change, its average annual recession in forty-eight years being half a foot. Between 1842 and 1890 the Canadian fall receded 150 to 230 feet along a distance of 900 feet on the western half of its front, and 270 feet at the apex of its curve. This gives an average recession near the middle of from 4 to 6 feet a year; and if this rate had been constant, only about 7,000 years would have been required for the erosion of the gorge.

There is indication, however, that the recession of the falls has not always been at so rapid a rate, and that its age is greater than 7,000 years. The volume of water, the most important factor in determining the rate of retreat, has probably varied greatly, for studies of the shore-lines of the Great Lakes make it clear that their basins have been gently uplifted on the N. since the ice-sheet withdrew, causing changes in their lines of discharge. Before the uplift, it is quite possible, even probable, that Lake Huron drained across the Province of Ontario directly to the lake of that name; in that event, Niagara river must have had but a small fraction of its present volume, and the recession of the falls must have been slow. The great depth of water in the pool below the falls seems to indicate a decided increase in the volume of water about the time that the falls had receded to a point somewhat above the cantilever bridge. The height of the falls has decreased during the retreat, for the limestone cap of the upland descends gently southward, while the rapids below the falls ascend southward; and this loss of height must have had some effect on the rate of recession. It is probable that after the arrival at the drift-filled valley by which the whirlpool is explained there was an increased rate of recession for a time. These and other factors on which the retreat of the falls depends are at present so uncertain that no definite statement can be made as to the time since the river first leaped over the escarpment. The age of the falls is of importance because it gives means of dating a closing stage of the glacial period. It is pretty well ascertained that during the earlier stages of the northward recession of the continental ice-sheet the St. Lawrence valley was obstructed by ice, and the waters of Erie and Ontario were united in a great lake, whose waters ran out to the S. W. by the Wabash river, across Ohio and Indiana to the Ohio river. At a later stage of ice retreat, an outlet was opened eastward down the Mohawk; then the eastern waters fell to a lower level than the edge of the Niagara plateau, separating the two lakes, Ontario occupying the lower basin N. of the escarpment, while Erie lay in the higher basin S. of the escarpment and drained northward over its rim.

An account of the geology of the Niagara gorge is given in the *Natural History of New York*, Geology of the Fourth District, by James Hall (1842); a history of the river, by G. K. Gilbert, is given in the Sixth Annual Report Com. Miss. New York State reservation at Niagara (1890). An account of the various surveys of the falls with maps and measurements is presented by A. S. Kibbe, in the Seventh Annual Report (1891). A popular account of Niagara is given in *The Niagara Book*, by various authors.

W. M. DAVIS.

Niagara Falls: city (formed by the consolidation of the villages of Niagara Falls and Suspension Bridge, incorporated in 1892); Niagara co., N. Y. (for location, see map of New York, ref. 4-C); on the Niagara river, and the Erie, the

Lehigh Valley, the Mich. Cent., and the N. Y. Cent. and Hudson River railways; 13 miles S. of Lake Ontario, 20 miles N. of Buffalo. The river is here crossed by three remarkable bridges, viz., the upper suspension, built of steel, a foot and carriage bridge, about 300 feet below the falls on the U. S. side, 821 feet span and 260 feet above the water, built to replace one destroyed in the winter of 1889; the cantilever, 910 feet in length, a short distance up stream from the Whirlpool Rapids, built in 1883, the first bridge of its kind constructed in the U. S.; and the railway suspension, 300 feet N. of the cantilever, built of steel, with a carriage-way 28 feet below the track. (See BRIDGES.) For ages the enormous power of the river was allowed to go to waste, though many projects were conceived to utilize it. The first practical step and triumph of engineering skill was the construction of a hydraulic canal, extending from a point above the falls, through the center of the city to the gorge. From this a 5,000 horse-power was obtained. Since then a great tunnel has been completed at a cost of about \$4,000,000, for the purpose of securing a vastly increased water-power for manufacturing purposes. (See TUNNELS AND TUNNELING.) The land and islands surrounding the "American" falls (that is, the falls on the U. S. side) have been appropriated for a State reservation, and the land on the Canadian side of the river now constitutes a similar reservation. From the lands within the New York State reservation the greater part of the scenery for which the locality is famous is visible. (For description of the falls and reservations, see NIAGARA FALLS.) The city contains 10 churches, Niagara University (Roman Catholic, organized 1856, chartered 1883), De Veaux College (Protestant Episcopal, chartered 1853), a national bank with capital of \$100,000, 3 State banks with combined capital of \$200,000, and 2 daily, a semi-weekly, and 2 weekly newspapers. It has numerous hotels and boarding-houses. The industries include the manufacture of paper, pulp, flour, silver-plated ware, paper-coating, and machinery. The assessed valuation of the city in 1893 was \$9,704,165, and the total debt in 1894 was \$512,000. Pop. of village (1880) 3,320; (1890) 5,502; of city (1892), State census, 12,638. EDITOR OF "GAZETTE."

Niagara Falls: another name for CLIFTON (*q. v.*), a town of Ontario, Canada.

Niagara Group: an American geological formation representing part of the Upper Silurian period; so named by the Geological Survey of New York on account of its typical development along Niagara river. It is exposed throughout the breadth of New York a short distance S. of Lake Ontario, and has a thickness of 300 feet, consisting of shale below and limestone above. At Niagara Falls there are 80 feet of shale overlaid by 85 feet of limestone. In Ohio, Michigan, and other Western States, the shale becomes thin, but the limestone increases to 600 or 800 feet. It occurs also in New Brunswick, Newfoundland, etc., where it is thicker than in New York. The limestone is largely used for building purposes, especially for abutments of bridges, etc. The deposit is marine, and in many places abounds in fossils; some of the earliest land-plants, consisting of the trunks of trees which drifted far from shore, are found in it.

ISRAEL C. RUSSELL.

Niare, Zamouse, or Bush-cow [*niare* and *zamouse* are from native names]: a wild ox (*Bubalus pumilus*) found in Western and Western Equatorial Africa. It has no dewlap, has sharp, crooked, and short horns, large and finely fringed ears, and a fierce disposition. It is of a rather small size; it is sometimes trained for the saddle, and may be taught to obey the bit as well as horses; but its pace is only 4 or 5 miles an hour.

F. A. L.

Nias': an island of the Malay Archipelago, a short distance to the W. of Sumatra, near the equator. It is 70 miles long, with an average breadth of 16 miles; is mountainous, and is surrounded with coral reefs, but is fertile, producing rice, sugar, and large quantities of pepper. The inhabitants are estimated at from 200,000 to 250,000. They are closely allied in appearance and language to the Battas, an independent and warlike race in Sumatra. Nias is especially remarkable for the persistency with which the slave-trade has continued there. It is due to intertribal wars. Modigliani's *Un viaggio a Nias* (1890) is an excellent monograph on the island. Revised by M. W. HARRINGTON.

Nibelungenlied, nee 'be-loong-en-leet': the greatest popular epic of the Middle High German period. It was composed by an anonymous poet at the close of the twelfth cen-

ture. The poem is divided into cantos, called adventures, the number of which varies in the different manuscripts. We can further distinguish in the epic two great parts, in the first of which the scene is laid on the Rhine, with Worms as the center, while the chief events of the second part take place on the lower Danube, at the residence of Attila, King of the Huns. The principal hero of the first part is Siegfried, Prince of the Netherlands, who assists Gunther, the King of the Burgundians, in obtaining the hand of Brunhilde, or Brynhild, the powerful Queen of Iceland, and who is rewarded with Kriemhilde, the beautiful sister of Gunther. The envy and jealousy of Brunhilde cause a quarrel between her and Kriemhilde, and finally lead to the murder of Siegfried by Hagen, the faithful vassal of Gunther and deadly enemy of Siegfried. The central figure of the second part is Kriemhilde, who, after the death of Siegfried, thinks of nothing but of avenging herself on the murderers of her husband. For this purpose she marries Attila, and invites Gunther, who had consented to the murder of Siegfried, to visit her with his Burgundians at Attila's residence. Contrary to the advice of Hagen, Gunther and his brothers, Gernot and Gieselher, accept Kriemhilde's invitation. They march to the Danube, and finally arrive at Attila's court, where, after a long and dreadful struggle, all are killed, including Kriemhilde. Only Attila, his friend Dietrich von Bern, and the latter's faithful companion Hildebrand, survive to lament the fearful catastrophe.

The subject-matter of the poem is based upon the German hero-legends which originated in the times of the migration of the tribes, and which formed the favored contents of many single hero-songs previous to their final combination into one great epic. The account in the *Nibelungenlied* of the annihilation of the Burgundians by the Huns has preserved the reminiscence of the historical fact that Attila, in 437, defeated the Burgundians under Gundahar (Gunther), whose capital was Worms. The name of Kriemhilde may also be historical, if the report of Jordanis is correct, according to which (cap. 49) Attila died by the side of a girl named Ildico, which name is the diminutive of Hilde. In Dietrich von Bern we have the famous Theodoric the Great (475-526) of history, who is the most prominent figure in the German hero-legend. Though he reigned long after the death of Attila (453), the legend nevertheless has him appear as a fugitive at Attila's court, thus illustrating the free manner in which the legend treats historical truth.

Concerning Siegfried and his relations to Kriemhilde and Brunhilde there are no historical accounts, unless we accept the views of some recent investigators who see in him the historical Arminius. Owing to the fact that in the *Nibelungenlied* Siegfried and Brunhilde present certain features of character (their extraordinary physical strength, Brunhilde's strange aversion to marriage, etc.) which are seemingly supernatural, a number of scholars hold the view that both are of mythological origin. This opinion derives its main support from the Old Norse version of the Siegfried legend in the *Eddas*, according to which Siegfried and Brunhilde seem to belong to the family of Germanic gods and demigods. Outside of the Norse versions no trace of such divine origin for them has, however, been found in Germanic mythology, and there is, moreover, not the slightest reason offered to explain the strange fact of this old Germanic myth of Siegfried and Brunhilde combining with the historic legend of the Burgundians. All the mythological speculations concerning the divine pre-existence of Siegfried and Brunhilde must therefore be dismissed as more or less clever conjectures. It is far more probable that the Siegfried legend, like the legend of the Burgundians, preserved the reminiscence of the tragic fate of some national hero, who presumably lived before the migration of the tribes, in an age which was accustomed to adorn its heroes with superhuman attributes.

Both legends, that of Siegfried as well as that of the Burgundians, originated among the Franconians, whence they migrated to the North and to other German tribes. We can distinguish two such migrations of the legends to the North, one which probably took place as early as the sixth century and a second one during the thirteenth century, the account of which is embodied in the *Thidreksaga*. Lachmann believed that the *Nibelungenlied* in the form handed down to us was not written by a single poet, but was a conglomeration of old hero-songs. While the existence of such songs must be admitted at least for the beginning of the twelfth century, it is quite obvious that the skillful plan and artistic unity of the poem could not be attained by a

mere compiler, but must be ascribed to the conscious work of a single poet. Who this great poet was we do not know, and all the guessing as to his identity and home has proved fruitless.

That the *Nibelungenlied* was a very popular epic can be seen from the number of manuscripts still extant. Among these (ten complete manuscripts and eighteen fragments) the most important are the three which date back to the thirteenth century, and which, since Lachmann, are usually quoted as A, B, C. As to their respective age and authenticity, Lachmann, the editor of MS. A, held that this, the most imperfect of the three, was the original, while Holtzmann, and especially Zarncke, attempted to prove the greater antiquity of MS. C, of which Zarncke made an excellent edition. This difference of opinion was mainly due to opposing views concerning the origin of the poem, and it resulted in a long and bitter fight between the leaders and followers of both schools, known as the famous *Nibelungenstreit*. The view now held by most scholars is that of Karl Bartsch, who showed in his *Untersuchungen über das Nibelungenlied* that none of the three MSS. represents the original, that the latter is lost, and that MS. B, which was edited by Bartsch, preserved the original more faithfully than the others.

For several centuries the *Nibelungenlied* was entirely forgotten, until Bodmer, in 1757, called attention to it by editing parts of the epic. His efforts created, however, little interest among his contemporaries. Frederick the Great, for instance, treating with contempt all attempts to revive mediæval German literature. A change in the critical estimation and understanding of the poem was brought about by the Romanticists and by the rise of national feeling during the wars with Napoleon I. Then the poem was interpreted and studied at several universities, and in 1815 Zeune published an edition of the epic for the young men who were to carry it with them to the battle-fields. Since then the *Nibelungenlied* has constantly increased in popularity. The greatest philologists of the nineteenth century, like the Grimms, Lachmann, Müllenhoff, Zarncke, Bartsch, and Scherer, devoted themselves to its elucidation, and numerous translations carried the knowledge of it into the widest circles. While in former periods the poem had to suffer from unjust comparisons with Homer, it is now universally considered the greatest national epic of the Germans, in which the wild passions and valorous deeds of a heroic age and the most tender and sacred emotions of the human breast find their artistic expression. For although the characters of the epic appear in the knightly guise of the twelfth century, we can still notice that the principal heroes really belong to a more primitive period. With marvelous skill the author has depicted his times as well as those of the older heroic age, carefully preserving the epic style despite the lyrical character of the strophe which he employs, and thus creating a work of poetry rich in colors, full of dramatic life and of the deepest ethical sentiments—a picture of the Germanic character and mind in their period of youth.

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Nicander of Colophon: Greek didactic poet of the third century B. C. He was the author of a lost epic poem.

'Επεριοίμενα, in five books, which suggested Ovid's *Metamorphoses*. We still have a poem, *Θηριακά* (Remedies against the Bites of Venomous Animals) and 'Αλεξιφάρμακα (Remedies against Poisons), in which the author has sought to enliven the ungrateful theme by digressions and descriptions. There are editions by J. J. G. Schneider (1816) and by O. Schneider (1856).
B. L. G.

Nicaragua: a republic of Central America, between Honduras on the N. W. and Costa Rica on the S., extending from the Caribbean Sea to the Pacific. Area about 40,000 sq. miles. The general outline is nearly an isosceles triangle; one side forms the Caribbean coast, which runs from N. to S. about 300 miles; the Pacific coast trends from S. E. to N. W. and terminates in the Bay of Fonseca, which separates Nicaragua from Salvador. The main mountain axis enters the country from Honduras, passes across it in a southeasterly direction, and terminates at the San Juan river; it is nearly parallel with the Pacific coast and about 90 miles distant from it. Eastward from this range the country falls to low and often swampy lands along the Caribbean coast. Near the Pacific coast, and roughly parallel to it and to the central range, there is an irregular line of volcanic peaks. Nearly all the active and quiescent volcanoes of Nicaragua are in this line, and some of them rise to more than 6,000 feet. Between the volcanoes and the central range is the lake valley, 300 miles long, the most striking natural feature of Nicaragua, and one which has largely determined its history. In it are the two beautiful lakes Managua and Nicaragua, respectively 134 and 110 feet above sea-level in the dry season, and connected by a short river, the Panaloya or Tipitapa; from the southeastern end of Lake Nicaragua the waters are discharged through the San Juan river, 108 miles long, to the Caribbean Sea. Though the outlet is to the Atlantic side, the lake valley is properly on the Pacific slope. The line of volcanic mountains is not continuous; on the contrary, its peaks are scattered, some of them near the coast and some bordering the lakes; indeed, several of them are on islands in Lake Nicaragua. Between these volcanic cones the divide between the lakes and the Pacific is merely a line of low hills, and in some places even these are wanting. Lake Managua is 32 miles long by 16 wide, and deep enough everywhere for the small steamers which ply on it. The Momotombo volcano, on its northern side, is one of the highest peaks in the country (6,255 feet), and the shores everywhere are remarkable for their picturesque beauty. Northwest from the lake the plain of Leon stretches to the Pacific, and is now crossed by a railway. The Tipitapa river, between the two lakes, has little water in the dry season, and is never navigable for large vessels. Lake Nicaragua is 92 miles long by 34 wide, and from 12 to 83 feet deep; its three largest islands, Ometepe, Zapadero, and Solentiname, are simply mountains rising from the water, and the first is a more or less active volcano. At one point the lake is separated from the Pacific by a neck hardly 12 miles wide, and without high hills; here it is proposed to make the Pacific section of an interoceanic ship-canal, on a line 17½ miles long. See SHIP-CANALS.

The total population of the republic by the census of 1890 was only 360,000; of these, 198,000 were classed as Indians (generally civilized peasantry) and 144,000 as mixed races. Much the greater part of this population is gathered about the lakes and in the space between them and the Pacific. All the northeastern part is very thinly inhabited, mainly by semi-civilized or wild Indians, and portions of it are covered with heavy forests. On the eastern coast is the Mosquito Reserve or MOSQUITIA (*q. v.*), where, as yet, the Nicaraguan Government has only a nominal authority. The eastern and northeastern regions have several good-sized rivers, flowing through fertile valleys; only the low coast lands are unhealthful. The only important industries of Nicaragua are agriculture (especially coffee-growing), grazing, the collection of rubber and dye-woods in the forests, and gold-mining; the annual product of the gold mines (nearly all in the northern districts) does not exceed 23,000 oz. The annual exports now (1894) average in value about \$4,000,000, the principal items being coffee, rubber, dye-woods, hides, gold bullion, and fruits (from the Mosquito Coast). Of the total exports, about one-fourth are to the U. S. The imports considerably exceed the exports, about one-fifth coming from the U. S. There are 122 miles of Government railways connecting the lakes with the Pacific coast at Corinto; about 1,600 miles of telegraph lines are

also operated by the Government. The common language is Spanish, but some of the Indians still speak their own dialects. The government is a centralized republic; the executive is a president, chosen for four years, and not eligible for re-election for the succeeding term; congress consists of a senate (two senators from each of the twelve departments) and a chamber of deputies (one for every 20,000 inhabitants). All male adult citizens are electors. The Roman Catholic is recognized as the state religion, but other cults are tolerated. The national debt in 1891 was \$3,037,536, about two-thirds of which was in foreign bonds, payable in 1919, with interest at 6 per cent. The revenue for 1891 was \$2,847,729, and the expenses for the same year amounted to \$2,968,961. Interest on the debt is regularly paid. The coast of Nicaragua was discovered by Columbus in 1502, and the country was first explored by Gil Gonzalez Davila, who reached the lake region from the Pacific side in 1523; he found a large Indian population. Granada (the original capital) and other towns were founded by Francisco Hernandez de Córdoba in 1524-25. Not long after Nicaragua was made a province of Guatemala, and it continued so until the Central American countries became independent of Spain in 1821. From 1823 to 1839 it was a state of the Central American confederation. During this period, and after it assumed the position of an independent state, there were frequent civil wars, culminating in 1856 in the subjection of the country to the filibuster William Walker, who, however, was expelled in Apr., 1857. With the new constitution of 1858 and the presidency of Tomás Martínez began a period of peace and comparative prosperity, occasionally broken by short wars with some of the other Central American countries. In 1893 there was a civil war, resulting in the election of Gen. José Santos Zelaya. In 1895 Nicaragua united with Honduras and Salvador to form the "Greater Republic of Central America." (See HONDURAS.) Since 1857 the capital has been Managua.

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HERBERT H. SMITH.

Nicaragua (town): See RIVAS.

Nicaragua, Lake: See NICARAGUA.

Nicaragua Ship-canal: See SHIP-CANALS.

Niccolini, GIOVANNI BATTISTA: poet; b. at S. Giuliano, near Pisa, Italy, Oct 31, 1782. He studied first at Florence, then philosophy and jurisprudence at Pisa, but later turned to classical literature. In Florence he made the acquaintance of the already famous Ugo Foscolo, who conceived a deep affection for him and greatly influenced his literary ideals. Indeed, he is supposed by some to have made him the Lorenzo of the *Ultime lettere di Jacopo Ortis*. Niccolini's first poetical success was a poem (*La Pietà*) on the plague in Leghorn (1804). In 1807 Élise Bonaparte, then Queen of Etruria, made him professor of history and mythology in Florence, where his lectures made a sensation. After the Restoration he was for a time librarian of the grand ducal palace, but the sneers of the courtiers drove him back to his earlier employment. In the meantime he had begun to write plays. His first piece, *Polissena* (1810), was later crowned by the Accademia della Crusca (1818). This was followed by the less important *Medea*, *Edipo*, *Ino e Temisto*, and by versions of the *Seven against Thebes* and *Agamemnon* of Æschylus. In 1815 his first drama, employing modern material and showing an approach to the romantic manner, *Matilda* (in imitation of the *Douglas* of the English John Home), had but moderate success. In *Nabucco* (printed anonymously in London, 1819) he entered upon the drama of political tendencies, slightly veiling under Assyrian names figures of the Napoleonic era (Nabucco = Napoleon; Mitrane = Pius VII.; Arsace = Carnot). Ceasing now for a time to write plays, he took part vigorously in the struggle for literary reform then raging. In 1827, however, he produced a new drama, *Antonio Foscarini*, intended to show a way of reconciliation between romanticism and classicism, but also full of political intentions. A violent controversy at once followed the representation of this. In *Giovanni da Procida* (1830) he uttered his first unmistakable revolutionary cry, a protest against foreign domination in Italy. *Lodovico Sforza detto il Moro* (1833) was unimportant, as was also *Rosmunda d'Inghilterra* (1837); but *Arnaldo da Brescia*, a dramatic poem (secretly printed at Marseilles, 1843), was a political event of the first importance, by reason of the vehemence of its

criticism of the Guelph ideas then dominant in Italy. His later plays, *Filippo Strozzi*, *Beatrice Cenci* (in imitation of Shelley), and *Maria ed i Cambri* (a national lyric drama), are less interesting. Niccolini was critic as well as poet, and we have from him several interesting treatises: *Del sublime e di Michelangelo* (1825); *Dell'imitazione nell'arte drammatica* (1828); *Sull'romanzo storico* (1837); and, above all, *Discorso sulla tragedia greca* (1844). He died at Florence, Sept. 20, 1861, leaving in manuscript a *Storia della casa di Hohenstaufen*. The first collected edition of his works was in three volumes (Florence, 1831; 4th ed. 1858). This has now been superseded by Prof. Corrado Gargioli's complete edition in ten volumes (Milan, 1862, seq.). See also Vannucci, *Ricordi della vita delle opere di Giovanni Battista Niccolini* (2 vols., Florence, 1866). A. R. MARSII.

Niccolo da Pisa, nĕc-kō-lō-daa-pee'sā: sculptor and architect; b. at the beginning of the thirteenth century. His style, which is unlike that of the artists of his own epoch, is supposed to have been formed on the study of the antique. The Emperor Frederick II., when in Rome in 1231, secured Niccolo's services, and a little later commissioned him to design and erect the fortifications of the castle at Capua and other places. In 1225 Niccolo was called to Bologna to build the convent and church of the Dominicans. In 1231 he was at Padua erecting the Basilica of St. Anthony; he afterward built the Church of S. Maria Gloriosa dei Frari in Venice. Later he made many designs for the Church of San Giovanni at Siena and some buildings and improvements at Pisa, where he was obliged to lay the foundations of his buildings on piles. He built the Church of St. Michael and several palaces in this manner; also the campanile of the Augustinians. He made designs for San Domenico at Viterbo and for San Lorenzo at Naples. He enlarged and embellished the cathedral at Volterra. At Lucca he sculptured several works, among others a *Deposition* (dated 1237) over a door of the cathedral. He erected the monastery and Church of Ss. Trinità at Florence, which Michelangelo admired so much. His statue of a *Virgin and Child* which he made for San Domenico at Bologna was continually imitated by other sculptors, and he was consulted on every important question in architecture and in engineering. In 1260 he built the famous Baptistery at Pisa, in 1267 sculptured the *arca* or shrine of San Domenico in the church of that saint in Bologna, and in 1268 the pulpit for the Siena cathedral. Charles X. of Anjou sent for him to come to Naples to build the abbey of Tagliacozzo. Niccolo was recognized as the greatest sculptor of the age. D. at Siena in 1278. W. J. STILLMAN.

Niccolo di Arezzo, called also NICCOLO LAMBERTI and NICCOLO DI PIERO: sculptor and architect; b. at Arezzo in 1350. He studied sculpture with Muccio of Siena, whom he soon surpassed. Two statues for the campanile of Sta. Maria dei Fiori proved his skill, but on account of the plague he left Florence in 1383 and went to Arezzo, where he worked at a bas-relief for the Brotherhood of Sta. Maria della Misericordia. The wall of Borgo San Sepolero having been demolished by an earthquake, Niccolo was sent to repair it. He was driven from Arezzo by civil war and returned to Florence, where he took part in the work at Or San Michele and Sta. Maria dei Fiori, and was chosen one of the seven sculptors to compete for the gates of the Baptistery. Boniface IX. required him to come to Rome after this to repair the Castel St. Angelo. It is supposed that he afterward went to Milan in the service of the Visconti, and that he was the architect called Niccolo Selli of Arezzo who worked for John Galeazzo at the time the Certosa of Pavia was begun. In 1411 the monument of Pope Alexander V. was intrusted to him at Bologna. This fine work still exists at the Certosa. His work is often mistaken for that of Andrea Pisano. D. in Bologna in 1417.

W. J. STILLMAN.

Nice, nees, or **Nicaea** [Gr. *Nίκη*, liber., victory, or *Nίκαια* (se. πόλις, city), city of victory, liter., fem., of *νίκαιος*, pertaining to victory; cf. Mod. Turk. name, *Isnik* < Gr. *εἰς Νίκαιαν*, to Nicaea]; an ancient capital of Bithynia; 44 miles S. E. of Byzantium. According to Strabo, it was founded by Antigonos (d. 301 B. C.) and rebuilt by Lysimachus (d. 281 B. C.), who changed its name from Antigonía to Nicaea, in honor of his first wife. It was rectangular, 16 stadia in circuit, and surrounded by massive walls. Two œcumenical councils were held here: the first (325), consisting of 318 bishops, was the first General Council of the Christian Church, and the most important of the series. It condemned Arius, formulated the Nicene Creed, and de-

termined when Easter should be observed. The second (787), reckoned the seventh œcumenical, of 350 bishops, sanctioned the use of pictures in worship. Nice was captured (1078) by the Seljuk Turks and retaken (1097) by the Greeks and crusaders, who brought their ships 7 miles overland. From 1204 to 1261, while Constantinople was in the hands of the Franks and Venetians, it was the capital of the Byzantine empire. Since 1330 it has been held by the Ottomans. In the solitary church (of the eleventh century) still existing is a rude realistic picture of the first council. See ISNIK.

E. A. GROSVENOR.

Nice (Ital. *Nizza*): capital of the department of Alpes-Maritimes, France; at the foot of the Alps, on both sides of the mouth of the Paglione; 140 miles E. by N. of Marseilles (see map of France, ref. 8-1). It consists of the old town, the new town, and the port, and the three divisions have very different appearances, but they are all connected with each other and surrounded by beautiful promenades, drives, and public gardens, which, together with the exceedingly mild and salubrious climate, yearly attract thousands of foreigners who spend the winter here. It has spinning and weaving factories, and manufactures of artistic pottery, wax, essences, and perfumeries; flowers and fruits are raised on a large scale, and the preservation of the latter forms a prominent industry. Its trade in oil, wine, hemp, and silk is also very important. In 1888 it acknowledged the supremacy of the house of Savoy, and in 1814 became part of the kingdom of Sardinia, but was in 1860 ceded to France. Pop. (1891) 74,250.

Nice, Councils of: See NICE or NICAËA.

Nicene Creed: See CREED.

Niceph'orus: Byzantine historian and Patriarch of Constantinople; commonly regarded as a saint and called the Confessor; was born in 750. Although a layman, he was against his will appointed patriarch by Nicephorus I. in 806, but was persecuted and finally deposed in 815 by the iconoclast Leo V., the Armenian, who banished him to a monastery in the Princes' islands. There he composed many works, deservedly admired for their accuracy, learning, and finished style. Among them are a *Brief History of Constantinople* from 602 to 770, a *Chronology* from Adam to the time of the author, and various treatises on the iconoclastic controversy. D. in 828. Banduri was preparing a comprehensive edition of Nicephorus's works, but died before it was complete. Some were published by Neri (1849) and others by Petra (1852).

E. A. GROSVENOR.

Nicephorus: name of three Byzantine emperors. NICEPHORUS I. (803-811). A soldier, eventually general-in-chief. He rebelled against Constantine VI., by whom he was defeated. His life was spared, but his eyes were put out. In 803 a popular insurrection broke out against the Empress Irene, the sole sovereign, and raised Nicephorus to the throne. He was ambitious and brave, but perfidious. He fought against his two great contemporaries, Charlemagne and Haroun-al-Rashid, was constantly unsuccessful, and obtained peace by paying tribute to each. Making war against Crum, King of the Bulgarians, he invaded Bulgaria; but his whole army was destroyed in the passes of the Balkans, and Nicephorus was captured and put to death (811). His skull, lined with silver, served as a drinking-cup.—NICEPHORUS II. See PHOCAS II.—NICEPHORUS III., BOTONIATES (1078-81). An intrepid and able general before his accession, on the throne he was indulgent and pusillanimous. His reign was distracted by insurrections, which he was too feeble to suppress. Finally, attacked by the partisans of Alexius Comnenus and desirous of averting civil war, he resigned his crown and became a monk.

E. A. GROSVENOR.

Nich'iren [liter., lotus of the sun]: a Japanese priest; b. 1222 A. D.; founder of the Hokke-shiu or Nichiren-shiu, one of the most popular of Buddhist sects. His fanaticism and bitter quarrels with other sects caused him to be banished to Cape Idzu, whence he returned in 1263 A. D. after a two years' exile. A second banishment and a period passed as a hermit in the mountains of Koshu marked the close of his career. D. in 1282. The incidents of his life figure largely in Japanese art. The chief temples of the sect are at Ikegami, 6 miles S. of Tokio, and its chief book is the *Hokkekyō*, divided into two sections of fourteen chapters each, the first giving Buddha's life up to his thirtieth year, the second the rest of his teachings. These Buddhists recognize a difficult observance for the clergy and an easy one for

the laity. Their central doctrine teaches that every living plant or being may, by successive transmigration, attain to Buddhahood. Man works out his own salvation by observing the law and by prayer, not by relying on Amida Buddha, as some other sects teach. There are two forms of teaching; one symbolic, the other the pure truth. Shaka (that is, Sakya-muni, or the Buddha), whose emblem is the lotus, is worshiped; and the founders, Nichiren and Kishimoin, are held in reverence. J. M. DIXON.

Nichol, JOHN PRINGLE, LL. D.: astronomer; b. at Brechin, Scotland, Jan. 13, 1804, the son of a bookseller; taught school in early life; studied for the ministry of the Scottish Church, and was licensed to preach, but soon devoted himself to science; became a successful popular lecturer upon astronomy, in which capacity he visited the U. S., and Professor of Practical Astronomy in the University of Glasgow. Among his works were *Views of the Architecture of the Heavens* (1838); *The Stellar Universe* (1848); *The Planetary System, its Order and Physical Structure* (1851); and *Cyclopedia of the Physical Sciences* (1857). D. at Rothesay, Scotland, Sept. 19, 1859.

Nicholas, SAINT: Bishop of Myra, in Lycia, Asia Minor; b. at Patara, in Syria. He is the chief patron saint of Russia; patron of numerous seaports; patron saint of children, especially schoolboys, poor maidens, travelers, merchants, and sailors; one of the most popular saints of the Christian Church. On the day of his birth he stood up in his bath with folded hands mutely thanking God that he saw the light. He would nurse only once on Wednesdays and Fridays. He was while a little boy pointed out as a saint. He became a priest and a monk in the monastery of Holy Sion, near Myra, and rose to be abbot; made a pilgrimage to Palestine, and on his return settled in Myra, which was only 3 miles from Patara, where he was chosen bishop. In 325 he attended the Ecumenical Council of Nice, and boxed the ear of Arius because he was so horrified at Arius's blasphemy. He was a miracle-worker upon a stupendous scale. He quelled storms at sea, foretold the future, multiplied loaves of bread, and even raised the dead. He died on Dec. 6, 326, and was buried at Myra, but his relics were removed to Barri, in the kingdom of Naples, in 1087. The most famous story told about him is to the effect that by the clandestine gift of three purses of gold he portioned off three penniless girls whose bankrupt father had contemplated for them a life of shame. It is this story which occasioned the representation of the saint with three golden balls, placed sometimes upon the book he carries, sometimes at his feet, again in his lap. The stories of his deliverance of sailors and shipwrecked persons made him the patron saint of merchants, and as the early merchants were necessarily money-lenders, the three golden balls of their patron saint were adopted by the merchants' guild. So it came to pass ultimately that the golden balls of St. Nicholas became the symbol of the pawnbroker. The care he showed in the protection of children made him their patron, and led to the fiction that he would give them presents on the eve of his festival (Dec. 6). This idea has been transferred to Christmas eve, and in the famous poem of Clement C. Moore, *'Twas the night before Christmas*, the saintly Bishop of Myra appears in any but a dignified way; yet Santa Claus is a corruption of the Dutch name of St. Nicholas, and the Dutch in New Amsterdam celebrated a San Claus holiday.

SAMUEL MACAULEY JACKSON.

Nicholas: the name of several popes. NICHOLAS I. (858-868), a Roman by birth, an imperious and energetic character; asserted the papal authority with great success against the metropolitan in his controversy with Hincmar of Reims, and even against the royal and imperial power, compelling Lothaire, King of Lorraine, who was supported by his brother, the Emperor Louis, to abandon his mistress, Walrada, and reinstate his legitimate wife, Theutberga, in her rights as queen. Less successful was his contest with the Patriarch of Constantinople, Photius, who had usurped the see after the deposition of Ignatius by the emperor. Nicholas excommunicated Photius and demanded the reinstatement of Ignatius, but the emperor, Michael III., supported Photius, who in his turn excommunicated Nicholas, arguing that the highest ecclesiastical authority had been transferred from the see of Rome to that of Constantinople by the transference of the imperial residence.—NICHOLAS II. (1058-61), who was guided throughout his pontificate by the advice of Hildebrand, afterward Gregory VII., held the famous Easter Council in Rome, 1059, which placed the

papal election in the hands of the cardinals, and required the assent of the emperor only in the last instance.—NICHOLAS III. (1277-80) deprived Charles of Anjou of his vicariate of Tuscany, and forced Rudolph of Hapsburg to cede the Romagna and the exarchate of Ravenna.—NICHOLAS IV. (1288-92) was an unimportant pontiff, remembered chiefly for his abuse of the absolving power in annulling the treaty by which Charles of Anjou had obtained from Alphonso III. of Aragon his release from prison.—NICHOLAS V. (1447-55), b. at Pisa in 1398, a peaceable and learned man; reorganized and enlarged the Vatican Library and the University of Rome, and gathered in Rome a great number of the most celebrated scholars of the age, among whom were many Greeks who fled to Western Europe on the downfall of the Eastern empire.—In 1328, Louis of Bavaria raised Peter de Corbario as anti-pope to John XXII., under the name of Nicholas V., but he died shortly after in the papal dungeon, and is not counted in the papal succession.

Nicholas I., NIKOLAI PAULOVITCH: Czar of Russia (1825-55); b. at St. Petersburg, July 7, 1796; the third son of the Emperor Paul. Before his accession he traveled, visited England, married in 1817 the eldest daughter of Frederick William III. of Prussia, and lived at St. Petersburg in domestic retirement, occupied by military studies. On the death of Alexander I., the elder brother, Constantine, resigned the crown, and thus Nicholas succeeded to the throne. A formidable military conspiracy, which endangered not only his succession but the very existence of the empire, he put down with admirable courage and presence of mind, but also with a relentless severity which approached cruelty. In his reign wars were carried on in Central Asia, the Caucasus, Turkey, Poland, Hungary, and with the Western powers, but he himself possessed slight military skill. He was a good administrator and a vigorous but intolerant ruler. As a diplomat also he had some talent. For several years after 1849 Russia occupied the first place in the political system of Europe, and her plans with respect to Turkey were rapidly maturing when they received a sudden check from Napoleon III. by the alliance between Great Britain, France, and Turkey, and the ensuing Crimean war. The misfortunes of the Russian arms during this war were a great humiliation to him, and are said to have shortened his life. D. Mar. 2, 1855. See RUSSIA (History).

Nicholas II.: Czar of Russia; son of Alexander III.; b. May 18, 1868; received a careful education, in which especial attention was paid to the modern languages and scientific studies; entered the army at the age of eighteen; in 1890-91 traveled extensively in the East, visiting Egypt, India, China, and Japan, and he has also visited most of the countries of Western Europe. On the death of his father, Nov. 1, 1894, Nicholas succeeded to the throne, having previously become affianced to the Princess Alix of Hesse-Darmstadt.

Nicholas de Cusa: See CUSANUS.

Nicholasville: town; capital of Jessamine co., Ky. (for location, see map of Kentucky, ref. 3-H); on the Queen and Cresc. Route and the Richmond, Nich., Irvine and Beattyville railways; 12 miles S. of Lexington. It is noted for the thoroughbred horses raised and trained there, has several grain elevators, flour-mills, and hemp-factories, and handles a large quantity of tobacco annually. There are a national bank with capital of \$100,000, a State bank with capital of \$100,000, a private bank, and two weekly newspapers. Pop. (1880) 2,303; (1890) 2,157.

Nichols, EDWARD LEAMINGTON, Ph. D.: physicist; b. in Leamington, England, Sept. 14, 1854; prepared for college at Peekskill Military Academy; graduated at Cornell University 1875; studied in Leipzig, Berlin, and at Göttingen, where (1879) he took the degree of Ph. D.; was appointed Fellow in Physics at Johns Hopkins University in 1879. He became connected with Edison in electrical work at Menlo Park in 1880; was Professor of Physics and Chemistry in Central University, Richmond, Ky., 1881-83; Professor of Physics and Astronomy in the University of Kansas, Lawrence, 1883-87; in 1887 became Professor of Physics in Cornell University, where he has been largely instrumental in developing the course in electrical engineering. Prof. Nichols is a member and vice-president of the American Institute of Electrical Engineers. He is the author of about fifty papers and memoirs, chiefly upon experimental physics, which have appeared in the *Annalen der Physik und Chemie*, *Philosophical Magazine*, *Electrical World*,

American Journal of Science, Nature, and the Transactions of the several scientific societies; also of a *Laboratory Manual of Physics and Applied Mechanics* (2 vols., New York, 1894), and of a small volume of lectures entitled *The Galvanometer* (New York, 1894). Since 1893 he has been editor of *The Physical Review*, and associate editor of *Johnson's Universal Cyclopædia*, in charge of physics and its applications. C. H. THURBER.

Nichols, JOHN: author; b. at Islington, a suburb of London, England, Feb. 2, 1745; was apprenticed to the eminent printer William Bowyer; became his partner, successor, and biographer, and was a distinguished benefactor to English letters, not only by the enterprise and liberality displayed in several costly undertakings, but by his careful editorship of numerous works and by his own learned writings. Nichols printed in 1778 for private distribution a brochure of fifty-two pages, *Brief Memoirs of Mr. Bowyer*, which was soon expanded into a quarto volume, *Biographical and Literary Anecdotes of William Bowyer, Printer, F. S. A., and of Many of his Learned Friends* (1782); and the latter work became so popular as to be ultimately recast into the valuable series entitled *Literary Anecdotes of the Eighteenth Century* (9 vols. 8vo, 1812-15), and was followed by *Illustrations of Literary History* (8 vols. 8vo, 1817-58), completed by his son, John Bowyer Nichols. From 1778 until his death Mr. Nichols was the editor and publisher of *The Gentleman's Magazine*. Among his elegant volumes upon English local history were *Bibliotheca Topographica Britannica* (52 Nos., 1780-90); *The Progresses, Processions, Festivities, and Pageants of Queen Elizabeth* (4 vols., 1788-1821) and of *King James I.* (4 vols., 1828); and *The History and Antiquities of the Town and County of Leicester* (7 parts, 8 vols., 1795-1815). D. in London, Nov. 26, 1826.—**JOHN GOUGH NICHOLS**, son of John Bowyer Nichols, continued the publishing business, edited several genealogical journals and was author of works on antiquarian subjects. Revised by H. A. BEERS.

Nicholson, JAMES: sailor; b. at Chestertown, Md., in 1737; was engaged in the capture of Havana 1762; took command in 1775 of the *Defense*, a small Maryland vessel, with which he recaptured several prizes from the British; was appointed, June, 1776, to the command of the *Virginia* (twenty-six guns), and in Jan., 1777, succeeded Commodore Esek Hopkins as commander-in-chief of the Continental navy, and retained that post throughout the war; was engaged with his crew as volunteers in the battle of Trenton; fought a severe but indecisive engagement with the British ship *Wyoming* June 2, 1780, and was taken prisoner after a gallant resistance with his vessel, the *Trumbull* (thirty-eight guns), in Aug., 1781, by the British vessels *Iris* and *General Monk*. After the war he became commissioner of loans in New York, where he died Sept. 2, 1804.

Nicholson, JOHN: soldier; b. in Dublin, Ireland, Dec. 11, 1821; entered the military service of the East India Company in 1838; engaged in the disastrous campaign in Afghanistan 1840-42; was for some months a prisoner among the Afghans; took part in the Sikh war of 1845; became assistant resident at Lahore; rendered important services in the Sikh war of 1848, after which he became deputy commissioner of the Punjab, and acquired such influence over the savage tribes of the frontier that he became the object of a kind of hero-worship among a sect which sprang up called the Nekkul-Seynees, which insisted upon paying him the honors of a prophet despite his energetic refusal, carried to the point of inflicting floggings to cure his misguided worshippers of their delusion. With Sir John Lawrence, Nicholson divides the honor of having saved the Punjab to British allegiance during the great mutiny of 1857; he raised the famous "movable column," with which he destroyed all the rebel forces between Lahore and Delhi, and was assigned the post of honor in the final assault upon Delhi, in which he was mortally wounded Sept. 14, and died Sept. 23, 1857.

Nicias, nis-i-as (in Gr. *Nukías*): an Athenian statesman and general from the period of the Peloponnesian war. He was very wealthy, the leader of the aristocratic party after the death of Pericles, and the fierce opponent of Cleon; wary, cautious, and superstitious, but prudent and energetic. His military successes—the capture of Minoa in 427, of Melos in 426, of Spacteria in 425, of Cythera in 424—enabled him after the death of Cleon to negotiate a peace of fifteen years between Athens and Sparta in 421, which received his name. Neither of the parties, however, fulfilled the conditions, and

in 415 Alcibiades induced the Athenians to make an expedition against Sicily. Nicias tried to dissuade the people from the undertaking, but in vain. He then accepted the command—first in connection with Alcibiades, afterward alone—and laid siege to Syracuse. Re-enforcements were sent to the city from Sparta. The Athenian fleet was defeated and destroyed, and when Nicias retreated with his troops to the interior, he was soon compelled to surrender, and he himself was put to death (413). Plutarch has written a very interesting sketch of his life and character.

Revised by J. R. S. STERRETT.

Nickel [Germ., from Swed. *nickel*, shortened from *kopparnickel*, copper-nickel, an ore containing the metal]: a metal allied to cobalt and to iron. Although one of the principal ores of nickel was described by Hiarni in 1694 under the name of kupfer-nickel, signifying false copper, it was not until 1754 that Cronstadt announced the discovery of a "semi-metal" which he proposed to give the name nickel. It was reserved for Bergman, in 1779, to show that it was really a new metal.

Properties.—Pure nickel, or the metal obtained by galvanic deposition from a solution as pure as possible, is a silvery-white metal with a strong luster, not tarnishing on exposure to the air. It can be polished so as to be deceptively like polished silver. It is very ductile, hard, and tenacious. A nickel wire will sustain $1\frac{1}{2}$ times the weight required to break an iron wire of the same size. The specific gravity of nickel varies, according to different observers, between 8.27 and 8.93. Its atomic weight is 58.6; its coefficient of linear expansion 0.0000727; its specific heat 0.11; and its electric conductivity 7.374. Its malleability is diminished by an admixture of carbon or manganese. It is attracted by the magnet, and may be rendered magnetic by the same means as iron, its magnetic power compared with that of iron being given as 35:55, or as 8:9, or as 2:3. Repeated ignition destroys its magnetic property, and it loses this power at a lower temperature than iron. Nickel is very difficult of fusion. Adams succeeded in fusing pure nickel in a sealed porcelain crucible lined with pure alumina and bedded in a Hessian crucible at a heat which fused platinum. Crookes and Rohrig put its melting-point at 1,900°-2,100° C. Nickel is soluble in dilute sulphuric and hydrochloric acids, but slowly and with comparative difficulty. Nitric acid attacks and dissolves it readily, as does aqua regia. Strong nitric acid renders it passive. It combines directly with chlorine, bromine, iodine, fluorine, sulphur, phosphorus, and arsenic, forming soluble compounds.

Occurrence.—In the earlier days of nickel-mining the deposits in Saxony, Cornwall, Sweden, Norway, and Hungary furnished arsenide and sulpho-arsenide ores. Practically the ores utilized now on a large scale are the nickel-bearing pyrrhotites, which occur most extensively in the Sudbury district, Canada, and the silicates, among which garnierite is the principal one, mined in New Caledonia. In the U. S. nickel-mining was prosecuted for the longest period at the Gap mine in Pennsylvania, opened for copper in 1744, but worked for nickel since 1863. A small amount of nickel has also been annually produced as a by-product by the Muir la Motte lead mine in Missouri. Mining has also been conducted on a small scale at Lovelock Station, Nev., and at Riddles, Ore. Since 1885, when the production of nickel in the U. S. was 277,904 lb., it has declined, irregularly, until it was only 49,399 lb. in 1893.

At the New Caledonia mines the nickel ore, associated with cobalt ore and with chrome ore, is found at the contact of serpentine and argillaceous schists. Mining began in 1873, but development was hampered by the difficulty in extracting the nickel from the ores. From 1876 to 1890 the Thio district exported 59,448 tons of ore, carrying 8 to 12 per cent. of metal and 228 tons of nickel matte. In 1890 the product was 22,689 metric tons, in 1891 it rose to 60,921 tons, and in 1892 to 83,114 tons, the ore carrying 7 per cent. of metal. From lack of demand only 36,000 tons was exported to France, the balance going to stock, which rose to 80,000 tons. In 1892 France produced, chiefly from New Caledonia ores, 2,741,776 lb. of nickel; Sweden in the same year made 33,000 lb., Norway 275,000 lb., and Germany 1,494,000 lb.

In the Sudbury district, opened since 1887, the ore, a mixture of pure chalcopyrite and nickeliferous pyrrhotite, occurs in irregular lenticular masses in the Huronian rocks in proximity to dikes of diorite. There are indications that in depth the ore becomes more nickeliferous and less cupriferous.

Thus at the Copper Cliff mine the ore carries 4 per cent. of copper and 4.5 per cent. of nickel at a depth of 400 to 500 feet, while at 700 feet the ore runs on an average 0.5 per cent. of copper and 8 to 10 per cent. of nickel. Generally speaking, the ore in the district runs from 1 to 5 per cent. of nickel and from 1 to 4 per cent. of copper. The total product of nickel by the Sudbury mines, as determined by the Ontario Geological Survey, was 3,992,982 lb. It is shipped in the form of a copper-nickel matte, 12,427,986 lb. of this product having been imported into the U. S. in 1893. The statement has been made by good authority that the Sudbury mines can be worked at a profit when nickel sells as low as 25 cents per pound. The district controls the markets of the world. While formerly the metallurgy of nickel was much complicated by the presence of arsenic, cobalt, etc., the treatment of the New Caledonia and Sudbury ores is much simpler. The first process is to obtain by smelting in blast furnaces a matte, which is a mixture of sulphides of nickel, copper, and iron, a preliminary operation being, when sulphur is in excess in the ore, to roast it in heaps or furnaces. The matte is either roasted in reverberatory furnaces, producing an oxide, which is reduced by carbon, or it is blown in a Bessemer converter. The matte is also smelted with alkaline sulphides in excess.

Uses.—For some time the use of nickel was confined to the purposes of coinage and the making of certain alloys. In Jamaica, Belgium, Switzerland, Germany, Servia, Brazil, Mexico, Venezuela, Chili, and the U. S. small coins have been made with an alloy of nickel with zinc and copper, pure nickel being altogether too hard for this use. The U. S. cent, authorized by the act of Feb. 21, 1857, consists of 88 parts of copper and 12 of nickel.

Nickel is largely used in the preparation of German silver or nickel silver. This may be looked upon as a brass to which one-sixth to one-third of nickel has been added. Tradition tells us that this alloy has been in use in China from a remote period; its use in Europe became common about the middle of the nineteenth century. The white copper, or *packfong*, of the Chinese contains 40.4 parts of copper, 31.6 of nickel, 25.4 of zinc, and 2.6 of iron. German silver should be, approximately, 1 part of nickel, 1 of zinc, and 2 of copper. For casting purposes a little lead is sometimes added. A cheaper kind contains 8 parts of copper, 2 of nickel, and 3.5 of zinc. If the amount of nickel fall below 2 parts in 11–12, the silver produced will be little better than brass; 8 parts of copper, 3 of nickel, and 3.5 of zinc make a beautiful alloy closely resembling silver. The preceding, with 4 parts of nickel, makes a very beautiful compound having a faint shade of blue. The Chinese *tutenag* has 8 parts of copper, 3 of nickel, and 6.5 of zinc. This alloy is fusible, hard, and not easily rolled. The color of good German silver is nearly silver white, its fracture small-grained, specific gravity 8.4 to 8.7. It is as ductile as ordinary brass, but harder and capable of being polished. In making it, the three metals should be granulated and well distributed through the crucible, covered with charcoal, and well stirred while in fusion.

The chief use of nickel is for nickel-plating, or the deposition of nickel upon other metals by means of electricity. For many years the fact was well known that a brilliantly white deposit of metallic nickel could be obtained by the electrolysis of a solution of any one of many nickel salts, but the possibility of electro-plating with nickel was not demonstrated until Dr. Isaac Adams, Jr., solved the problem and created, in fact, a new art. He showed the way of supplying a nickel-plating solution regularly and continuously with the metal regularly and continuously withdrawn from it. The use and value of nickel on account of its hardness, beauty, luster, and the polish which it takes were rapidly recognized as soon as nickel-plated ware became common.

The best practical solution for nickel-plating is a solution of the double sulphate of nickel and ammonia. If properly prepared and used, this solution has the property of giving a deposit with a smooth surface which can be polished with little labor, and it gives a very thick deposit before it acquires a rough or matted surface. The solution should be of a salt as pure and neutral as possible, and kept free from substances which would impair its working properties, chief among which are nitric acid, the alkalies, and lime. Nitric acid and caustic alkali are used for cleaning goods about to be plated, and hence, without scrupulous care, a little nitric acid or alkali will find its way into the plating-vat. Nitric acid in very small quantities ruins the vat, the work com-

ing out black and streaked. The presence of potash or soda is at once manifested by a deposit of green oxide or sub-oxide of nickel upon the article being plated. Copper, zinc, and arsenic are also detrimental, and must be excluded or their bad effects neutralized.

While in electro-plating an anode of pure metal is convenient and useful, in working out the problem of nickel-plating Dr. Adams brought to light the curious fact that a plate of pure metallic nickel—used as an anode—does not satisfy the conditions requisite to successful plating. Such a plate does not dissolve regularly in the solution; or, in other words, it does not furnish from itself as much metal as is deposited upon the objects plating. If a plate of nickel combined with carbon—a carbide of nickel—be employed, the metal will be fed into the solution on one side just as fast as it is deposited out on the other, and thus the great desideratum attained—viz., the possibility of continuous and uniform work. Such cast-nickel plates, or anodes, are now successfully made, and form an article of commerce.

Joseph Wharton, of Philadelphia, early began experimenting to determine whether nickel could not be produced in a pure and malleable condition susceptible of being worked in nearly the same manner as iron, and of being applied in the manufacture of various objects requiring strength of material and a material that can not be easily oxidized. One of his earliest experiments was to take the somewhat spongy mass got by reduction of the oxide of nickel, and, after heating it to full redness, work it under a steam-hammer into a bar. In 1873 Mr. Wharton sent to the Vienna Exhibition a sample of nickel in the form of axles and axle-bearings, and at the exhibition in Philadelphia in 1876 he exhibited a remarkable series of objects made of wrought nickel, such as bars, rods, a cube, a horseshoe magnet, and magnetic needles of forged nickel. Dr. Fleitmann, of Iserlohn, Westphalia, Prussia, has improved and cheapened the operation of refining nickel and toughening it, and has reduced the liability to the presence of blowholes in castings by adding to the molten charge in the pot, when ready to pour, a very small quantity of magnesium. Complete malleability of nickel was obtained at Wharton's works in Camden, N. J., before Fleitmann's invention or process, but this last is more rapid and better than the old method. The metal so treated becomes remarkably tough and malleable, and may be rolled into sheets and drawn into wire. Cast plates can be successfully rolled. The cast plates, such as are made for anodes, after reheating, are rolled down to the desired thickness. It is found that it is a great improvement to the nickel anode plates to roll them down; they dissolve with greater uniformity in the bath. Nickel so treated with magnesium has been rolled into sheets as thin as paper. Dr. Fleitmann has also succeeded in welding sheet nickel upon iron and upon steel plates so as to coat them equally on each face with a layer of nickel. The quantity preferred by weight is $\frac{1}{10}$ iron and $\frac{2}{10}$ nickel, $\frac{1}{10}$ of nickel being placed on each surface. To secure union, the iron or steel must be perfectly flat and clean. A pile is made with outer facings of sheet-iron, to protect the nickel from scaling. When the whole is heated to the proper degree, it is passed through the rolls. The two metals become so firmly united that they may be rolled down, two or three together or separately, to the thinness desired.

The unusual properties displayed by meteoric iron, which is invariably associated with nickel, attracted attention to the alloy, but it was not until 1885 that Marbeau's manufacture of nickel steel in the crucible and its addition to ordinary steel brought out the valuable properties of small additions of nickel to steel. James Riley conducted some experiments at the works of the Steel Company of Scotland, with open-hearth steel, and showed that steel containing 4.7 per cent. of nickel had an elastic limit of 28 tons per square inch, and a breaking strain of 40 tons, whereas similar steel without nickel showed only 16 and 30 tons respectively. The elongation and contraction of area of the steel were not materially impaired. In 1890 the Creusot works in France began experiments with nickel steel for armor plate, and in 1891 successful results were obtained with plates of U. S. manufacture. The amount usually alloyed with armor-plate steel by the Bethlehem works is $\frac{3}{4}$ per cent. of nickel. Some experiments have been made in the direction of using nickel steel for heavy forgings and for common industrial purposes. For the latter, however, the alloy is still too costly. Nickel has declined steadily in price, and it is believed that the figure reached early in 1894 of 40

to 45 cents per pound does not reflect the ultimate capacity for placing it in the market at a low figure.

Revised by C. KIRCHHOFF.

Nickel-plating: See NICKEL.

Nickerson: city (founded in 1878); Reno co., Kan. (for location of county, see map of Kansas, ref. 7 F); on the Atch., Top. and S. Fc and the Mo. Pac. railways; 11 miles N. W. of Hutchinson, 58 miles N. W. of Wichita. It is in an agricultural and stock-raising region; contains a high school, 2 brick schoolhouses, 2 private banks, and a weekly newspaper; and has large stock-yards, roller flour-mill, railway machine-shops, salt-works, and creamery. Pop. (1880) 597; (1890) 1,662; (1895) 1,560. EDITORS OF "ARGOSY."

Nie'obar Islands: a group of twelve inhabited and seven uninhabited islands in the Indian Ocean, 125 miles N. W. of the northern point of Sumatra; area, 635 sq. miles, with 6,900 inhabitants belonging to the Malayan race, with only a low state of civilization. The islands are very fertile, producing coconuts, sugar, rice, tobacco, bamboo, and oranges in abundance. All attempts by the Danes to colonize them failed. Since 1869 they have belonged to Great Britain.

Nieode'mus: a member of the Sanhedrim, mentioned thrice in the Gospel of John—iii, 1-21, as coming to Jesus by night; viii, 45, as demanding that Jesus should be heard before being judged; and xix, 38-42, as assisting Joseph of Arimathea in laying out the body of Christ.

Nieol, ERSKINE: genre-painter; b. at Leith, Scotland, July, 1825. He studied in the Trustees' Academy, Edinburgh; settled in London in 1863; associate of the Royal Academy, London; was awarded a second-class medal at the Paris Exposition of 1867. His painting is robust, and his works are popular on account of their subjects, which include life and manners in Great Britain. *Paying the Rent* is in the collection of Mrs. W. H. Vanderbilt, New York; *Paddy's Mark* is in the Corcoran Gallery, Washington. W. A. C.

Nicolai, CHRISTOPH FRIEDRICH: critic and editor; b. in Berlin, Mar. 18, 1733; was educated in the schools of Berlin, and became in 1749 apprentice in a bookstore at Frankfurt-on-the-Oder, where he privately studied classical and English writers, mathematics, history, and philosophy. In 1752 he returned to Berlin and entered the publishing-house of his father. Through the publication of his *Briefe über den gegenwärtigen Zustand der Wissenschaften* (1756), he made the acquaintance of Lessing, and subsequently of Moses Mendelssohn, with whom he associated in publishing the *Bibliothek der schönen Wissenschaften* (1757-58) and the *Briefe die neueste Litteratur betreffend* (1759-65). In 1765 Nicolai founded the *Allgemeine deutsche Bibliothek*, a periodical which he continued until 1792, and by which he exerted a great influence on German literature. He also published a novel, *Leben und Meinungen des Herrn Magisters Schulhaus Nothhanker*, a description of a journey through Germany and Switzerland in twelve volumes, and a number of smaller works. While young and under the stimulating influence of Lessing's genius, Nicolai rendered valuable services to German literature, not only as a publisher of influential journals, but also as a critic. He was among the first in Germany to point to Shakespeare's greatness as a dramatist. In his later years he failed to understand the new era in German literature inaugurated by Herder and Goethe. Thus he attempted to ridicule Goethe's *Werther* by a silly parody called *Freuden des jungen Werther* (1775), and in a similar manner he tried to make fun of Herder's enthusiasm for the *Volkslied* by publishing the *Kleyner feyner Almanach* (1778). His antagonists handled him mercilessly and stamped him as the representative of shallow reasoning and barren rationalism. D. in Berlin, Jan. 8, 1811. See von Göcking, *Nicolais Leben und litterarischer Nachlass* (1820); Foss, *Friedrich Nicolai in Archiv f. Litteraturgeschichte* (ii, 375). JULIUS GOEBEL.

Nicolaieff, or Nikolaïev, née-kō-lai'yef: town; chief naval station of Southern Russia and great grain emporium; on the Bug, 20 miles from its mouth, and 80 miles N. E. from Odessa (see map of Russia, ref. 10-C). It is strongly defended and advantageously situated. Pop. (1891) 76,578.

E. A. G.

Nicolas, Sir NICHOLAS HARRIS, F.S.A.: historian and antiquarian; b. at East Looe, Cornwall, England, Mar. 10, 1799; became a lieutenant in the British navy in 1815;

studied law; was called to the bar 1825; was joint editor of *The Retrospective Review* 1826 and of the *Excerpta Historica* 1831; made a knight of the Hanoverian Guelphic order 1831, chancellor of the Ionian order of St. Michael and St. George 1832, of which he became grand cross 1840. D. at Cape Cury, near Boulogne, France, Aug. 3, 1848. Among his works are *Synopsis of the Peerage of England* (1825); *History of the Battle of Agincourt* (1827); *The Chronology of History* (1835); *History of the Orders of Knighthood of the British Empire* (4 vols., 1841-42); *Dispatches and Letters of Lord Nelson* (7 vols., 1844); *Memoirs of Sir Christopher Hatton* (1847).

Nicolaus (in Gr. Νικόλαος) of Damascus: Greek historian, intimate of Herod the Great, and tutor of the children of Antony and Cleopatra; wrote a *Universal History* in 144 books, important fragments of which have been preserved, together with portions of his biography of Augustus. See Müller, *Fragmenta Historicorum Græcorum*, vol. iii., pp. 343-464. B. L. G.

Nicolay, JOHN GEORGE: historical writer; b. at Essingen, Rhenish Bavaria, Germany, Feb. 26, 1832; was taken to the U. S. by his father in his childhood; was educated in the common schools of Ohio and Illinois; entered the office of *The Pike County Free Press*, Pittsfield, Ill., in 1848, becoming finally editor and proprietor; sold his newspaper and became clerk in the office of the secretary of State of Illinois at Springfield; made the acquaintance of Abraham Lincoln, who chose him as his secretary upon his nomination as President at Chicago; was private secretary of President Lincoln 1861-65; was U. S. consul in Paris, France, 1865-69; edited for a time *The Chicago Republican*; was marshal of the Supreme Court of the U. S. 1872-87. He is the author of *The Outbreak of Rebellion* (New York, 1881), and joint author with John Hay of *Abraham Lincoln: a History* (10 vols., New York, 1891; supp., 2 vols., 1894).

C. H. THURBER.

Nicole, née kōl', PIERRE: moralist and theologian; b. at Chartres, France, Oct. 19, 1625. He studied at Paris at the Collège d'Harcourt and at the Sorbonne, and was a precocious scholar in the classics and theology. He entered Port Royal as a master of classical studies, and soon became the spokesman of its ideas and its efficient but anonymous defender in its contentions with the Jesuits. He was the staunch and life-long friend of Arnauld, and was associated with him in the composition of the famous *Logique* or *Art de penser* of Port Royal, and of many controversial works. He fled with him to the Netherlands from the renewed religious persecutions in 1679, but his more pacific spirit led him to relinquish theological controversy as a condition of returning to Paris (1683). D. Nov. 16, 1695. He furnished Pascal the materials for some of the *Lettres Provinciales*, supervised the first collected edition, and published (1659), under the pseudonym of *William Wendrock*, a Latin translation of them that rivaled the original in popularity. In his eighteen letters under the title *Les Imaginaires et les Visionnaires* (1667) he expressed the austere puritanism of Port Royal in its condemnation of the drama and fiction generally, and excited Racine to a bitter personal reply. His chief title to enduring fame is his thirteen volumes of *Essais de Morale* and *Lettres*, begun in 1671, which assure him a place in the second rank of moralists. They were regarded by his contemporaries as masterpieces of literary style, but now only the *Essai sur le moyen de conserver la paix avec les hommes* is cited. They are judicious in thought and just in expression, but lack depth. A. G. CANFIELD.

Nicoll, WILLIAM ROBERTSON, LL. D.: a minister of the Free Church of Scotland; b. at Aberdeen, Oct. 10, 1851; was educated at Aberdeen University and the Free Church College of Aberdeen; was minister at Duftown 1874-77, and at Kelso 1877-86; since 1884 he has been the editor of *The Expositor*; since 1886 editor of *The British Weekly*, of which he was the founder; since 1891 editor of *The Bookman*, of which he was the founder; the projector and editor of *The Expositor's Bible* (to be completed in about 40 vols.); the *Theological Educator*; *The Foreign Biblical Library*; *The Household Library of Expositions*; *The Church Library*; *The Sermon Bible*; *The Sermon Year Book*; and similar publications. He is the author of *The Incarnate Saviour* (1881); *The Lamb of God* (1886); *Jesus Christ* (1887); *Memoir of Prof. Elmslie* (1890); *The Key of the Grave* (1893); and with C. K. Shorter a new *Life of Jesus* (1895). C. K. HOYT.

Nicomedia (in Gr. *Νικομήδεια*): the capital of ancient Bithynia, at the head of the Sinus Astacenus, founded by Nicomedes I. (278-248 B. C.) in 264 B. C., after the destruction of Astacus (a little to the S. E. of it) by Lysimachus. From 292 to 330 A. D. it was the capital of the Eastern Roman empire, and contained many splendid buildings. It has suffered very severely from earthquakes, as in 358 and 362 A. D. Arrian was born, Hannibal died, and Diocletian abdicated here. Constantine died at his Villa Ancyrona, close by. The modern Turkish town of *Ismit* occupies the old site.

Revised by J. R. S. STERRETT.

Nicopolis [= Lat. = Gr. *Νικόπολις*, liter., city of victory; *νίκη*, victory + *πόλις*, city]: name of ten ancient cities, one in Egypt, four in Asia, and five in Europe, each commemorating a victory. The most important are: (1) in Epirus, built by Augustus after the naval battle of Actium (31 B. C.). Long a splendid city, after many vicissitudes it was destroyed by the Bulgarians (1034). Its extensive ruins are 5 miles N. of Preveza. A heroic battle was fought here (Oct. 3, 1798) by 760 French, Prevesans, and Suliotas against 7,000 soldiers of Ali Pasha of Yanina. See Bellaire's *Les Îles Ioniennes sous la domination française*. (2) A town in Bulgaria on the Danube (Bulg. *Nicopol*), probably ancient *Nicopolis ad Istrum*, built by Trajan after the second Dacian war (106). Bayezid I. there won a great battle (1396) over the allied French, Hungarians, and Germans. European historians assert that 60,000 Ottomans were slain. Pop. (1888) 5,156.

E. A. GROSVENOR.

Nicosia, *nēē-kō-see āā*, or **Lefcosia** (anc. *Tremitus*): capital of Cyprus since 1192; surrounded by high walls raised by the Venetians and still intact; famous for its wines and carpets (see map of Europe, ref. 8-H). When captured by the Ottomans (1570) 20,000 persons were massacred. Pop. 12,515.

E. A. G.

Nicosia: town of Sicily; 40 miles N. W. of Catania (see map of Italy, ref. 9-F). It is picturesque and venerable in appearance with its mediæval cathedral and four churches, but its inhabitants are reputed the most illiterate and uncivilized of the island. Pop. 15,460.

E. A. G.

Nicotine, or **Nicotia**: See TOBACCO.

Nietheroy, *nēēk-tā-roī*: former capital of the state of Rio de Janeiro, Brazil; on the eastern side of the bay, opposite Rio de Janeiro city (see map of South America, ref. 6-G). The business portion, sometimes called Praia Grande, contains few buildings of interest, but the suburbs of Icarahy, São Domingos, São Lourenço, etc., scattered for a long distance along the shores of the bay and among the hills, contain many charming residences and are favorite holiday resorts. Nietheroy was repeatedly bombarded during the naval rebellion of 1893-94. Pop. over 20,000.

H. H. S.

Nicue'sa, **DIEGO**, *de*: a Spanish commander; b. at Baeza, Spain, about 1465. He went to Española in 1502, acquired considerable wealth there, and later was agent for the colonists in Spain. For his subsequent history, see the article DARIEN.

Nicum, **JOHN**, **D. D.**: Lutheran clergyman; b. in Württemberg, Jan. 6, 1851; educated at Muhlenberg College, Allentown, Pa., and the Theological Seminary, Philadelphia; became pastor at Frackville, Pa., 1876, Frankford, Philadelphia, 1878, Syracuse, N. Y., 1880, Rochester, N. Y., 1887. His chief works are *History of the New York Ministerium* (1888), and a translation with additions of Wolf's *The Lutherans in America* (1891). He is a member of the American Society of Church History and a contributor to its printed proceedings, as well as to *The Lutheran Church Review*, *The Independent*, and the various Lutheran Church papers. Dr. Nicum has also been active in securing uniform legislative action for the Lutheran churches in the State of New York.

H. E. JACOBS.

Nidāna, *nēē-daa'na* [Sansk., cause, from *√dā*, to bind]: one of the twelve links of the Buddhist chain of cause and effect which Gautama thought out under the Bo-tree during the third watch of the night in which he became Enlightened. He saw that *Ignorance* (in a previous state of existence, of the Four Noble Truths) was the first cause of life with all its misery and sorrow. From this ignorance comes *Conformations*, or the character-forming qualities derived from former births; from conformations come *Consciousness*; from consciousness *Corporeal Form and Name* (that is, individual being); from this come the *Six Organs of Sense*; from these *Contact*; and from contact with the objects of sense comes *Sensation*; from sensation comes *Desire*, or lust, which in

turn brings *Attachment*, or clinging to the object of desire (life); from this clinging to life comes *Continuity of Becoming*. This leads to *Birth* in one of the six *GATI* (q. v.), and with birth come *Sickness*, *Disease*, and *Death*. But if Ignorance, the first cause, be removed by the complete extinction of desire, each link will in turn be removed, rebirth will be avoided, sorrow and suffering will come to an end, and Nirvāna will be attained. See Monier-Williams's *Buddhism* (London and New York, 1889); Oldenberg's *Buddha* (trans. by Hoey, London, 1882); Alabaster's *Wheel of the Law* (London, 1871); and the other works mentioned under the article BUDDHISM.

R. LILLEY.

Nibelungen: See NIBELUNGENLIED.

Niebuhr, *nee'boor*, **BARTHOLD GEORG**: historian and statesman; b. at Copenhagen, Denmark, Aug. 27, 1776; studied law and philosophy at Kiel and Göttingen; was appointed private secretary to Count Schimmelmann, Danish Minister of Finance, in 1796, and next year secretary to the royal library in Copenhagen; visited England in 1798, and entered the civil service of the Danish Government in 1799; but his enthusiasm for England and hatred to Napoleon made it very unpleasant for him in Copenhagen, and in 1806 he removed to Berlin, where from this year till 1809 he held various offices in the financial department of the Prussian Government. He soon fell out, first with Stein, then with Hardenberg, and finally resigned. Appointed historiographer to the King of Prussia, he delivered in 1810-11 a course of lectures on the history of Rome at the newly established University of Berlin, and in this sphere his brilliant genius and immense learning at once found their proper application. From 1816 to 1822 he resided in Rome as Prussian ambassador to the papal court, though in reality wholly occupied by scientific studies; and in the latter year he removed to Bonn as professor at the university. Here he developed a great literary activity; founded the *Rheinisches Museum* (1827), superintended the new edition of the *Corpus Scriptorum Historiæ Byzantinæ*, and continued his great work, the *Römische Geschichte*. Under the violent impression which the French Revolution of 1830 made on him, he broke down mentally and physically, and died Jan. 2, 1831. His *Römische Geschichte* (3 vols., 1811-32) is, so far as it goes—namely, to the first Punic war—a complete reconstruction of the history of Rome. The entire narrative of the founding of Rome, and the subsequent regal period, all of which had up to Niebuhr's time been accepted as authentic history, he discarded, after a thorough critical analysis, as purely legendary. Some of his hypotheses have been rejected, such as that of the epic source of the early Roman legends; others have been modified, such as that of the origin of the *plebs*; but the fundamental distinction between history and legend, and the methods employed in distinguishing them, inaugurated a new epoch in the study of history, and his wonderful intuition into the correlation between the various elements of which a social organism is composed, as well as the astonishing power of imagination with which from a few scanty remnants he reconstructed the whole organism, will always bear witness to his eminent genius. Other works are: *Kleine historische und philologische Schriften* (2 vols., 1828); *Lectures on Roman History* (3 vols., 1843); *Lectures on Ancient History* (3 vols., 1851); edition of *Fronto* (1816). See Susanna Winkworth, *Life and Letters of B. G. Niebuhr* (3 vols., London, 1852); F. Eysenhardt, *Barthold Georg Niebuhr* (Gotha, 1886); Bursian, *Gesch. der class. Philol. in Deutschland*, pp. 647-663.

Revised by ALFRED GUDEMAN.

Niebuhr, **KARSTEN**: traveler; b. at Lüdingworth, in the Hanoverian district of Hadeln, Mar. 17, 1733; studied mathematics at Göttingen; became lieutenant-engineer in the Danish service in 1760, and in the following year was sent as mathematician to an expedition to Arabia, Persia, and the neighboring countries for the purpose of obtaining information bearing on New Testament history and geography. Though all his companions in the expedition perished Niebuhr continued his travels for several years, and on his return to Denmark applied himself to the preparation of a valuable work on Arabia, *Beschreibung von Arabien* (Copenhagen, 1772). He also published *Reisebeschreibung von Arabien und andern umliegenden Ländern* (1774-78) and *Reisen durch Syrien und Palästina* (1837), and edited the papers of Forskal, the naturalist, who died on the journey—*Descriptiones animalium* (1755) and *Flora Egyptiaco-Arabica* (1776). D. at Meldorf, Holstein, Apr. 26, 1815.

Niel, nê-el, ADOLPHE: marshal of France; b. at Muret, Haute-Garonne, France, Oct. 4, 1802; was educated at the École Polytechnique of Paris and the Military Academy of Metz; distinguished himself in the expedition against Constantine 1836, and was made commander of the engineering corps in Algeria; took part in the expedition against Rome in 1849; conducted the siege of Bomarsund in 1854, and planned the operations which led to the fall of Sebastopol; distinguished himself in the Italian campaign of 1859, was made a marshal of France after the battle of Solferino, and Minister of War in 1867. D. in Paris, Aug. 13, 1869.

Niel-lo-work: ornamental work in which plates of metal are engraved with ornamental figures, the lines of which are then filled with a black alloy and the whole burnished. The art is practiced in Russia, and to a certain extent by the silversmiths of Western Europe and the U. S. Some of the earliest and best niellos are Byzantine; the most celebrated are Italian of the Cinque-cento period, and printing from engraved plates is thought to have originated in niello-work of that time. R. S.

Niemcewicz, nyem-tsev'ich, JULIAN URSYN: poet; b. at Skoki, Poland, Feb. 16, 1757; received a military education, but left the service in 1788, and entered into Polish politics as a deputy from Lithuania; fought in 1794 at the side of Kościuszko; was carried, together with him, as a prisoner to St. Petersburg, and later accompanied him to the U. S. He returned to Poland in 1807, and played a conspicuous part in politics there till 1830. Shortly after the fall of Warsaw he went to Paris (1833), where he resided till his death, May 21, 1841. In Polish literature he became very celebrated as the author of elegies, e. g. *Dumnie w Urszowie* and *Maje przemiłne*, and of the memorable historical songs *Śpiewy historyczne* (Warsaw, 1816-18-19). He also wrote dramas, *Powrót posła* (The Messenger's Return), *Katynia: wielki Samolub*, *Dwór na gościeniu*; and romances, *Dwaj Szczerzowie* (1815), *Lejba i Siora* (1821), *Jan z Tegzyna* (3 vols., Warsaw, 1825). Two volumes of his *Memoirs* were published at Posen, 1871.

Revised by J. J. KRÁL.

Nie'men: river of Prussia and West Russia. It rises a few miles S. of the city of Minsk, becomes navigable at Grodno, and divides at Winge into the Russ and the Gilge, both of which fall into the Kurisches-Haff. It is 500 miles long, navigable 400 miles from its mouth, and is of considerable commercial consequence.

Niepcz, nê-eps', JOSEPH NICÉPHORE: one of the inventors of photography; b. at Châlons-sur-Saône, France, Mar. 7, 1765; entered the army 1792, and saw active service in Italy; was administrator of the district of Nice 1795-1801. In the latter year he returned to Châlons, and devoted himself to researches in chemistry and lithography. In 1813 he conceived the idea of obtaining sun-pictures, and afterward in conjunction with DAGUERRE (*q. v.*) he invented several of the earlier processes used in PHOTOGRAPHY (*q. v.*). D. July 5, 1833. —His nephew, CLAUDE MARIE FRANÇOIS NIEPCE DE SAINT-VICTOR (1805-70), also a soldier, wrote *Traité Pratique* (1856) on photography, and *Recherches Photographiques* (1855).

Nievo, nê-ä'vô, IPPOLITO: poet and novelist; b. at Padua, Italy, Nov. 30, 1832. He studied philosophy and history at the university in his native place, but while still a student became ardently interested in the revolutionary movements then going on. He joined Garibaldi as a volunteer, and accompanied him as an officer on his Sicilian expedition. On his return, in Mar., 1861, he was lost in the wreck of the steamer Ercole, near the Gulf of Naples. He had published several stories showing great talents: *Il conte pecorajo*, *Angelo di bontà*, and *Le avventure del Barone di Nicastro*. Still more interesting, however, is his posthumous *Confessioni di un attore* (2 vols., Florence, 1867)—a kind of historical romance, giving a survey of the history of Italy from 1775 down to 1858, and full of episodes drawn with a most skillful hand. His verses have been published under the title *Poesie di Ippolito Nievo* (Florence, 1883).

A. R. MARSH.

Nièvre, nê-evr': central department of France; situated along the Loire and its two affluents, the Allier and Nièvre, and the Yonne, an affluent of the Seine. Area, 2,632 sq. miles. It is mountainous, and not very fertile. Wine is extensively produced, but wheat is not raised in sufficient quantity for home consumption. Timber and minerals are abundant. Iron, coal, copper, lead, and silver are mined, and there are marble quarries and manufactures of glass and pottery. Pop. (1891) 343,581. Capital, Nevers.

Niger: the third largest river in Africa, in respect of its length and the size of its basin. It drains an area of about 1,150,000 sq. miles. It is formed by the junction of three little rivers, in about 8° 20' N. lat. and 10° W. lon., and is known to most of the natives in its upper course as the Joliba and in its middle and lower courses as the Quorra. It is 2,500 miles long, and is notable by two facts: (1) Its delta, which begins 100 miles from the sea, is the largest in Africa, the mouths of its outermost branches being 200 miles apart, the whole including 14,000 sq. miles of low alluvial plain covered with forest and jungle. (2) The Niger is the only river in Africa which affords uninterrupted steam navigation between the sea and the heart of the continent. On this route, however, the Niger is followed only as far as the confluence with its greatest tributary, the Benue, on which light-draught steamers journey as far as Yola in Adamawa. Rising among mountains, the Niger flows sluggishly N. to the edge of the Sahara, and then, describing a great bend, it flows S. E. and S. to the Gulf of Guinea, its course running nearly all the way through an undulating plain. The French have navigated the river in light-draught gunboats from Bamaku, on the upper Niger, to the port of Timbaktu. Ascending from the sea, rock obstructions stop navigation at Rabba. The main channel through the center of the delta is known as the Nun river.

C. C. ADAMS.

Niger Territories: the region in Northwest Africa governed by the Royal Niger Company under a charter granted by Great Britain in 1886. The company, through their agents, made treaties with about 300 native states and tribes, and the region embraces about 500,000 sq. miles, including the Niger delta, but most of it E. of the Niger, and between the Sahara and the Benue river. Their authority over most of this territory is merely nominal, and they have (1894) apparently no influence whatever over the great states of Sokoto and Bornu. The capital is Asaba, above the Niger delta, where public buildings, including a prison and hospitals, have been erected. The head station of the military force is at Lokoja, at the confluence of the Niger and Benue rivers. Trade is making gradual but encouraging progress, amounting (1893) to nearly £400,000. A council in London governs the territories. The importation of spirituous liquors is prohibited in nineteen-twentieths of the area.

C. C. ADAMS.

Night-blindness: See BLINDNESS.

Night-hawk: a name applied in North America to birds of the genus *Chordeiles*, belonging to the family *Caprimulgidae*, or goatsuckers. They are sometimes confounded with the whip-poor-will, from which they may be readily distinguished by their forked tails and absence of bristles about the mouth. The beak is small, gape of mouth wide, wings very long. The plumage is mottled with black, white, gray, and tawny, and there is a conspicuous white patch on the wing. The common species, *Chordeiles virginianus*, is abundant in Eastern North America, and there are two sub-species, one in Florida and one in the Southwest. The Texan night-hawk (*C. texensis*), found also in the Southwest, is smaller and lighter colored. The eggs are laid upon the bare ground, without a nest. The birds are well known by their sharp cry and the loud booming sound produced at twilight by the rapid rush through the air. Night-hawks devour enormous quantities of insects, over 600 having been found in one bird.

F. A. LUCAS.

Night-heron: a popular name for several species of herons belonging to the genus *Nycticorax*, distinguished from other herons by stouter bills and shorter legs and necks. The most common species is *Nycticorax nycticorax*, which is found in both Europe and North America, although the American bird is accorded the rank of a sub-species, *N. n. naevius*. It is about 2 feet in length, and when adult of a light ashy color, top of head, scapulars, and interscapulars dark glossy green. There are two long, slender white plumes hanging from the tail. This bird, locally known as qua or quawk from its cry, breeds in colonies, nesting in high trees in swampy localities. *Nycticorax violaceus* of the Southern U. S. is a rarer and somewhat handsomer bird.

F. A. LUCAS.

Nightingale [O. Eng. *nihtgale*; *niht*, night, + *gale*, sing]: *Daulias luscinia*, a small and inconspicuous member of the family *Sylviidae*, famed for its song, which is heard not only at night, but during the day as well. The nightingale is about the size of a bluebird, and is reddish brown above, grayish white below. It is common throughout a

great part of Europe, ranges east into Persia, and occurs in Northern Africa. It also visits England, particularly the eastern and southern counties, where its song may be heard from the middle of April to the middle of June. The Per-



The nightingale (*Daulias tuscina*).

sian nightingale (*Daulias hafizi*) is said to be the bulbul of the poets, but that name is now generally applied to birds of the genus *Pycnonotus*, members of another family, the *Iridæ*. The nightingale feeds principally upon worms and insect larvæ. The nightingale of the East Indies is the *Kittacincla macrura*, a bird resembling the true nightingale. It sings by night or in a darkened cage, and its song is regarded as equal to that of the true nightingale.

F. A. LUCAS.

Nightingale, FLORENCE: b. at Florence, Italy, in May, 1823, of wealthy English parents. Prompted by philanthropic instincts, she early turned her attention to the relief of humanity, and studied systems of nursing and hospital management under the Sisters of Charity in Paris and subsequently at the Kaiserswerth institution on the Rhine. During the Crimean war she was sent by the British war department, at the head of a band of select nurses, for the relief of the sufferings of the sick and wounded at Constantinople, and in this position displayed marvelous energy and ability; and the testimonial of £50,000 subscribed for her by a grateful public she devoted to the founding of a training-school for nurses. Her chief writings are *Notes on Hospitals* (1859); *Notes on Nursing* (1860); *On the Sanitary State of the Army in India* (1863); *Notes on Lying-in Institutions* (1871); *Life or Death in India* (1873), etc.

Revised by S. T. ARMSTRONG.

Night-jar: See GOATSUCKER.

Nightmare [*nicht* + *mare* < O. Eng. *mara*, incubus, bad dream; O. H. Germ. *mara* > Mod. Germ. *mahr*, ghost, nightmare]: a terrific dream (*ephaltes*, *hypnophobia*, *incubus*, *succubus*) in which there appears to be a disagreeable object, as a person, animal, or goblin, present and often upon the breast of the sleeper, accompanied by the inability to cry out, move, or call for help. Some patients have merely a sense of terror, oppression, and inability to call, without any dream. It is often ascribable to heart disease or asthma, more frequently to obstruction in the circulation caused by the pressure of food or flatulency in the alimentary canal, especially when the sleeper lies upon his back and the weight of the overloaded viscera falls upon the aorta. Many of the symptoms of nightmare may occur to nervous and anxious patients in a half-wakeful state just after going to bed. The careful voluntary suspension of the effort to think (a suspension often difficult to accomplish) will usually prevent these attacks, which seem to be due to the performance of the function of thinking at a time when the supply of blood to the brain is deficient. The ancients believed that devils and witches were present during an attack of nightmare. They affirmed that the evil spirits which placed themselves upon the patient were males, called *incubi*, while female spirits and witches, *succubi*, were thought to lie beneath the sleeping sufferer.

Nightshade Family: the *Solanaceæ*, a group of gamopetalous dicotyledons, numbering 1,500 species, mostly natives of the warm climates. They are nearly all herbs or small shrubs, a few only being trees; their flowers are regular, with a superior two-celled ovary, and numerous ovules. The potato (*Solanum tuberosum*), tomato (*Lycopersicum esculentum*), and tobacco (*Nicotiana tabacum*) are members of this family, as are also the species of *Petunia*, *Datura*, *Cestrum*, *Lycium*, etc., many of which are familiar ornamental plants.

CHARLES E. BESSEY.

Nigid'ius Fig'ulus, PUBLIUS: Latin grammarian; prætor 58 B. C. As a follower of Pompey banished by Cæsar, he died in exile 45 B. C. Next to Varro the most learned man of his time, he treated not only grammar, but also subjects connected with natural science and religion. See A. Sweboda, *P. Nigidii Figuli operum reliquie* (Vienna, 1889).

M. W.

Nihilism [from Lat. *nihil*, nothing]: a philosophy of universal negation; a nickname given to the tenets of the extreme section of Russian revolutionists and rebels against the czar's authority, who are erroneously supposed to be partisans of universal destruction, without having any positive constructive element in their programme.

Origin of the Name.—The term Nihilism was invented by the great Russian novelist Ivan Turgenev, and appears for the first time in his novel *Fathers and Children*. It is used as a nickname of the hero Bazaroff, who impersonates an intellectual movement which came into existence during the epoch of the emancipation of the serfs (1861), and which since the appearance of Turgenev's novel has actually been known in Russia under the name of Nihilism.

Primitive and genuine Nihilism was a school of philosophical and ethical individualism which flourished in Russia between 1855 and 1865, and is now entirely extinct. It was the first manifestation of the awakening of the feeling of independence in the masses of educated Russians. It had no political aspects, however, and was by its very nature opposed to political action. It proclaimed man's absolute independence of all claims which the family, society, the state, had upon him. It was a vehement and impassioned protest of the individual man against the subjugation which was imposed upon him by ancient traditions in the name of the family and the community. These early Nihilists did not deny everything, for they believed firmly, fanatically, in science and in the power of the individual mind; but they refused to bow to any other authority, and deprecated all that was based upon emotions, fancy, supposed revelation. Something similar took place in Germany in the so-called *Sturm und Drang* period, and for similar reasons. With all its grotesque exaggerations this early Nihilism was a grand and useful movement in a country where the individual had been crushed and downtrodden for generations. The recognition of the rights of women and of children in modern Russia is due to the struggle of the early Nihilists. They paved the way for the modern militant Nihilism, in which the idea of individual independence has received a broad political and social conception; but this social feeling came from quite a different source.

The Origin of the Modern Political Movement.—Political aspirations manifested themselves with the Russian people at a very early date, almost as soon as Western Europe set them a good example. The Napoleonic wars resulting in the invasion of France and the temporary occupation of her provinces by the Russian and German armies brought a considerable section of the best Russian troops into contact with the French, fresh from their great Revolution. The result was a political fermentation among the officers and even soldiers of the imperial guard which, ten years later (Dec. 14, 1825), brought about the famous Decembrist insurrection, which for a moment imperiled the throne of the Emperor Nicholas. This insurrection, which had for its aim the emancipation of the serfs and the establishment of a free constitution in Russia, and which was led and supported by men of the highest position in the country, opened the long struggle for freedom which has been going on in Russia. The revolt was put down, six of its leaders perished on the scaffold, 125 were sent to the Siberian mines, and all sympathizers and accomplices were treated with extreme severity; but the traditions of this first liberal movement could not be extirpated, and in the next generation there arose in Russia a great writer and patriot, Alexander Herten (see HERTZEN, ALEXANDER), who, having voluntarily expatriated himself in order better to serve the cause of Russian free-

dom, settled in London and there started his famous *Kólokol* (Alarm Bell), a periodical which had an enormous influence in Russia. Moreover, he founded a free printing-office, which did for Russia what the free presses of Switzerland and the Netherlands did for France in the time of Voltaire and Diderot. The leading points of the programme of Herzen and the democrats of his time were those of the Decembrists, namely, free constitutional government for the country and the emancipation of the serfs. Owing to better knowledge of the agrarian arrangements and of the aspirations of the peasantry, they laid proper stress upon the agrarian question, advocating the emancipation of the serfs with land endowment, and they had the satisfaction of seeing that their plan, although mutilated, was accepted in principle by the Government in 1861.

Transformation of the Individualistic Nihilism into a Political and Social Movement.—With the majority of the educated classes aspirations for liberty found their satisfaction in the individualistic rebellion described above. The years 1860–64 mark the fullest dominion of this school, which found its prophet in Dmitry Pisarev, an essayist and literary critic of the *Russkoi Slovo* (Russian Word), the organ of this individualistic Nihilism; but even at this period there was in the movement an undercurrent making in another direction. It may be called social Nihilism as opposed to the individualistic, and was represented in 1860 by Nicholas Tchernyshevsky, the publicist, journalist, economist, and novelist. He was a socialist and the father of the Russian revolutionary movement. He preached the absolute devotion of the individual to the cause of his country, but he gave the idea of self-sacrifice an individualistic interpretation as the fulfillment of the highest personal happiness for people of a high intellectual and moral development. The theory of moralized egotism and egotistical self-abnegation was developed by Tchernyshevsky with admirable skill, and served as a transition to the doctrine of absolute devotion to the good of the community. As time went on and the disastrous results of the economic shortcomings of the emancipation act of 1861 became more and more apparent, the influence of Tchernyshevsky gained upon that of the genuine Nihilism represented by Pisarev. The generation of 1870 was educated by Tchernyshevsky, but it took from him the kernel of his ethics, dropping as useless his theory of all-pervading individualism. Another writer, Schapov, whose name is little known abroad, must be mentioned here, because his influence in shaping the views of the present revolutionary movement was perhaps even greater than that of Tchernyshevsky. Schapov is the historian of the Russian peasantry. His object has been to bring to light the constructive principles of political and social life, adhered to by the masses of the peasantry as opposed to those which the Muscovite, and afterward the St. Petersburg monarchy, forced upon them. These principles are self-government and local autonomy in administrative and ecclesiastical matters, as opposed to the administrative and ecclesiastical centralization of the state; and in the economic domain communistic ownership of land, meadows, forests, fisheries, and all natural riches, as opposed to the system of private property maintained by the state. Thus he has shown the masses of Russian peasantry to be an excellent plastic material for the building up of a community diametrically opposed to the centralized despotism which has been constituted by temporary historical necessity—namely, the military struggle with alien conquerors.

Nihilism since 1870.—Upon the ground thus prepared foreign influences began to work powerfully after 1870, which is the epoch corresponding to the greatest development of international socialism. At that time, as nowadays, international socialists were divided into two sections, the social democrats and the anarchists. The former advocated the abolition of private property in the instruments of labor and their collective ownership by the workmen; but they wished to preserve the present political organizations, which should be made an instrument with which to rebuild the economic structure of the community. Thus for the social democrats the practical object was to take possession of political power. Peaceful electoral agitation was their chief weapon. The anarchists, headed then by the Russian Michael Bakunin (see BAKUNIN, MICHAEL), advocated the total abolition of the state and the substitution for it of a series of small, absolutely independent, and freely constituted communes. Of these two doctrines, the latter had by far the greater fascination for the Russian socialists of 1870. It seemed the shortest way to universal happiness, and it flat-

tered the national feeling of the Russians. The political backwardness of their country was no longer a drawback, but an advantage. The antiquated autocracy was easier to overthrow than a constitutional monarchy based upon the popular vote. According to Bakunin, the village commune (*mir*) had only to be freed from the oppressive tutelage of the state to become an ideal form of the anarchical organization of society. In fact, Bakunin's anarchy was but a queer mixture of the Prudhonian doctrine with the Slavophilism of Khomiakov or *peasantism* of Schapov. The Russian anarchy of 1870 was a mere dream of universal harmony; but it had for its practical result the complete estrangement of the extreme revolutionary party from the majority of advanced Russians. The autocracy was opposed simply because it was a government, no substantial difference being admitted to exist between Russian autocracy and, for example, the English parliamentary régime. Accordingly, nothing was expected and nothing was asked from the educated classes and the liberal opposition, which was in favor of a constitutional government for Russia. The socialists of this epoch based all their hopes upon the peasants. Thousands of young people of both sexes, most of them belonging to the upper classes, went on a crusade among the peasants. They renounced all their privileges and became themselves common manual laborers in the fields, in factories, at the wharves and railways, in all places where common workpeople assembled. The movement failed completely. In 1873–74 some 1,500 propagandists and agitators, or their friends and relatives, were arrested in the thirty-seven provinces of the empire and thrown into prison. Half of them were released after a few months' detention; the rest were kept in solitary confinement for from two to four years, during which seventy-three of them either died or lost their reason. In 1877 a part of them (193) were tried and condemned to various punishments, from simple exile to ten years' penal servitude in the Siberian mines.

A number of other trials of the same nature followed, serving to the Russian socialists as an object lesson, showing the childish inconsistency of their indifference to the forms of political government. Sounder views gained ground very rapidly, but passions spoke first. The wanton cruelty with which political prisoners were treated, the horrors of preliminary detention, the barbarous punishments inflicted for trifling offenses, proved unendurable even to the mild, patient Russians. The spirit of revenge was kindled, giving birth to the first attacks, known by the name of terrorism, upon the Government. The terrorism began with the shot of Vera Zassulitch at Gen. Trepoff, who had ordered the flogging of a political prisoner. On Mar. 31, 1878, she was acquitted by the jury, although she had never denied her act. In 1878 the terrorism was accepted as a system of warfare by the Russian revolutionists, whose organ was a paper called *Zemlia i Volia* (Land and Liberty). This was the first practical struggle with the worst representatives of political despotism, and it gradually led to a very radical change in the theoretical programme. In 1880 the most energetic and numerous section of the Russian revolutionists proclaimed that the aim of their attacks upon the Government was the obtaining of a constitution for Russia. This was the *Narodnaia Volia* party with the "executive committee" at its head, which may be considered the embodiment of Nihilism as understood abroad. A minority made a split, founding a paper called *Tcherny Perediel*, which kept to the exclusively socialist agitation, repudiating all interference in politics. The paper had but a short life, the police having discovered and sequestered its printing-office immediately after the publication of its first number, and the party had such a small following that it could not recover from this blow. It was soon dissolved.

The whole of the revolutionary strength rallied under the banner of the *Narodnaia Volia*, which in 1880 thus formulated its programme of political and economic reforms: 1. A permanent representative assembly, having supreme control and direction in all general state affairs. 2. Provincial self-government, secured by the election of all public functionaries. 3. Independence of the village commune as an economic and administrative unit. 4. Complete liberty of conscience, speech, press, meetings, association, and electoral agitation. 5. Manhood suffrage. 6. Substitution of the standing army by a territorial militia. 7. Nationalization of land. 8. A series of measures tending to transfer the possession of factories to workmen.

These points make the programme a socialistic one, but it

is strictly social democratic. It is intended that the remoulding of the country's economic structure shall be carried out exclusively by the future national parliament. For the present the obtaining of such a parliament is the object to which are directed all the efforts of the revolutionary body known to outsiders by the name of Nihilists. The early formless anarchism has disappeared so completely as to leave no trace whatever. In fact, since 1879 there have not been any anarchist manifestoes or pamphlets, or any declaration of anarchist opinion at any of the numberless trials. There were two ways in which the Nihilists tried to carry out their campaign against autocracy. The first, which is widely known, is that of direct attempts against the representatives of autocracy. The second, which is little known, was the organizing of military insurrections similar to that of the Decembrists. These insurrections did not take place; the police succeeded in discovering the plots before they were matured. In the years 1882-84 about 300 military officers of all arms were arrested all over the empire.

In 1888 the minority, which had seceded from the bulk of the party and founded the unsuccessful *Tcherny Perediel*, started in Switzerland a paper, *The Social Democrat*, fully indorsing the programme of the German socialists. Owing to the remarkably rapid growth of this party among German workmen, and the direct and indirect influence of this momentous fact upon Russian workmen, this party has made striking progress among the workmen of all large Russian cities. It has for its immediate object the overthrow of the autocracy, but reckons only upon the power of the proletarians, while the majority of the revolutionary party gives greater prominence to the agrarian question, appealing chiefly to the masses of the peasantry on the one hand and to the liberty-loving, educated classes on the other. Its weapon is organized public opinion, which will force the Government to yield to the legitimate demands of the people, which "include alike the conception of the right of the people to political freedom and the conception of their right to satisfy their material needs on the basis of national production. The party considers the guarantees of these rights to be: 1. Representative government on the basis of universal suffrage. 2. Freedom of religious belief. 3. The independence of courts of justice. 4. Freedom of the press. 5. Freedom of meetings and associations. 6. Inviolability of the individual and his rights as a man." The programme adds the demand for wide provincial and territorial self-government, considering that in view of the variety of tribes and nations composing the empire, "a necessary condition of political freedom is the recognition of the right to political self-determination for all the nationalities entering into its composition."

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(2) Upon the modern movement: George Kennan, *Siberia*; Edmund Noble, *The Russian Revolt*; Peter Kropotkin, article in *The Fortnightly Review* (London, June, 1882); Adolph Thun, *Geschichte d. Russ. Nihilismus* (Basel, 1883); L. Tikhomirov, *Russia, Political and Social* (London, 1887); Stepmak, *Underground Russia* (London, 1883) and *The Russian Storm Cloud* (London, 1886). S. STEPNIK.

Niigata, nee'čē-gaa'tā : a city and port of Japan; situated on the west coast of the main island, at the mouth of the Shinanogawa; seat of the local government of Echigo (see map of Japan, ref. 5-D). The town is built on a narrow strip of land between the river and the ocean, which is barred from view by high sand hills. Opened to foreign trade in 1869, and nominally a treaty-port and the residence of foreign consuls, Niigata has virtually no foreign trade. The bar at the mouth of the river prevents vessels of foreign build from entering, and the open roadstead is unsafe. During high westerly winds vessels have to seek shelter at the isle of Sado, about 40 miles distant, which, famed for its gold mines, forms part of the prefecture of Niigata. Niigata is a bigoted center of Buddhism. A species of muslin, *chijimi*, made from hemp, is manufactured in the country districts: the apples and watermelons of the province are considered the best in the empire. Pop. 40,778.

J. M. DIXON.

Nijmwegen : See NYMWEGEN.

Nijnii-Novgorod, or Nijegorod : government of Central Russia, along the Volga and its affluents, the Oka and the Vetlooga. Area, 19,797 sq. miles. The surface is mostly level; the soil is not very fertile, but excellently cultivated; large quantities of grain, hemp, and flax are raised. In the northern part extensive forests are found, which have given rise to considerable ship-building and manufactures of all kinds of wooden implements. There are also manufactures of Russian leather, soap, iron, and many other articles. Pop. (1890) 1,569,500.

Nijnii-Novgorod : town of Russia; capital of the government of the same name; on the right bank of the Volga, at its confluence with the Oka; 275 miles by rail E. of Moscow (see map of Russia, ref. 6-F). The town is divided into two parts, the principal one being situated on the steep promontory, triangular in shape, and 400 feet high, at the apex of which, on the highest point, stands the Kremlin or citadel, surrounded by a wall 30 feet in height. This portion of the town is mainly made up of three handsomely built streets; the low town consists of one long street along the Volga. The whole town is built of wood, and has few attractions. It is remarkable, however, for a great fair held, from July 15 into September, on a triangular space formed by the junction of the left bank of the Oka with the right bank of the Volga, and so low as to be in other seasons often entirely inundated. (See FAIR.) The ground is laid out for streets, and the Russian Government has established a system of permanent sewerage, extending from river to river, which is in itself an object of interest. As the time for the fair approaches, a great town springs up, with churches, theaters, hospitals, etc., all built of wood in a substantial manner. Hundreds of thousands of people flock here on these occasions, the only means of access from the town being by a bridge of boats across the Oka. The waters are almost completely covered with boats engaged in conveying goods and people, and a large number of people occupy their boats as residences during the fair. The extension of railways and perfection of other means of internal communication through Russia and contiguous portions of Asia does away largely with the motive for fairs of this kind, and this at Nijnii is diminishing in importance. Pop. (1890) 73,033.

Revised by A. C. COOLIDGE.

Nijnii-Tagilsk : town; in the government of Perm, Russia; in the Ural mountains; in a district exceedingly rich in iron, copper, lead, and platinum (see map of Russia, ref. 5-I). It contains a mining-school, extensive forges, and manufactures of machinery. Pop. about 40,000.

Nikko [lit., sun's brightness] : a village of Japan, about 80 miles by rail N. of Tokio, situated at the base of the great range of mountains of which Nantai-san is the chief (see map of Japan, ref. 6-E). Here are situated the finest temples in the empire. Always associated with religious edifices, Nikko became of first importance as a religious resort on the death of IYEFASU (*q. v.*), whose mausoleum was erected on the southern slope of a hill called Hotoke Iwa. About fifty years after the burial of Iyeyasu in 1617, a son of the emperor became abbot of Nikko, and henceforth, till 1868, a prince-abbot was always in residence. A long and magnificent avenue of cryptomerias leads up to Nikko, and its temples are marvels of elegance and beauty. Noteworthy sights are the red-lacquered bridge, crossed only by the emperor, which has been recently renewed, and several fine waterfalls. Nikko, which is a favorite summer resort, is 2,000 feet above sea-level. J. M. DIXON.

Nikolaevsk, neē-kō-laa'evsk : fortified town of Eastern Siberia; on the Amur, 23 miles from its mouth (see map of Asia, ref. 2-I). It was founded in 1851, and is an important port. Pop. 2,500.

Nikola I. Petrović-Njegoš, pet'rov-ich-nēg'ōsh : poet; b. at Cetinje, Montenegro, Oct. 7, 1841; was educated at Trieste and Paris (1856-60); succeeded his uncle Danilo (assassinated Aug. 13, 1860) as reigning Prince of Montenegro; waged successful wars on the Turks in 1862 and again in 1876, considerably enlarging his territory. He gave his country a new code of laws and a sort of constitutional government. He published some of his poems composed in the Servian language in the almanac *Orlić*, over the signature "N." They are lyric songs eulogistic of freedom, and epics modeled after the folk-song. He wrote two historical tragedies, *Vukašin* and *Balkanska carica*. In 1873 he printed a collection of his poems for his private use. Some of his poems have been translated into other Slavonic languages. J. J. KRÁL.

Nikon: Patriarch of Moscow; b. at Nijnii-Novgorod, Russia, 1605; educated in a monastery; rose to be patriarch 1652; introduced Greek music into the Russian Church and revised the Russian liturgy and confession of faith. These reforms excited the violent opposition of the conservatives, some of whom split off, establishing the sect called Raskolniks or Old Believers. By their intrigues he was compelled to retire to a monastery 1658, and in 1666 he was deposed. The new czar canceled this action and restored him to his see, and he was hastening to resume his place when death overtook him Aug. 17, 1681. See Stanley, *History of the Eastern Church*, and W. Palmer, *The Patriarch and the Tsar*, a translation of Nikon's replies to his enemies and a history of his career (6 vols., London, 1871-76). SAMUEL MACAULEY JACKSON.

Nile [from Lat. *Nīlus* = Gr. *Νεῖλος*, Nile]: probably the longest and most celebrated river in the world, and the most remarkable of the four great streams of Africa. It flows from the equatorial regions along and inside the eastern axis of the continent, and after a course of 4,300 miles (estimated) reaches the Mediterranean in 31° 30' N. lat. by two principal mouths, forming a delta which begins near Cairo, 100 miles from the sea, and extends 150 miles along the shores. The upper half of the Nile drains vast tropical regions abundantly watered and receives many tributaries; the lower or northern half traverses the rainless portion of the great desert regions, where its valley, bordered by bare rocky bluffs, appears like a band of verdure in the midst of this desolate country.

The basin of the Nile is about 1,500,000 sq. miles, or half the size of the U. S., exclusive of Alaska. For centuries from 200 B. C. the ancient geographers declared that the river rose far S. in great lakes whose position was approximately given by Ptolemy. Their information was discredited by later geographers, and the source of the Nile was the greatest geographical problem until it was solved by several explorers, chief among whom were Speke, the discoverer of Victoria Nyanza, and Baker and Stanley, who revealed Lakes Albert Nyanza and Albert Edward respectively. The ultimate head-waters are not yet definitely determined. The Congo-Nile water parting S. of Victoria Nyanza approaches within 25 to 125 miles of the southern shores of that lake. It is not unlikely that the Kagera affluent of Victoria Nyanza, rising among the mountains near the northeastern shores of Tanganyika Lake (Baumann, 1892), is the most remote source. The main fact is that the Nile proceeds from three lakes lying on high plateaus under the equator—Victoria Nyanza (3,800 feet), Albert Edward (2,850 feet), and Albert Nyanza (2,300 feet). Victoria Nyanza is very remarkable, considering its size, for the small gathering-ground from which it collects its waters. The true Nile issues from the north end of it as a powerful and rapid stream flowing toward the N. W. into Albert Nyanza, where it is joined by the waters received from Albert Edward. Thence it runs with rapid course, and leaves the plateau regions to enter the great plains of the Egyptian Sudan. Here it receives from the W. the waters of a vast network of rivers collected by the Bhar-el-Arab and the Bhar-el-Gazal, and those of the eastern plateaus through the Sobat. After the junction of these rivers, under the name of Bhar-el-Abiad, or White Nile, it follows again a northern course between the tablelands of Kordofan and the plains of Sennaar to Khartum, where the Blue Nile, or Bhar-el-Azrek, brings to it the united waters of the Abyssinian plateau and its snowy mountains. Lower down, about N. lat. 17° 40', another powerful stream, the Atbara, or Black Nile, pours in the waters of Northern Abyssinia. From this point to the Mediterranean, along its course of nearly 1,500 miles, it receives not a single tributary of importance. Thence making a great bend, it forms a series of rapids, the so-called cataracts of the Nile, the last of which is at Assuan, at its entrance into Egypt.

Like all streams fed by the periodical rains of the tropics, the Nile has its regular season of freshets overflowing its broad valley, transforming Egypt into a widespread lake from which the cities rise like islands. At Khartum the river begins to rise early in April, but in Egypt generally on June 25. The waters then gradually increase until Sept. 27. At Thebes the flood reaches 40 feet; at Cairo, 27; and at Rosetta, at the mouth of the river, 46 feet. After their retreat the waters leave behind them mud and moisture, in which seeds deposited produce a most luxuriant vegetation and a succession of rich crops. Egypt's proverbial fertility

thus entirely depends upon this annual inundation of the Nile, which renews the manure of its soil and provides the necessary moisture in this rainless climate. A rise of only 20 feet at Cairo causes a scarcity; more than 27 feet is unfavorable, and these excessive floods have in recent years caused great destruction of property, including crops. The White Nile contributes very little to the fertility of Egypt, the rich sediment being derived from the Abyssinian tributaries, chiefly the Atbara. At the flood period an enormous volume of the water goes to waste, though it is sorely needed at low water. The necessity of a vast scheme of water-storage is admitted, and engineers (1894) are selecting sites for great reservoirs which may be filled at flood periods and emptied at low water. The Nile is navigable for small vessels for the greater part of its course, but in the White Nile masses of aquatic vegetation, known as the sud, sometimes impede and even imprison vessels.

Revised by C. C. ADAMS.

Niles: city; Berrien co., Mich. (see map of Michigan, ref. 8-H); on the St. Joseph river, and the Cleve., Cin., Chi. and St. L. and the Mich. Cent. railways; 48 miles S. W. of Kalamazoo, 90 miles E. of Chicago. It is in an agricultural region, derives large power for manufacturing from the river, and contains flour and paper mills, iron-foundries, carriage and wagon factories, and other industrial works, two national banks with combined capital of \$150,000, a State bank, capital \$25,000, and a daily and three weekly newspapers. Pop. (1880) 4,197; (1890) 4,197; (1894) 4,508.

Niles: city; Trumbull co., O. (for location of county, see map of Ohio, ref. 2-J); on the Mahoning river, and the Erie, the Penn., and the Pitts. and W. railways; 5 miles S. E. of Warren, the county-seat, 58 miles E. of Cleveland. It contains 9 churches, public, high, and grammar schools, electric lights, and street-railways, water-works, several manufacturing, and a daily and two weekly newspapers. Pop. (1880) 3,879; (1890) 4,289.

EDITOR OF "INDEPENDENT."

Nilghau, or **Nylghau** [Hind., liter., blue ox; *nīl*, blue + *gau*, ox, cow; cf. Sanskr. *gāus*; Gr. *βοῖς*; Lat. *bos*]: a large antelope (*Portax tragocamelus*) found in India, inhabiting the jungles, but apparently preferring the vicinity of cultivated land. The male is of a blue-gray color when full grown, and stands about 4 feet high at the shoulders. The females and young males are tawny red. The horns are 6 or 7 inches long. It is at times very wild, courageous, and resolute, but ordinarily falls an easy victim to the spear or rifle of the hunter. It has never been thoroughly tamed. The flesh is very poor, but the hides have a limited use in the arts. F. A. LUCAS.

Nilsson, CHRISTINE: singer; b. near Wexiö, Southern Sweden, Aug. 3, 1843, of a peasant family. Her father and brother obtained a humble living by playing music at peasant festivities in the neighborhood. Christine attracted the attention of Count Tornérhjelm by her playing and singing in a public market-place, and went by his aid to Halmstad, Stockholm, and Paris, where she finished her musical education by three years' study under Wartel, and made her *début* with eminent success at the Théâtre Lyrique, Oct. 24, 1864, in *La Traviata*. In 1867 she appeared in London in both opera and oratorio, and in 1868 she made a great sensation in Paris by her representation of Ophelia in Ambroise Thomas's *Hamlet*. In that year also she sang in the Crystal Palace, London, at the Handel festival. She first appeared in the U. S. in 1870 in concerts, and in 1871 sang in opera with great success. No singer ever visited the U. S., with the exception of Jenny Lind, who created such an instantaneous furor. She reappeared in London in 1872, and in that year was married in Westminster Abbey to Auguste Rouzeaud, who was connected with a Paris banking-house. He afterward failed in business, and died in an asylum for lunatics in 1882. In 1873 she sang with great success in St. Petersburg. From 1872 to 1877 she sang in London in Italian opera at Drury Lane and at her Majesty's theater, taking the part of Elsa in *Lohengrin* in 1875. She visited her native country in 1876 and again in 1885. In 1883 she made another professional tour in the U. S.; married in Paris Count Casa de Miranda, a Spanish nobleman, Mar. 12, 1887. Soon after she retired from the stage. Her favorite rôles are Mignon, Elsa, and Margherita. Her voice possesses remarkable sweetness, brilliancy, and evenness.

B. B. VALLENTINE.

Nilsson, SVEN: naturalist and archaeologist; b. Mar. 8, 1787, in Asmundtorfs parish, in Skaane, Sweden, where his

father was a peasant. He was Professor in Natural History in the University of Lund 1832-56, and became widely known as a high authority in zoölogy and palæontology. His most important zoölogical work is his *Skandinavien Fauna*, in four volumes. A fifth volume of *Illuminated Figures of the Scandinavian Fauna* properly belongs to the set, and the whole constitutes a monumental work. In his later years he devoted himself almost exclusively to Scandinavian antiquities, and by his celebrated work *Skandinaviska Nordens Ur-inväpnare*, in two magnificent volumes, he became one of the founders of the science of archæology. The first part of this work on the inhabitants of Scandinavia during the stone age was translated into English and published in London by Sir John Lubbock in 1868. The second part treats in a similar manner of the bronze age. Nilsson died Nov. 30, 1887. RASMUS B. ANDERSON.

Nimeguen: See NIMWEGEN.

Nîmes, neem (anc. *Nemausus*): capital of the department of Gard, France; beautifully situated in a valley between hills covered with vineyards and orchards (see map of France, ref. 8-G). It is the see of a bishop, has many excellent educational institutions, and its manufactures of cottons, lace, hosiery, brandy, and especially of silks, are very important. The old portion of the city is poorly built, and is separated by boulevards from the eight modern suburbs, which form the larger part of the town. The architectural monuments which the city contains from the Roman period are of the highest interest. The Maison Carrée is a beautiful Corinthian temple, well preserved, thoroughly restored since 1789, and now used as a museum of paintings and antiquities. Les Arènes is the best preserved amphitheater which exists, containing from thirty-two to thirty-five ranges of seats. In the early Middle Ages it was employed repeatedly as a stronghold; afterward poor people used it as a sort of free tenement-house. Since 1858 it has been completely restored. Pont du Gard, the magnificent aqueduct, is in the vicinity of Nîmes. The citadel, now used as a prison, dates from 1687. The Romans occupied the city in 121 B. C., and during the first emperors it was a magnificent city. Subsequently it suffered much from the Visigoths, Saracens, and Normans, and in the fourteenth century it was nearly deserted. Under Francis I. it rose again, and although it suffered much by the revocation of the Edict of Nantes and during the Revolution, it is very prosperous. Pop. (1891) 71,623.

Nimrod: according to Gen. x. 8-12, a son of Cush and grandson of Ham, "a mighty hunter before the Lord," "a mighty one in the earth," who founded an empire in Shinar or Babylonia and extended his authority northward over the territory of Assyria. This narrative is probably in part an echo of certain ethnic movements. That Assyria was a colony from Babylonia is an assured result of cuneiform study. The name Nimrod, however, has not yet been found in the cuneiform literature. The character is believed by many to be identical with the hero of the great epic, commonly called the Izdubar epic. The Oriental imagination was deeply impressed by the biblical picture of Nimrod, and made of him a tyrant who persecuted Abraham and was guilty of many other acts of cruelty. D. G. LYON.

Nimrūd, or **Nimroud**: the modern Arabic name of the ruins which represent the ancient Assyrian city Calah (Assyr. *Kalkhu*, Heb. כַּלְחָה). They lie on the east side of the Tigris, about 20 miles S. E. of Mosul, and about 7 miles above the mouth of the upper Zab. Calah was built by Shalmaneser I. about 1320 B. C., and was after Asshur and Nineveh the third Assyrian capital. After the rise of Calah the three cities flourished contemporaneously, certain of the kings having palaces in more than one of them. When Assur-nazir-pal (884-860) ascended the throne he found Calah in ruins and Assyria in a weak condition. A great warrior, he restored the military power of the nation and rebuilt the city. Here resided likewise his son, Shalmaneser II. (860-824), and his great-grandson, Ramman-nirari III. (811-782). Shalmaneser II. has left inscriptions at Calah, Asshur, Nineveh, Balawat, and other places. Of later kings who adorned Calah may be mentioned Tiglath-pileser III. (745-727), Sargon (722-705), and Esarhaddon (681-668). Sargon's chief architectural work was, however, at his new capital, Dūr-Sharrukin, and that of his sons was at Nineveh. With the accession of the Sargon dynasty therefore the importance of Calah began to decline. The buildings erected here were not only palaces, but also temples and *ziggurats*, or towers,

pyramidal in shape. In the last year of the reign of Asshur-nirari (754-745), as we learn from the eponym canon, Calah was the scene of an insurrection. Tiglath-pileser III., the successor of Asshur-nirari, may have made use of this insurrection to seize the throne.

The ruins are about a mile and a half from the Tigris, but formerly the river, which has shifted its course several times, ran along the western and southwestern sides of the city. The inclosure is almost rectangular in shape, not quite a mile and a half from E. to W., and somewhat less than a mile from N. to S. The southern wall, beginning at the southeast angle of the inclosure, runs W. for half a mile, then turns S. and extends another half mile to the old bed of the Tigris. The greatest length from N. to S. is therefore almost as much as that from E. to W. The principal buildings were on an artificial mound or platform in the southwest angle of the inclosure, extending about two-fifths of a mile N. and S. and about one-fourth of a mile E. and W. The Tigris seems to have washed the west and south sides of the mound. George Smith enumerates the buildings as follows: 1. A tower on the northwest corner of the mound, faced with stone to the height of 20 feet, 167 ft. 6 in. each way, built by Shalmaneser II. 2. Temples around the tower built by Assur-nazir-pal. 3. The northwest palace (S. of the tower), about 350 feet square, built by Assur-nazir-pal, repaired by Sargon. 4. The center palace (S. of the northwest palace), built by Shalmaneser II., added to by Ramman-nirari III., dismantled by Tiglath-pileser III., who rebuilt it; destroyed by Esarhaddon. 5. The southwest palace (S. of the center palace), built by Esarhaddon out of materials of the northwest and center palaces. 6. The southeast palace (E. of the southwest palace), built by Shalmaneser II. 7. Temple of Nebo (N. of the southeast palace), built by Ramman-nirari III.

The first excavations at Nimrūd were begun by A. H. Layard in 1845. He was encouraged thereto by Botta's success at Khorsabad. The expenses were borne by Sir Stratford Canning, and the work was successful from the start. Many large and beautiful alabaster bas-reliefs were secured for the British Museum. Those come particularly from the palace of Assur-nazir-pal and are of great value, not only as works of art, but also for the light which they shed on the military methods and the religious beliefs of the times. In the attention paid to the adornment of weapons and furniture, and in the representation of the minute and elaborate embroidery on the dress of the king and his attendants, these sculptures are hardly equaled by any of the work of the two remaining Assyrian centuries. Many of these bas-reliefs were in duplicate, and not a few of the duplicates were sent to the U. S. (See ASSYRIA, under *History*.) Plaster reproductions of the British Museum reliefs may be seen in the Harvard Semitic Museum at Cambridge, in the Metropolitan Museum at New York, and in smaller numbers at other places. Layard's work at Nimrūd occupied parts of several years. Others have also carried on excavations there, notably Hormuzd Rassam and George Smith.

See articles ASSYRIA and ASSYRIAN EXPLORATIONS and the literature there cited, and for the topography, Felix Jones's *Vestiges of Assyria*, sheet 2. D. G. LYON.

Ninepins: See BOWLS AND BOWLING.

Nine-point Circle: See CIRCLE.

Nineveh (Assyr. *Ninā* and *Ninua*, Heb. נִינְוָה, Gr.

Ninos, Septuagint version, *Niveus*): the most celebrated city of the Assyrians. Classical tradition ascribes the founding of the city to Ninus and his wife Semiramis, but this is incorrect. Ninus seems to be a mythical personage. The name Semiramis has with probable correctness been identified with Sammuramat, the name of the wife of Ramman-nirari III. (811-782), but Nineveh had existed for many centuries before the time of Sammuramat. The name of the city resembles the Assyrian word for fish (*nīnu*, Heb. נֶזֶם), and some persons seek a connection between the two. They find corroboration in the complex ideogram (the sign for fish inside the sign for receptacle) by which the city is represented, and also in the story concerning the great fish which swallowed Jonah, the prophet to Nineveh.

The history of the city is intimately connected with that of Assyria. Here was the royal residence during most of the best-known period of Assyrian history. The beginnings of Nineveh antedate our knowledge. A temple to Ishtar, at all periods the favorite deity of the city, existed

there in the nineteenth century B.C. The library of Assurbanipal furnishes a copy of a hymn addressed to Ishtar of Nineveh, the original of which seems to have come from the eighteenth or nineteenth century B.C. In the time of the El-Amarna correspondence (sixteenth century B.C.), the worship of this Ninevite goddess was known in the land of Mitanni, and seems to have been even introduced into Egypt. After this time the temple of Ishtar was restored by many of the kings of Assyria. As Nineveh had overshadowed the older capital Asshur, so it in turn was overshadowed by Calah on the erection of this latter city by Shalmaneser I. (See NINEVEH.) With the accession of the Sargon dynasty (722-606), however, the loss was more than regained. Sargon himself preferred to build a new city and palace, but his successors Sennacherib, Esarhaddon, and Assurbanipal lavished their time and wealth on the adornment of Nineveh. The extensive conquests of this dynasty, especially in the west, as far as the Mediterranean and Egypt, added greatly to the royal resources. Cedar-trees for the roofs of the buildings were cut down in Lebanon by Manasseh the Judean and neighboring kings, and transported thence to Nineveh. Sennacherib informs us that he tore down the palace of his predecessors, because it was too small and in decay, and that he erected another on a grander scale. This structure must have covered many acres, because it was made large enough, not only for the residence of the king and his attendants, but also for the royal horses and for the storage of booty. In the Bavian inscription he informs us that he enlarged the city, fortified it with lofty walls, irrigated the country around by a system of canals, and surrounded the capital with parks and plantations. Elsewhere he tells us that he built the "Royal Street" 52 cubits wide, leading to the park gate, and published a decree forbidding the abutters, under penalty of death, from laying any part of the foundation of a house within the limits of the street. Esarhaddon, who restored Babylon, which had been destroyed by his father, built a palace at Calah and also one at Nineveh. The last named was considered by its builder superior to any that had gone before. It was likewise surrounded by a park containing rare foreign plants, and its completion was celebrated by a great feast. Assurbanipal lived in the palace built by his grandfather Sennacherib, the restoration of which he records at length and with evident satisfaction. He found it necessary also to strengthen the city walls, which had suffered much from continued heavy rains. The restoration and adornment of the temples of Ishtar and Nebo at Nineveh also engaged his attention. In the palace of Assurbanipal was situated the royal library, that storehouse to which we are so much indebted for our knowledge of Assyrian affairs. Hence, too, have come many of the finest bas-reliefs in alabaster. In the time of the Sargonids Nineveh was politically the chief city in the world. West and south, even Asia Minor and Egypt, were subject. Ambassadors came from all known regions bearing tribute; the harem was crowded with princesses from many lands, whose fathers felt honored in being thus allied to the great ruler; the city was thronged with captives and booty, architecture and learning flourished. The prophet Nahum gives an idea of the strength and splendor of the city. A speedy decline followed Assurbanipal. The war with Babylon in the middle of his reign, though successful, was a serious blow to the greatness of Nineveh. His successors were weak, and probably had neither time nor means for extensive building operations. In the sack of the city by the Babylonians and their allies in 606 B.C. the palaces and temples were reduced to ruins, burying in their fall the best products of the Assyrian development.

The tradition of the site of Nineveh has survived until to-day. The ruins lie on the Tigris, E. of Mosul. The river touches the inclosure now only at the northwest and southwest angles. The inclosure has four sides of unequal length. It is about 3 miles long (N. E. to S. W.) while its greatest breadth is a little less than $\frac{1}{2}$ miles in the northern portion, and its least breadth about three-fifths of a mile at the southern end. The surrounding parks and villages may formerly have been reckoned as part of the city. In Jonah Nineveh is spoken of as a "great city" "of three days' journey." The ruined wall and moat are still distinct. The east side is furthermore defended by several outer lines of embankment. The river Khamsar (Assyr. *Khusur*) flows through the city from the E., dividing it into two nearly equal portions, and emptying into the Tigris. Near it is the principal mound, now called Kouyunjik, which is oblong in shape, about 3,000 feet from N. to S., and about half

as much from E. to W. across its center. It has as yet been only in part explored. P. E. Botta, French consul at Mosul, was first to make the attempt. His success in digging at Khorsabad, which he believed to be Nineveh, turned his attention from Kouyunjik, and A. H. Layard reaped the great harvest of discovery. Other explorers have been Ross, Hormuzd Rassam, and George Smith. The last named enumerates the buildings in the mound as follows: (1) Three ruined temples, built and restored by many kings in different ages. (2) A palace founded by Shalmaneser I. (B.C. 1320), restored by several subsequent monarchs, destroyed by Sennacherib. (3) A palace founded by Ramman-nirari III. (B.C. 811-782), restored by Sennacherib and Esarhaddon. (4) A palace built by Tiglath-pileser III. (B.C. 745-727). (5) Temple of Nebo and Merodach, restored by Sargon (B.C. 722-705). (6) The southwest palace, built by Sennacherib (B.C. 705-681). (7) The north palace, built by Sennacherib, restored by Assurbanipal (B.C. 668-626).

Nebbi Yunus (the prophet Jonas) is another mound of smaller extent within the inclosure, about three-quarters of a mile S. E. of Kouyunjik. Here also are the ruins of royal buildings, a palace of Sennacherib and one of Esarhaddon; but excavations have been attended with more difficulty than at Kouyunjik, owing to the presence of a Mohammedan cemetery on the mound.

If the Ninevite palaces could be restored as they were in the days of Assurbanipal they would prove to be works of surprising magnificence. Many of the bas-reliefs were so calcined by the fire that they crumbled on exposure to the air. Others have been ruined by the action of the rain, which has carved deep ravines down the sides of the mounds, and still others, during the long centuries, have been dug out by the natives to burn into lime or to use in building houses. Those which reached the British Museum, wonderful as they are, are but a very small portion of what once existed.

The English explorers at Nineveh were more interested in sculptures and inscriptions than they were in architecture. They have accordingly not made such full measurements, drawings, and sketches as the French have done at Khorsabad and at Telloh. The result is that we shall never know the finest Assyrian palaces so well as we do those of less importance.

See Felix Jones's *Vestiges of Assyria*, sheet 1 (Ichthyographic Sketch of the Remains of Ancient Nineveh), and ASSYRIA AND ASSYRIAN EXPLORATIONS. D. G. LYON.

Ningpo: a free port or departmental city of Cheh-kiang, China, and one of the five ports opened to foreign residence and trade by the treaty made at Nanking in 1842. It is situated at the confluence of the Ts'ki and the Fung-hwa rivers with the Yung, 11½ miles from the sea, and 125 by water from Shanghai; lat. 29° 55' N., lon. 121° 22' E. (see map of China, ref. 6-K). Its walls, which are 25 feet high and 22 feet thick at the base, have a circuit of nearly 5 miles, and are pierced by six gates. The streets are clean and well paved and the shops and houses well built. Fire-walls cross the city at distances of 200 to 300 yards. The city, which is an irregular oval in shape, contains many fine buildings, among which are a seven-story pagoda 160 feet high dating from the eighth century, a Mohammedan mosque, a lofty drum-tower near the center of the city, the Temple of the Queen of Heaven, founded near the close of the twelfth century, but rebuilt in 1680 by the Fuh-kien merchants (hence usually known as the "Fuh-kien Temple"), many other Buddhist and Taoist temples, and numerous pai-lows or memorial arches. The foreign settlement is separated from the native city by the Ts'ki, and occupies the angle between that river and the Yung.

The gold and silver smiths of Ningpo are noted for the delicacy and tastefulness of their work, and Ningpo confectionery is celebrated all over China. The specialty of the place, however, is its elegantly carved and inlaid furniture. Silk-culture is extensively carried on in the surrounding country, and silk-weaving is an important industry. In 1893 498 piculs of silk piece-goods were exported. The development of manufacturing interests in Japan has given a great impetus to cotton-culture, and in 1893 the steam cotton-ginning establishments of Ningpo cleaned over 60,000 piculs of raw cotton. Owing to its proximity to Shanghai the foreign trade with Ningpo is not as great as was anticipated when the port was opened in 1842. According to the returns of the imperial maritime customs, the net volume of trade of the port amounted in 1893 to

15,478,005 taels (\$16,251,905 U. S. gold), of which 6,996,717 taels represented foreign imports, 2,192,662 taels native imports, and 6,288,626 taels exports. The chief articles of exports were tea (3,925,551 taels), raw cotton (1,006,116 taels), silk and silk piece-goods, and alum. The imports include opium (5,289 piculs), cottons (639,800 piculs), yarn, sugar (90,237 piculs), tin (581 piculs), vermilion (581 piculs), lead, kerosene oil, and rice (204,854 piculs). The number of vessels entered during the year was 524 (tonnage, 458,646 tons), cleared 530 (tonnage, 459,642). Of the 381 steamers that entered and cleared 162 carried the British flag and 215 the Chinese.

Ningpo has long been an important center of trade. In 1522 the Portuguese settled here by permission and flourished, but their rapacity led to their expulsion in 1542, when 800 of the 1,200 Portuguese residents were massacred, and 25 Portuguese vessels and 42 junks were destroyed. The city was occupied by the British from Oct. 13, 1841, to May 7, 1842, and was captured Dec. 9, 1861, by the Taipings, who, however, were compelled by the foreign fleets then in the river to retire on May 10, 1862. It is an important center of missionary work. Pop. estimated (1893) 255,000.

R. LILLEY.

Ninigret: an Indian chieftain of the Narragansett tribe, sachem of Niantic and uncle of Miantonomoh; was neutral during the Pequot war of 1632, but aided the English in that of 1637. Having afterward visited the Dutch at Manhattan and the Western Indians, he was suspected of plotting against the colonists, and war was declared against him by the commissioners of the united colonies 1653, but it was not immediately carried into effect. Meanwhile Ninigret waged war upon the Indians of Long Island, and having refused to obey a summons to Hartford in 1654, Maj. Simon Willard was sent against him, and he was forced to flee. In 1660-62 he sold a large portion of his territory to the colonists, abstained from participation in King Philip's war 1675-76, and died soon afterward.

Niño, neen'yō, PEDRO ALONSO: navigator; b. at Moguer, Spain, about 1455. He was early connected with Portuguese trading and exploring expeditions to the eastern coast of Africa; was commander of a supply fleet which sailed for Santo Domingo in 1496; and was with Columbus on his third voyage (1498) to Trinidad and the coast of Paria. Returning to Spain immediately after, he associated himself with Cristobal Guerra, a merchant, for a trading expedition to Paria. They left Palos in June, 1499, followed the track which Columbus had taken, coasted Venezuela to Cumaná, and by peaceful trading obtained a large amount of pearls and some gold from the Indians; in Apr., 1500, they returned to Spain. This was, from a financial point of view, the first successful voyage to America. Niño was accused of keeping back a part of the royal perquisites, was arrested, and died before his suit was decided.

HERBERT H. SMITH.

Ninon de l'Enclos: See L'ENCLOS.

Nio (anc. *Ios): an island of the Ægean, now, but not anciently, reckoned as one of the Cyclades. It lies N. of Theara and S. W. of Naxos, and is 11 miles long and 5 broad. Area, 20 sq. miles. It is rough, but quite productive, and has a fine harbor and some 4,000 inhabitants.

Niobe [= Lat. = Gr. *Νιόβη*]: daughter of Tantalus, King of Phrygia, and Dione or Taygete; sister of Pelops, and wife of Amphion, King of Thebes, to whom she bore six sons and six daughters (though the number varies). She was on intimate terms with Leto, a wife of Zeus, but boasted arrogantly that she was superior to Leto because she had twelve goodly children, whereas Leto had but two, forgetting that these two were the gods Apollo and Artemis. Enraged at her presumption, Apollo slew her sons and Artemis her daughters. After lying unburied for nine days the children were buried by the gods at Thebes. In pity for the grief of Niobe, the gods changed her into stone and fixed her forever on the side of Mt. Sipylus, E. of Magnesia, on the Hermus. Though turned to stone Niobe still wept, for to this day water oozes from the eyes of the rock-relief, a story which has been noticed by Homer, Sophocles and Ovid. Nowadays the so-called Niobe of Mt. Sipylus is referred to the art of the Hittites, who held sway in Asia Minor before the advent of the Phrygians. The celebrated group of Niobe and her children, in the Uffizi Gallery in Florence, represents the killing of the children by Apollo and Artemis. It was discovered in 1583 on the Esquiline in Rome, and is probably not the group nor a copy of the group mentioned by Pliny as standing in the pediment of

the temple of Apollo Sosianus, for the reason that the existing statues can not be grouped in a pediment. Probably this group represents Niobe standing on the summit of a hill, up which the children hasten to her for protection. Remnants of another and more excellent group are preserved in Rome (Museo Chiaramonti). The group mentioned by Pliny was ascribed in antiquity to Scopas or Praxiteles. See any *History of Greek Art* under Scopas, or the *Age of Scopas*, but especially see Stark, *Niobe und die Niobiden* (Leipzig, 1863), and his *Nach dem Orient* (1874), p. 243 ff.; Schweisthal, *L'image de Niobé et l'autel de Zeus Hypatos au mont Sipyle* in the *Revue Archéologique* (1887, pp. 213-232); Weber, *Le Sipylos et ses monuments* (Paris, 1880); Humann, *Ein Ausflug in den Sipylos* (Brunswick, 1885); Ramsay, *Sipylos and Cybele* in *Journal of Hellenic Studies*, vol. iii.; Perrot and Chipiez, *History of Art in Phrygia*, etc. (London, 1892), p. 37 ff.; the articles *Niobe* and *Skopas* in Baumeister's *Denkmäler*.

J. R. S. STERRETT.

Niobium: See COLUMBIUM.

Niobrara River, or in Fr. *L'Eau qui Court* (i. e. the running water): a tributary of the Missouri. It rises in Laramie co., Wy., and flows 450 miles to the E., through Northern Nebraska, in its lower course separating South Dakota from Nebraska. It is a shallow and very rapid stream. Its upper valley is treeless pasture-land. It next traverses the Great Sandhill region, believed to be almost valueless. It then flows through a rocky region with fertile, well-timbered ravines, and its lower valley has good farming land, with abundant trees.

Niort, née'ōr': capital of the department of Deux-Sèvres, France; on the Sèvre-Niortaise; 43 miles N. E. of La Rochelle (see map of France, ref. 6-D). It is a handsome town with beautiful promenades and many elegant buildings. It is a railway junction, and its tanneries, dyeworks, and manufactures of chamois, gloves, and shoes are important. The public gardens are very beautiful. Pop. (1891) 22,313.

Nip'issing: a lake and district of Ontario, Canada. The lake is in lat. 46° 20' N., about half way between Georgian Bay and the Ottawa river. It is about 40 miles long, 30 wide in its greatest breadth, and of very irregular outline. It receives many streams, of which the most important is the Sturgeon river from the N., and empties by the French river, about 40 miles long, into Georgian Bay. The Canadian Pacific Railway runs along its northern shore. The lake is subject to sudden gales, which make navigation dangerous. Two steamers run on the lake in the summer. The scenery is very picturesque, and a summer hotel has been constructed on one of the numerous islands. Gold has been discovered on the shores near the outlet. The district has a climate as favorable as that of Ottawa, Canada. Good farming lands abound, and the country is being rapidly settled.

MARK W. HARRINGTON.

Nipmucs: See ALGONQUIAN INDIANS.

Nipperdey, KARL LUDWIG: Latinist; b. in Schwerin, Germany, Sept. 13, 1821; studied under Lachmann and Haupt at Berlin; became privat docent in Leipzig 1850, professor in Jena 1852. D. by suicide Jan. 2, 1875. He edited *Cæsar*, *Cornelius Nepos*, and the *Annals of Tacitus* with German notes, an exegetical masterpiece (9th ed. by G. Andresen, 1892). Cf. R. Schöll, *K. N.* (Jena, 1875), who also published *C. N. Opuscula* (Berlin, 1877). A. G.

Nippon: See JAPAN.

Nirvāna, neēr-vaa'na [Sansk. (in Pāli *nibbana*), a blowing out (of the flame of life, or the like), extinguishment, extinction; *nir*, euphonic form of *nis*, out + *vāna*, a blowing, deriv. of *√vā*, blow]: the highest aim and the highest good of the Buddhist saint; the blissful condition of those who by the removal of ignorance and the extinction of desire have arrived at a point where rebirth is no longer necessary and the misery and sorrow incident to life are at an end. (See NIDĀNA.) This is accomplished by walking in the Noble Eightfold Path. See BUDDHISM.

The attainment of Nirvāna is not necessarily coincident with death. Gautama became enlightened and attained Nirvāna under the bo-tree. He lived many years thereafter, just as an engine may still run by its momentum after the steam is shut off; but no craving remained and there could be no rebirth, for nothing remained to be re-incarnate. At his death he passed away "with that utter passing away in which nothing whatever is left behind."

Men nowadays can not attain Nirvāna. For "enlightenment" all conditions must be favorable. When Gautama was on earth tens of thousands achieved it, and diminishing numbers after his decease; but the opportunity at last passed by, and until another Buddha comes men can hope only to be reborn in a more favorable environment.

Nirvāna, like much else in Buddhism, is an inheritance from the older Indian philosophy, modified by the rejection of pantheism; but a pantheistic influence remains in the Mahāyāna schools, and some teachers make Nirvāna mean absorption into the Absolute.

Nirvāna, like many other Buddhist ideas, was too subtle for popular comprehension. The goal was too distant, and now most Buddhists are content to be reborn in one of the heavens, and in the Northern school it has for the most part been supplanted by the doctrine of a Western paradise of sensuous Oriental bliss, where desire is not extinguished but is gratified for numerous aeons. See SIKHĀVATI.

See Oldenberg's *Buddha*, translated by Hovey (London, 1884); Alabaster's *Wheel of the Law* (London, 1871); Monnier-Williams's *Buddhism* (London and New York, 1889); Max Müller's essay on *Buddhist Nihilism*; Ellinwood's *Oriental Religions and Christianity* (New York, 1892); and the works mentioned under the article **BUDDHISM**.

GEORGE WILLIAM KNOX.

Nisard, né zair', JEAN MARIE NAPOLEON DESIRÉ; literary historian; b. at Châtillon-sur-Seine, France, Mar. 20, 1806. He was liberally educated, taught in the École Normale from 1830 to 1840, was made Professor of Eloquence at the Collège de France in 1843, and director of the École Normale in 1857. He drew attention to himself by criticism noticeable for its lack of sympathy with the romantic movement and the severity of its judgments on its representative writers. The ideal French qualities of mind were to him good sense, clearness, precision, and truth, and these he found in their perfection in the literature of the seventeenth century. From this standpoint his main work, *Histoire de la littérature Française* (4 vols., 1844-61), is written. Its interest centers in its judgments of the main classical writers, the mediæval literature as well as all merely mediocre writers being mainly neglected and the eighteenth and nineteenth centuries being regarded as periods of decay. The same standard of criticism is applied with wider range of subject in his various volumes of essays: *Études d'Histoire et de Littérature* (1859); *Notables Études* (1864); *Mélanges d'Histoire et de Littérature* (1868); *Les quatre grands Historiens Latins* (1874); *Portraits et Études d'Histoire Littéraire* (1875); *Renaissance et Réforme* (1877). He was chosen to the Academy in 1850. D. at San Remo, Italy, Mar. 26, 1888. A. G. CANFIELD.

Nisch, or **Nissa** (anc. *Naissus*): second city of Serbia; on the Nissava; 115 miles S. E. of Belgrade (see map of Austria-Hungary, ref. 10-J); always an important military center, now the southern key of Serbia. Here the Ottoman armies always mustered before a European war. Pop. (1893) 19,877. E. A. G.

Nishapur': town; in the province of Khorassan, Persia; on the Saka; 53 miles W. of Meshed (see map of Persia and Arabia, ref. 2-J). It is a large city surrounded with walls and ditches, but poorly built and partly in ruins. The surrounding plain, however, situated at an elevation of 4,200 feet, is densely peopled and well cultivated. It has been a city of great importance. The Greeks, who called it Niçaya and Nicaea, believed it to be the birthplace of the god Dionysos. Pop. of the town (1884) 11,000, according to Schindler.

Revised by M. W. HARRINGTON.

Ni'si Pri'us [Lat., unless sooner]: a term of English law used (mostly adjectively) to designate a trial of issues of facts in a civil case before a single judge and a jury, the record of the trial, the writ by which the jury is summoned, or the whole system of proceeding at such trials. The phrase is also commonly employed in the U. S. with a similar meaning, though in some States the expression "trial at circuit" is used. (See **CIRCUIT**.) The rulings and opinions rendered by the judge in trials of this kind are termed *nisi-prius* decisions. *Nisi-prius* trials and decisions are distinguished from those at bar or in banc, that is, those before a full court, either for the trial of issues of fact or for the hearing of appeals upon questions of law from an inferior court. The origin of this peculiar technical phrase is as follows: By the ancient English practice actions of various kinds were tried only in the superior courts sitting at Westminster, and it was therefore necessary for parties and counsel

to resort thither from all parts of the realm to attend to the hearing of the causes in which they were interested. In order to remedy this inconvenience, it was provided by Magna Charta that actions of certain kinds should be triable in the county where the cause of action arose, before justices to be sent into each county once a year. Subsequently, this system of local trial was extended to other actions, till it became the uniform practice to try all common-law actions (as distinguished from suits in courts of equity) in the first instance before a judge and jury in the county where the cause of action arose; but the action was still nominally instituted as before, in the superior court, and the jury were summoned by writ to appear there, "unless before" (*nisi prius*) the day appointed the justices came into the proper county to hold a session of court. These important Latin words in the writ then became a convenient designation for the system of trial. These matters are now regulated by the judicature acts, and the *venire* no longer contains the words *nisi prius* or *nisi*, but the words occur in the record and judgment roll. *Nisi-prius* decisions upon questions of law are more commonly reported in England than in the U. S. As they are rendered by a single judge, and often on the spur of the moment, they are not generally deemed to have as high value and authority as decisions rendered by a full court or an appellate court. Their weight and importance of course vary with the ability and reputation of the presiding judge. The most valuable English *nisi-prius* reports are those of Peake, Espinasse, Campbell, Carrington and Payne, and Foster and Finlason. For fuller particulars, see the works of Archbold, Selwyn, Stephens, etc., on *nisi-prius* law, and Henry J. Stephen's *New Commentaries on the Laws of England* (11th ed., London, 1890). Revised by F. STURGES ALLEN.

Nissa, or **Nish**: same as **NISCH** (q. v.).

Nissen, HEINRICH: archæologist and historian; b. in Hadersleben, Germany, Apr. 3, 1839; studied in Kiel and Berlin; was privat docent in Bonn in 1867; professor in Marburg 1869-1876; was called to Göttingen in 1877, to Strassburg in 1878, and to Bonn in 1884. His principal works are *Kritische Untersuchungen über die Quellen der 4. und 5. Decade des Livius* (1863); *Das Templum* (1869); *Pompeianische Studien zur Städtekunde des Alterthums* (1877); *Italische Landeskunde*; *Griechische und Römische Metrologie* (in J. Müller's *Handbuch der class. Alterthums-wissenschaft* (1887). ALFRED GUDEMAN.

Nithsdale, or **Nithsdale**, WILLIAM MAXWELL, Earl of; b. in Scotland in 1676; married Lady Winifred Herbert, daughter of the Earl of Powis; took part in the rebellion headed by the Earl of Mar 1715; fell into the hands of the Government at Preston; was committed to the Tower of London, and condemned to death; escaped from the Tower disguised in the clothes of the countess, who had paid him a visit and remained in his stead; took refuge with the Venetian ambassador, and made his way to the Continent. D. at Rome, Mar. 20, 1744. The countess died in 1749.

Nitocris (*Neit-Aker*, *Nit-Aqert*): an Egyptian queen; the last ruler of the sixth dynasty, who reigned seven years. Her name has been found in the royal list of the Turin papyrus, but upon no monuments. Our information comes mainly from Herodotus (ii., 100). She is said to have received the throne after the murder of her brother by conspirators, who afterward made her regent. Her brother's death she avenged by drowning those implicated in the plot in a large subterranean chamber into which they were invited to partake of a feast of inauguration. To escape retribution she took her own life. She is also said to have built the third largest pyramid, but she appears rather to have enlarged and faced with granite the pyramid of Mycerinos of the fourth dynasty, in which it is believed that her funeral chamber was located. A story similar to that of Cinderella attaches to her under the name of Rhodopis. Nitocris was also the name of the wife of Psammetichus II., and of his daughter. Herodotus also mentions a Nitocris, Queen of Babylon (i., 185 f.). CHARLES R. GILLET.

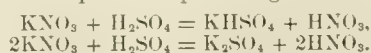
Nitrate of Silver and **Nitrates**: See **NITRE** and **SILVER**.

Nitre: See **SALTPETRE**.

Nitric Acid [*nitric* is a deriv. of *niter*]: one of the compounds which nitrogen forms with oxygen and hydrogen. So far as known, nitric acid was first prepared by the Arabian chemist Geber (probably in the ninth century A. D.) by distilling a mixture of niter or saltpeter, cyprian vitriol (sulphate of copper), and alum. He called it *aqua dissolutiva*.

Later it was prepared by other methods and called *aqua fortis*, *spiritus nitri acidus*, and *acidum nitri*. Glauber first showed that the acid can be most easily made by treating saltpeter with sulphuric acid. This led to the name *spiritus nitri fumans Glauberi*. Lavoisier discovered that nitric acid contains oxygen, and later showed that it contains nitrogen. Nitric acid occurs in nature in combination as salts called nitrates. The ammonium, potassium, and sodium salts are very widely distributed over the earth's surface, and in a few places nitrates are found in very large quantities. Small quantities of nitrates occur in the air and in all bodies of natural water. From the soil the nitrates pass into the plants. Nitrates are formed wherever organic substances containing nitrogen, especially refuse animal matter, undergo decomposition in the soil in contact with alkaline bases or their carbonates. This conversion is of great importance in nature, and it has been the subject of much investigation. It was first thought that *nitrification*, as the process is called, was due simply to the action of oxygen, but the work of Schlösing and Müntz, as well as that of Warrington, has shown that it is caused by the action of organized ferments. (See FERMENTATION.) It appears that the nitrifying ferment is present in the soil, and that where the conditions are favorable it acts upon waste nitrogenous matter yielding nitrates. Thus the waste matter is converted into material that is of value for vegetation. Generally the nitrates do not accumulate in the soil, because they are soluble in water. Bodies of water in the neighborhood of places where animal matter is undergoing nitrification always contain nitrates, and their presence is an indication that the water is probably contaminated with sewage.

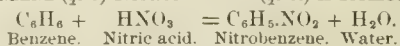
Nitric acid is made from either potassium nitrate, KNO_3 , commonly called *saltpeter*, or sodium nitrate, NaNO_3 , commonly called *Chili saltpeter* or *cubic niter*, by treating with sulphuric acid. At the same time, in case potassium nitrate is used, either potassium sulphate, K_2SO_4 , or acid potassium sulphate, HKSO_4 (bisulphate of potash), is formed, or both may be formed according to the proportion of sulphuric acid used. The equations representing the reactions are:



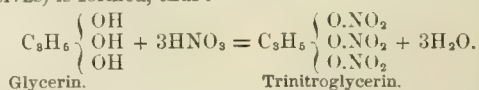
In the laboratory the preparation of the acid is carried on in glass vessels so constructed that the acid does not come in contact with anything but glass. On the large scale the composition of the saltpeter by the sulphuric acid takes place in cast-iron retorts, and the acid formed is condensed in earthenware jars. Generally the proportion of saltpeter and sulphuric acid is such that the product left in the retorts is acid potassium sulphate, as this, being easily melted, can be removed from the retorts with less difficulty than the ordinary sulphate, which is hard and requires to be broken up before it can be taken out. It will be seen then that all the nitric acid used is obtained from nitrates found in nature, and these have probably been formed by the action of the nitrifying ferment upon organic matter containing nitrogen.

The acid obtained by the process described is not pure, but always contains water and other compounds of nitrogen which are formed by the action of heat in the acid. In this state it is always more or less colored. The nitrates from which nitric acid is made always contain other substances, especially chlorides, and the acid itself is therefore impure for this reason. On the large scale natural sodium nitrate, or Chili saltpeter, is now used altogether in the preparation of nitric acid, both concentrated and dilute. Pure nitric acid is made from the commercial product by distilling it again. The chlorine, hydrochloric acid, and oxides of nitrogen pass over first, then comes pure acid, and the iodic acid, from the iodate in the saltpeter (see IODINE), and sulphuric acid, and non-volatile impurities remain in the retort. Nitric acid perfectly free from water has probably never been prepared, but Roscoe prepared an acid containing 99.5 to 99.8 per cent. of the compound HNO_3 . This concentrated acid is an exceedingly energetic substance. It acts upon organic matter, disintegrating it, and in many cases setting fire to it. It must be handled with the greatest care. In dilute form it also acts readily upon other things producing deep-seated changes. The acid found in the market generally contains about 68 per cent. acid, the rest being principally water. The pure acid boils at 86°C . (186.8°F .), undergoing slight decomposition. It acts upon metals as iron, copper, silver, tin, zinc, etc., yielding in most cases salts called nitrates which are soluble in water. Thus when sil-

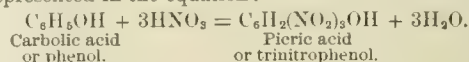
ver is treated with the acid nitrate of silver, AgNO_3 , is formed, and this dissolves in the water which accompanies the acid. The metal is therefore said to dissolve in the acid. Whenever nitric acid acts upon a metal a reddish-brown gas is seen. This is nitrogen peroxide, NO_2 . Upon organic substances nitric acid acts in different ways. In its most concentrated form it decomposes them. The action in these cases is mainly oxidation. The substances are burned up by the oxygen given up from the acid. When the action does not go to this length nitro-products and ethereal salts of nitric acid may be formed. Thus when the acid acts upon BENZENE (*q. v*) NITROBENZENE (*q. v*) is formed, thus:



When it acts upon GLYCERIN (*q. v*) nitroglycerin (see EXPLOSIVES) is formed, thus:



NITROCELLULOSE (*q. v*) is formed by the action of the acid upon cotton which is nearly pure CELLULOSE (*q. v*). Nitrocellulose is guncotton. (See PYROXYLIN and EXPLOSIVES.) PICRIC ACID (*q. v*) is formed by treating CARBOLIC ACID (*q. v*) with nitric acid. It is trinitrophenol, and is formed as represented in the equation:



Nitric acid is sometimes used in calico-printing to produce a yellow pattern on an indigo ground, in consequence of its power to destroy the color of indigo. "It serves, further, under the name *rouille*, for producing a compound of iron fraudulently used for 'loading' or 'weighting' black silks in the process of dyeing" (Wagner).

Nitrates.—These are the SALTS (*q. v*) of nitric acid. The most common are the potassium and sodium salts, which will be more fully treated under POTASSIUM and SODIUM (*qq. v*). The calcium salt is made artificially. (See CALCIUM and SALTPETER.) Nitrate of *silver*, or lunar caustic, is of value in the arts, as is nitrate of *lead*; nitrates of *barium* and *strontium* are used in pyrotechny; and nitrate of *bismuth* in medicine. Each of these receives notice under the head of the metal contained in the salt. IRA REMSEN.

Nitrification: See NITRIC ACID.

Nitrite of Amyl: an amber-colored, highly volatile liquid, smelling like ripe bananas, insoluble in water, but soluble in alcohol. It is obtained by the action of nitric acid on amyl alcohol or "fusel oil." Its formula is $\text{C}_5\text{H}_{11}\text{NO}_2$. Amyl nitrite was discovered in 1844, but was not used as a medicine till 1865, when it was brought to notice by Dr. B. W. Richardson, of London. If two or three drops of it be poured on a handkerchief and the vapor inhaled, almost immediately the blood-vessels of the head, face, and neck are felt to throb rapidly and violently; the face becomes crimson and hot, and the head aches from the sensation of fullness. Simultaneously, there is felt an indescribable commotion within the chest, with a feeling of breathlessness and oppression due to a violent and disorderly throbbing of the heart. These effects come on within a few seconds after breathing the fumes of the amyl nitrite, and disappear entirely within a few minutes, unless an overdose be taken. Physiologically, the singular symptoms are largely referable to depression of the vagus nerves and the vasomotor system of nerves, and to paralysis of the unstriated muscular elements in many parts of the body. Hence in spasmodic affections of these parts this substance is used medicinally. In *angina pectoris*, or "breast-pang," and in spasmodic asthma it often relieves with a suddenness and completeness almost magical, if the condition is due to spasm of the arterioles. It is given by inhalation or internally.

Revised by H. A. HARE.

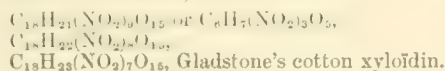
Nitrites: See NITROUS ACIDS.

Nitrobenzene, Nitrobenzol, or Essence of Mirbane ($\text{C}_6\text{H}_5\text{NO}_2$): a heavy yellow liquid; discovered in 1834 by Mitscherlich; produced by treating benzene with strong nitric acid. On mixing the two liquids they become warm, assume a brown color, and soon emit red fumes and boil. The color becomes finally orange. On adding water the nitrobenzene separates and settles to the bottom of the vessel. A mixture of sulphuric acid and nitrate of soda is preferred to nitric acid: $\text{C}_6\text{H}_6 + \text{HNO}_3 = \text{C}_6\text{H}_5\text{NO}_2 + \text{H}_2\text{O}$.

The nitrobenzene is washed with water, a trace of free acid neutralized by a very dilute solution of soda, unchanged benzene distilled off by steam, and the liquid freed from moisture, which makes it turbid, by filtration over dry powdered chloride of sodium (common salt). It has an odor like that of bitter almonds, whence it is often called improperly artificial oil of bitter almonds. It is extensively used as a perfume for soap. Its chief importance is due, however, to the fact that it is converted by reducing agents into aniline: $C_6H_5NO_2 + H_2 = C_6H_5N + 2H_2O$. See ANILINE, ANILINE COLORS, and BENZENE.

Revised by IRA REMSEN.

Nitrocellulose: a general term for the product resulting from the treatment of cellulose, as cotton, wood-fiber, etc., with a mixture of strong nitric and sulphuric acids, whereby one or more atoms of hydrogen are replaced by an equal number of molecules of nityl (NO_2). Several varieties are known. Hadow (*Chem. Soc. Qu. Jour.*, vii., 201) gives the formulas of three, as follows:



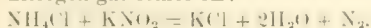
The first is called trinitrocellulose, and is chiefly used as an explosive. The guncotton for photographers' collodion consists of mixtures of the last two. See COLLODION and PYROXYLINE; also EXPLOSIVES. Revised by IRA REMSEN.

Nitrogelatin: See EXPLOSIVES.

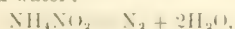
Nitrogen [Lat. *ni'trum*, niter + *-gen*, producing, found in Gr. *γενῆναι*, beget, produce, and Lat. *generare*, beget, produce]: a chemical element, from 79.1 to 79.2 per cent., by volume, of the atmosphere of the earth. It is also found, in small but essential proportion, in the bodies of all animals and plants, and in those constituents of the solid earth which are formed from their remains, such as coal and other apozoic mineral matter. In the earth and waters it occurs also, though in relatively very minute proportion, in the form of nitrates and of ammonia.

Before 1772 air was considered homogeneous and elementary, being convertible by continued respiration wholly into carbonic acid, then called "fixed air" and by several other names. At that date, however—which was two years previous to the discovery of oxygen by Priestley—the English chemist Rutherford discovered that after separating from air that had been repeatedly breathed all its carbonic acid, a peculiar irrespirable gas was left. Hence this chemist is recorded as the discoverer of nitrogen. Soon afterward Scheele and Lavoisier discovered that air consists of this gas and oxygen, and that it remains behind after the oxygen is removed.

Preparation.—Nitrogen gas, nearly pure, may be prepared by separating from atmospheric air its other constituents, which are oxygen, carbonic acid, and water. The oxygen, constituting a little over one-fifth of the volume, may be abstracted by passing air over some metals at incandescence. On a small scale, metallic copper in wire or turnings is used, and iron may also be used and is much cheaper, but may give nitrogen contaminated with carbonic oxide. Small remaining traces of oxygen, together with carbonic acid, which is always present, are most certainly removed by passing through a potash or soda lye to which has been added some pyrogallol. If the nitrogen is required to be anhydrous, sulphuric acid or chloride of calcium must also be employed to make it so. These modes of obtaining nitrogen from its most abundant source, the atmosphere, are, however, the most troublesome and expensive modes of all. It is much easier and cheaper to obtain it from a nitrite, nitrite of potassium being generally used. This is mixed in solution with sal ammoniac and boiled, when pure nitrogen gas comes off:



Ammonium nitrite, when heated, breaks up entirely into pure nitrogen and water:



but this salt is more expensive.

Nitrogen when pure is a gas, colorless, inodorous, and tasteless, of density = .97 (air = 1). It is but slightly soluble in water. Chemically, nitrogen has an exceptional inertness toward most other substances; but some metals, as *titanium*, *tungsten*, *boron*, and *carbon*, combine powerfully with it at very high temperatures. By the electric spark it may be made to combine with oxygen directly to form

nitric acid, and Bunsen found that when 100 volumes of air were mixed with 226 volumes of the explosive mixture (in the proportion to form water, 2:1) of hydrogen and oxygen, and the whole exploded, 11.5 per cent. of the air at once disappeared, combining to form nitric acids. During electric storms nitric acid is believed to be formed in the air in small proportion. Nitrogen and carbon may be made to combine directly to form *cyanogen*, by heat in the presence of an alkaline substance. Baryta performs this function best, and it has even been proposed to use this method for the manufacture of ammonia, which is easily obtained from the cyanide of barium.

The nitrogen of the air serves as an essential food for plants. To a considerable extent it is first converted into ammonium salts, particularly the nitrate. These find their way into the soils, and then are converted into substances that can be used by the plants. By the growth of plants nitrogenous compounds are constantly being withdrawn from the soil, but it appears, further, that plants have the power to take up from the air a part of the nitrogen which they need, whether directly or not has not yet been determined.

Nitrogen forms a large number of important compounds, among which may be mentioned AMMONIA, NITRIC ACID, NITROUS OXIDE, etc. These are described under the proper heads. The compound sometimes called hyponitric acid is now more commonly known as nitrogen peroxide. It has the composition NO_2 .

Revised by IRA REMSEN.

Nitroglycerin: See EXPLOSIVES.

Nitro-hydrochloric Acid (Eng. also *aqua régia*, Fr. *eau régale*, Germ. *königswasser*, *goldschmelzwasser*, *salpetersalzsäure*): the product of mixing together strong nitric and hydrochloric acids. The name *aqua regia*, royal water, refers to the power of such mixture to dissolve gold, the "king of metals"—a power which neither of the acids possesses alone. Aqua regia fumes in the air, has a deep-yellow or red color, and evolves free chlorine and a compound, $NOCl$, known as *nitrosyl chloride*. It was believed at one time that another compound of nitrogen, oxygen, and chlorine, of the composition $NOCl_2$, was also formed, but later investigations make it appear probable that this supposed compound is nitrosyl chloride, containing some free chlorine mixed with it. The energetic action of *aqua regia* is due to the free chlorine and to the chlorine given up by the unstable nitrosyl chloride. It is highly valuable in the arts and in the laboratory in operations with gold and platinum. It is also used in the destruction of organic bodies in the wet way, as when a mineral poison is to be isolated from a stomach or other viscous in toxicological cases, though more powerful agents are sometimes substituted in this case. A somewhat cheaper substitute for the ordinary *aqua regia* may be made by dissolving nitrate of soda in strong hydrochloric acid. Freely diluted with water it forms a valuable tonic in cases of indigestion.

Revised by IRA REMSEN.

Nitroleum: another name for NITROGLYCERIN.

Nitrous Acids and Nitrites: When potassium nitrate, KNO_3 , is heated it gives up part of its oxygen, and is converted into *potassium nitrite*, KNO_2 , and from this other *nitrites* can be made. These are salts of an acid of the formula HNO_2 , which, however, can not be made in the free state. Nitrites are formed in nature in the decomposition of organic matter, and they are often found in well waters. Their presence beyond a certain limit indicates contamination with sewage.

IRA REMSEN.

Nitrous Oxide, Nitrogen Monoxide, or Laughing-gas: a colorless, transparent, nearly odorless gas, having a sweet taste, and freely soluble in cold water. It is obtained from ammonium nitrate, which by being heated in a retort breaks up into water and nitrogen monoxide. This gas supports combustion nearly as energetically as pure oxygen, but its most important property is its anesthetic effect on the animal system when breathed instead of ordinary air. Being free from all irritant or offensive properties, it is as readily inhaled as air, but, being incapable of decomposition in the body, it furnishes no oxygen for the needs of the blood. Inhaling the gas thus amounts to temporarily cutting off the usual supply of oxygen through the breath, while not interfering with the respiratory movements or the elimination of carbonic acid. The result is that the individual, without any distress or disagreeable sensation whatever, becomes speedily asphyxiated into complete uncon-

sciousness. In this condition anæsthesia is perfect, and surgical operations can be performed without pain, as by the use of chloroform or ether. On withdrawing the gas and allowing air to be breathed, the blood becomes immediately rearterialized. The recovery of consciousness is then as swift as its loss, and there are no unpleasant after-effects. When pure and intelligently given, the use of the gas is perfectly safe; but of course if it be continuously breathed too long, the asphyxia will end in death. When breathed diluted with air an exhilarating or intoxicating effect is produced, under the influence of which the experimenter is irresistibly impelled to do all kinds of silly and extravagant acts; hence the old name of "laughing-gas." Nitrogen monoxide can be liquefied and solidified by pressure, and in this state a large supply can be conveniently kept for use in a small iron cylinder. For use in surgery the gas is inhaled through a mouthpiece so made that the expired gases do not mix with the contents of the bag. Revised by H. A. HARE.

Nitzsch, CHRISTIAN LUDWIG: anatomist and ornithologist; b. in Beucha, Germany, Sept. 3, 1782. D. at Halle, Aug. 16, 1837. His knowledge of the anatomy of birds was comprehensive, and he was the first to appreciate the importance of the condition of the carotid artery in the classification of birds. His reputation, however, rests upon the fact that he was the founder of the science of PTERYLOGRAPHY (*q. v.*), or the arrangement of the feathers of birds. His first essay was published at Halle, Saxony, in 1833, under the title *Pterylographiæ Avium Pars Prior*, and after his death his papers were edited by Burmeister and the work issued at Halle in 1840 with the title *Pterylographie*. An English translation, by Dr. Sclater, was printed by the Ray Society, London, in 1867. F. A. LUCAS.

Nitzsch, GREGOR WILHELM: classical scholar; b. in Wittenberg, Germany, Nov. 22, 1790; was Professor of Ancient Literature in Kiel 1827; was deposited 1852; was called to Leipzig as Professor of Classical Philology; d. July 22, 1861. He is chiefly known as the most learned and persistent advocate of the unity of the Homeric epics, whose nuclei he ascribed to one poetic genius. He wrote *Erklärende Anmerkungen zu Homers Odyssee* (3 vols., 1826-40); *Meletemata de historia Homeri* (2 vols., 1837); *Die Sagenpoesie der Griechen* (1852); *Beiträge zur Geschichte der epischen Poesie der Griechen* (1862). See Lübker, *G. W. Nitzsch in seinem Leben und Wirken* (Jena, 1864). ALFRED GUDEMANN.

Niu-chwang, or **New-chwang**: the town of the province of Shing-king or Southern Manchuria, designated in the treaties made with China in 1858 as a place to be opened to foreign residence and trade. It is a walled village, standing in a purely agricultural region, about 40 miles from the coast of the Gulf of Liao-tung, on a small silted-up branch of the Liao river, in lat. 40° 25' N. and lon. 122° 40' E. (see map of China, ref. 3-K). The walls are of mud and much broken down, and the population is small. Being entirely unsuitable for foreign trade, the village of Muh-kow-ying, usually called Yingtse, or "the camp," about 30 miles nearer the coast, was chosen by foreigners as the port of Niu-chwang, and this is the town now designated *Niu-chwang* in diplomatic and consular documents and in customs and trade reports. It was opened to trade in the spring of 1861. It is situated on the left or south bank of the Liao river, about 13 miles from its mouth, where there is a dangerous bar. The foreign settlement lies above the native town (in the other ports it is usually below) and extends along the river bank for over 1,000 yards. The main road leading from the coast to the interior bounds it in the rear. The river here is about half a mile wide, and has a depth at low water of 7 to 9 fathoms.

The native town consists of one long main street running E. and W. parallel to the river, and eight or ten shorter ones at right angles to this thoroughfare. The surrounding country is flat and marshy, only a few feet above the level of the sea, and presents a very dismal appearance. The river is closed by ice for four and a half or five months every year. In winter the temperature is frequently as low as zero; in summer it rises to 80° and 87°. The hottest months are June, July, and August.

The chief industry of the place is the manufacture of bean oil and bean-cake, pulse being a staple agricultural product in Shing-king.

The trade of the port in 1893, according to the imperial maritime customs report, amounted to 17,659,854 haikwan, or custom-house taels (\$18,542,846 U. S. gold). Of this, imports of foreign origin amounted to 5,548,403 taels, and of native origin 2,801,027 taels; exports of native produce to

foreign ports 2,167,111 taels, and to Chinese ports 7,143,313 taels. The chief foreign imports were cotton and woolen goods, metals, kerosene oil (both U. S. and Russian), and needles, and the chief native imports raw cotton, silk piece-goods, and sugar. The chief exports were beans (4,392,648 taels), bean-cake, used as food for cattle in Northern China and as manure in Southern China (2,327,215 taels), bean oil (345,365 taels), ginseng (741,932 taels), and raw silk (510,008 taels). In the same year 397 vessels, chiefly ocean-going steamers, with a tonnage of 296,654 tons, entered the port and the same number cleared. Of these, 52 per cent. were British, 25 per cent. German, 14 per cent. Chinese, and 6 per cent. Japanese. Pop. (1893) 60,000. R. LILLEY.

Nix, or **Nix'ie** (Germ. *nix*): in the popular mythology of the Teutonic races, a water-spirit usually malignant, and often assuming the human form, though able to take any other shape at will. Nixies were resorted to to determine the future, and their good will might be obtained by gifts. From the same etymological root we have "Old Nick" as a name for the devil.

Ni'za, or **Niz'za**, MARCOS, de: a Franciscan missionary, discoverer of Arizona; b. at Nice, Italy, about 1495. He went to America in 1531, labored in Guatemala, and in 1534 was with Alvarado in Peru. Later he was in Mexico, and was one of three Franciscans who accompanied Coronado to the N. in 1538. In the next year, under Coronado's instructions, he led an expedition to verify Cabeza de Vaca's reports of rich cities to the N. W. From friendly natives he heard accounts of seven "great cities" (probably the Zuñi pueblos), but after sending a Negro of his party to Cibola, one of them, where he was killed, Niza contented himself with a distant view of the place and returned. He brought to Coronado an exaggerated account of the riches of the seven cities obtained from the reports of the Indians, and probably embellished by his own fancy. The illusion was dispelled by Coronado's expedition in 1540. (See VASQUEZ DE CORONADO.) Niza accompanied it, but was sent back in disgrace after the true character of the pueblos had been discovered, and died soon after at Mexico. His report has been repeatedly published. H. H. SMITH.

Nizāmī: Persian poet of the romantic epic; b. in 1141 (A. H. 535), probably at Ganjah in Arran, where most of his days at least were spent. His full name is Abū Mohammed Nizām-ad-Dīn. His father, Yūsuf bin Muyid, was a native of Kumm; his mother, as we learn from his writings, was of Kurdish descent. Much of the first part of Nizāmī's life was passed amid the sternness of religious asceticism; illumination came in the form of an outburst of poetic inspiration, when, according to received accounts, he was already approaching his fortieth year, and he gave to the world the *Mukhzan-al-usrūr* (Treasury of Mysteries), the first of his well-known works. The beautiful romantic epic, *Khosrū and Shirin*, a story of love, followed (about 1180). This won court favor for Nizāmī, but he still preferred his life of retirement. His *Divān*, or collection of short odes alphabetically arranged, was next completed. The romantic love-story of *Laila and Majnūn* added fresh laurels to his fame. Nizāmī now turned his attention to the heroic subject of Alexander the Great, and produced the *Iskandar-nāmah*, treating in the first part the conqueror's victories, and in the second part presenting Alexander in the light of prophet, philosopher, and ethical teacher. The poet's last romance is called *Haft Paikar* (The Seven Portraits), written about A. D. 1197, and purporting to be seven stories narrated by the wives of the Sassanian King Bāhrām-Gōr. The above enumerated fivefold group of poems by Nizāmī, omitting the *Divān*, is known as the *Khamsah* (Quintuple), or is sometimes called the *Panj Ganj* (Five Treasures). D. at Ganjah in 1203 (A. H. 599). See W. Bacher, *Nizāmī's Leben und Werke* (Leipzig, 1871); S. Robinson, *Persian Poetry for English Readers* (1883); and Rieu, *Catalogue of the Persian MSS. in the British Museum* (vol. ii., p. 563, seq., 1881). There is a lithographed edition of Nizāmī's works (Bombay, 1834 and 1839; Teheran, 1845); lithographed editions also of separate poems have appeared in Europe, Persia, and India; there are partial translations by J. Atkinson, Hindley, von Hammer, and H. Wilberforce Clarke. A. V. WILLIAMS JACKSON.

Nizam's Dominions: See HAIDARABAD.

Njord: in Scandinavian mythology, a divinity that presides over the winds, quiets the sea, and is worshiped by sailors and fishermen. He was reared in Vanaheim, but the Vans gave him as a hostage to the Asas when the war be-

tween them was ended. His wife is Skade, daughter of the giant Thjasse. His dwelling is Noatun, near the sea. He is the opposite of the sea-giant Ægir, who represents the turbulent ocean. See SCANDINAVIAN MYTHOLOGY. R. B. A.

No: the name given to classical dramatic performances in Japan, and usually, but wrongly, associated with dancing. The No has been compared to the old Greek drama from its stateliness, solemnly chanted choruses, quasi-religious element, and from the fact that it is performed in the open air. Scenery is absent, but the robes of the performers are magnificent. The music, though scarcely agreeable to Western ears, has a mysterious grace of its own. These No performances are kept up by the aristocracy, and are a feature of polite Japanese society. Each piece takes about an hour to act, but, in addition to the half-dozen pieces that make up a complete performance, various comic interludes are interspersed, causing the performance to take up the greater part of a day. J. M. DIXON.

Noah [from Heb. *Nôach*, Noah, liter., rest]: the patriarch who, on account of his piety, was saved by God from the Deluge, and thus became the second founder of the human race; he was a son of Lamech, and the father of Shem, Ham, and Japheth (Genesis i. 28-ix.). See DELUGE.

Noah, MORDECAI MANUEL: lawyer and editor; b. in Philadelphia, Pa., July 19, 1785; became a lawyer at Charleston, S. C.; engaged actively in politics as a Democrat; went as consul to Riga 1811, to Morocco and Algiers 1813-15; settled in New York, and was connected as editor or proprietor successively with seven newspapers, of which the most important were *The National Advocate* and *The Enquirer* (1826), afterward merged in *The Courier and Enquirer*. Soon after his return from Morocco, Maj. Noah endeavored to form a Jewish colony upon Grand island in the Niagara river, where they were to build a "New Jerusalem" under his administration as "judge in Israel," but few of the Hebrew race responded to the invitation. Noah was elected sheriff of New York, and subsequently appointed surveyor of the port and judge of the court of sessions. He published several successful dramas; a volume of *Travels* (1819); a translation of a spurious *Book of Jasher* (1840); a *Discourse on the Restoration of the Jews* (1845); *Gleanings from a Gathered Harvest* (1845); and other miscellaneous works, chiefly speeches. D. in New York city, Mar. 22, 1851.

Noailles, nō'aał', LOUIS MARIE, Viscount de: soldier; b. in France, Apr. 17, 1756; was second son of the Marshal de Mouchy and a brother-in-law of Lafayette, with whom he served in the American war of independence; was a good tactician; commanded the Soissonnais regiment at the siege of Yorktown, and was one of the commissioners to receive the capitulation of Cornwallis. He bore a patriotic part in the French National Assembly of 1789, proposing, on the night of Aug. 4, that the nobility should voluntarily give up their privileges—a proposition which he maintained with great fervor, and which gave him great influence in the Assembly; received an important command in the army, but resigned in May, 1792, in despair for the cause of liberty, and went to the U. S., while the viscountess, remaining in Paris, became a year later a victim to the Revolutionary tribunal. In 1803 Noailles re-entered the French army, went to St. Domingo, was mortally wounded in an engagement with an English vessel, and died at Havana, Jan. 9, 1804.

No-am'on (Nah. iii. 8, *נְאֻם אֲמוֹן*), or **No** (Ezek. xxx. 14-16, Jer. xlv. 25, *Διόσπολις*): the Hebrew name of Thebes in Upper Egypt, the Diospolis Magna of the Greeks. The name corresponds with the Egyptian *Nu-amen*, city of Amon, or *Nu*, "the city" *par excellence*. C. R. G.

Nobility: as a term of rank, a state of social dignity, transmissible by descent and often accompanied by political privilege. In ancient Egypt, as now in India, nobility was inherent in the highest castes, the sacerdotal and the military. In Sparta the nobility originated from conquest; at Athens it resulted from older settlement, the nobles or eupatrids being the descendants of those who at one time had constituted the entire people. In Rome the patricians, who, as at Athens, had originally been the whole people, formed for a long time an exclusive caste, allowing no intermarriage with inferiors, and possessing nearly all the political power: but gradually the plebeians gained equal political rights, and after this those among them who became curule magistrates were not only accounted noble themselves by virtue of their office, but also transmitted

dignity to their descendants. Nobility in the old German tribes was of immemorial origin, the earliest records of Teutonic peoples showing clearly the division into noble, simple freeman, and bondman. The origin of the existing nobility of Europe, however, can generally be traced to personal service to the king, who granted certain privileges or immunities either as a reward for past or an inducement to future service. (See FEUDALISM.) Thus in Gaul the lands conquered by the Franks were divided into governments over which various officers were appointed—dukes (from Lat. *dux*, a leader), counts (from *comites*, companions), and marquises (guardians of the frontier "marches"). Both in France and Germany lands and dignities bestowed originally for life became hereditary, and their possessors acquired practical independence of the crown. The result was the feudal anarchy of the Middle Ages. The greater nobles were often able to defy the royal authority, while against their tyranny over their own vassals there was no redress. With the decline of feudalism their power was gradually weakened. Surnames and armorial bearings, adopted in the eleventh and twelfth centuries, and soon becoming general, increased the exclusiveness of the nobles, especially in France and Germany. In the latter country a child could inherit no fief of the empire unless both his parents were of pure blood; and in France, though the son by marriage of a noble father and a mother of ignoble birth might inherit property and receive knighthood, he could enter no order of chivalry. The granting of letters of nobility was a blow to aristocratic exclusiveness. French sovereigns often replenished their treasury by compelling rich subjects to buy letters of nobility, as English kings obliged people to purchase knighthood. The policy of Richelieu, Mazarin, and Louis XIV. was directed to depriving the nobles of their political power, while leaving them their dignities and revenues. Nobility was abolished in France June 19, 1790, and the title of noble became a title to banishment or the guillotine. In 1806 Napoleon founded a new nobility, creating princes, dukes, counts, barons, and chevaliers. The imperial noblesse, generally a reward for services rendered to France, was the only kind acknowledged, and edicts were issued against usurpers of titles. At the Bourbon restoration the old noblesse was again recognized, and that of Napoleon's creation was suffered to remain. In 1848 nobility was abolished by the provisional government, but was again restored by Napoleon III.

The Italian nobility lived generally in strong castles, and were feared by the people, who, when it was possible, excluded them from political power, as in Florence and Genoa, where high birth was a disqualification for government. At present Italian nobles are of two kinds—those of ancient lineage, and others who, having bought estates, take the titles belonging thereto. Titles descend to the eldest son only, but the younger children are called by courtesy *dei principi*, *dei duchi*, etc. Spanish nobility is very ancient: being *hijo d'algo* (son of somebody) implies noble birth and entitles a gentleman to be called *don*, which name, however, is, like *esquire* in the U. S. and Great Britain, very generally given. The estates and titles of the higher nobles or grandees are entailed. Russian nobility was formerly patriarchal, but Peter the Great introduced the European system of titles. In England the Anglo-Saxon nobles sometimes possessed sufficient power to set at naught the will of the sovereign, but from the time of the Conquest, when William the Conqueror made every vassal dependent upon the king, the barons had no such irresponsible power as they gained on the Continent. In Great Britain the term nobility is used in an exclusive sense, being limited to the five temporal ranks of the peerage, duke, marquis, earl, viscount, and baron. Baronet is a title of honor and confers no political privileges. See the articles on these respective titles: Sir J. Lawrence *On the Nobility of the British Gentry*; C. F. Molesworth, *Les Diverses Espèces de la Noblesse* (Paris, 1683); *Le Blason de la Noblesse* (Paris, 1683); the works of Hallam, Stubbs, May, Guizot, and other historians. Revised by F. M. COLBY.

Noble, JOHN WILLOCK, LL. D.: lawyer; b. at Lancaster, O., Oct. 26, 1831; was educated at Miami University, Ohio, and at Yale College, where he graduated in 1851; was admitted to the bar and settled in St. Louis in 1855, but removed to Keokuk, Ia., in 1856; was city attorney 1859-60; enlisted in the Union army as a private on the outbreak of the civil war; became first lieutenant and adjutant in the Third Iowa Cavalry; became judge-advocate of the Army of

the Southwest and afterward of the department of the Missouri; was promoted to a colonelcy in 1865; breveted brigadier-general of volunteers Mar. 13 same year; served as U. S. district attorney at St. Louis 1867-70, then resumed private practice; became Secretary of the Interior under President Harrison, receiving his commission Mar. 6, 1889.

Noblesville: city; capital of Hamilton co., Ind. (for location of county, see map of Indiana, ref. 6-E); on the White river, and the Chi. and S. E. and the Lake Erie and W. railways; 20 miles N. of Indianapolis. It is in an agricultural and natural-gas region; contains 9 churches, a public high and 3 ward schools, and a daily and 2 weekly newspapers, and has a large strawboard-mill, flour-mill, and carbon-works. Pop. (1880) 2,221; (1890) 3,054; (1894) estimated, 5,000.

EDITOR OF "LEDGER."

Nobuna'ga: general and statesman; b. in 1533 of a petty noble family named Ota, in the province of Owari, Japan. He early showed himself an intrepid and capable soldier. Having increased his domains and power, he found himself in collision with the Buddhist priesthood, whose headquarters at Hiyeisan he burned to the ground in 1573. After deposing the last shogun of the Ashikaga house, he became virtual ruler of Japan under the title of Dainagon, and began the work of political reconstruction and concentration, to be perfected later by Hideyoshi and Iyeyasu. Again from 1575-80 he had to struggle against a new coalition of Buddhist monks. In 1582 he fell a victim to treachery. Nobunaga favored the introduction of Christianity, possibly as a counterpoise to Buddhism.

J. M. DIXON.

Nocera, nō-chā'ra (anc. *Nuceria Alfaterna*): town in the province of Salerno, Italy; in a district well suited to the raising of sheep and cattle (see map of Italy, ref. 7-F). It is a bishop's see, and has cotton-manufactures. It was destroyed by Carthage for taking part with Rome, flourished again, and was again destroyed by the Normans. Pop. about 12,500.

Noctilion'idæ [Mod. Lat., named from *Noctilio*, the typical genus, from Lat. *nox*, night; cf. Lat. *vespertilio*, bat, deriv. of *vesper*, evening]: a family of insectivorous bats (Chiroptera) without nasal appendages. The ears are moderate, and provided with a distinct tragus to each; the tail perforates the interfemoral membrane through its upper surface, or, when that is truncated, is produced beyond it; the intermaxillary bones are generally united (sometimes separated); the molars are large and have W-shaped ridges; the incisors are variable ($\frac{1}{2}$, $\frac{3}{4}$, or $\frac{1}{2}$ by 2); the middle finger has two phalanges; the stomach is saciform and its extremities inclined toward each other. The species are mostly confined to the tropical regions of both hemispheres.

Revised by F. A. LUCAS.

Noctilu'cine [from Lat. *noctilu'ca*, something that shines at night; *nox*, *noctis*, night + *luce're*, shine]: a name given by T. L. Phipson to an organic substance supposed to cause the production of light in phosphorescent fish, insects, and decaying matter. At ordinary temperatures it is semi-fluid and whitish in color. It contains nitrogen and water. It dries up readily, yielding amorphous films. Noctilu'cine is slightly soluble in water and insoluble in alcohol and ether. Sulphuric and nitric acids dissolve it with decomposition. When moist it absorbs oxygen and evolves carbon dioxide. In ozone it is more luminous than when in oxygen, the luminosity apparently being due to oxidation. The spectrum of the light emitted is nearly monochromatic. Noctilu'cine is secreted in a pure form by the luminous centipede, *Scolopendra electrica*. See *Chem. News*, xxvi., 130, No. 668; *Am. Chem.*, iii., 244; *Comptes Rendus*, lxxv., No. 9; *Watt's Diet.*, 2d supplement, p. 861.

Noctu'ina: See LEPIDOPTERA.

Nodal Points or Lines: See ACOUSTICS.

Noddy: popular name of a species of tern (*Anous stolidus*) whose popular and scientific names relate to the stupid, stolid behavior of the bird, which often alights on ships, and suffers itself to be taken by hand. The noddy is about 16 inches in length, including the long, graduated tail; the adult is sooty brown in color, but has a whitish head. The species is widely distributed over the warmer parts of the globe, and nests in great numbers on mangrove and other bushes. The nest is built of sticks; the eggs are buff with reddish-brown markings, and in some localities are taken in considerable numbers for food.

F. A. LUCAS.

Nodes [from Lat. *no'dus*, earlier **gno'dus*, knot; Eng. *knot*]: the points in which the path of any planetary or cometary body intersects the plane of the ecliptic, or any other plane of reference; also the points in which the orbit of any satellite intersects the plane of the orbit of its primary. Nodes are distinguished as *ascending* and *descending*. The ascending node is that through which the body passes from the south to the north side of the plane of reference; the descending, that through which it passes from N. to S. The first is denoted by the sign Ω , the second by the sign ω . The nodes of most other members of the solar system undergo gradual displacement in the heavens, making, in a period of time longer or shorter, a complete revolution. The period for the moon is short, being but about 18½ years, but for the planets it reaches many thousands of years. The direction of nodal movement is generally retrograde, or from E. to W.

Revised by S. NEWCOMB.

Nodier, nō di-ā', CHARLES: author; b. at Besançon, France, Apr. 29, 1780; studied at Strassburg, and led subsequently an errant and adventurous life, first as an ardent republican, then as a zealous royalist, writing sentimental novels, as *Stella* (1802) and *Le Peintre de Salzbourg* (1803), after the model of *Werther*, and satires against Bonaparte, as *La Napoléone* (1802), and editing *Télégraphe Illyrien* in 1814 under the auspices of Junot and Fouché; became a contributor to the *Journal des Débats* in 1815; librarian to the library of the arsenal of Paris in 1824, member of the Academy in 1834, and died in that city Jan. 26, 1844. He was a very prolific writer, and touched almost every field of literature from lexicography to satire. Some of his works have an interest still: *Dictionnaire des Onomatopées françaises* (1808); *Histoire de Sociétés secrètes de l'Armée* (1815). His chief literary significance, however, lay in his knowledge of the German literature and the services he rendered romanticism by rallying the young romanticists about him.

Revised by A. R. MARSH.

Noé, AMÉDÉE, de: See CHAM.

Noel, BAPTIST WRIOTHESLEY, M. A.: clergyman; a brother of the first Earl of Gainsborough; b. July 10, 1799, at Leightmont, Scotland; graduated at Cambridge 1826; became one of the queen's chaplains and incumbent of St. John's, Bedford Row, London, but in 1848 left the Established Church and became a Baptist minister in London. He was an eloquent preacher; published a number of volumes of sermons, besides numerous other works, chiefly religious (*Notes of a Tour in Switzerland, Essay on Christian Baptism*, 1849; *Letters on the Church of Rome*, 1851; *A Selection of Psalms and Hymns*, 1852, enlarged 1853; *Hymns about Jesus*, mostly original, 1869); and was distinguished for philanthropic labors among the poor of London. D. at Stanmore, Middlesex, England, Jan. 20, 1873.

Noët'ians: name given to the followers of Noëtus, a Patripassian who flourished probably about 200 A. D. (instead of 230, the date formerly given). All we know of him is derived from Hippolytus (d. 236), Epiphanius (d. 403), and Theodoret (d. 457, 8), and they do not quite agree in their statements, Hippolytus and Theodoret saying he was born at Smyrna, and Epiphanius calling him an Ephesian. Perhaps he was born at Smyrna and lived at Ephesus. He was excommunicated for his heresy, which Hippolytus connects with the pantheism of Heraclitus. Through his disciples, Epigonus and Cleomenes, the Roman bishops Zephyrinus (202-218 A. D.) and Callistus (218-223 A. D.) were carried over into the same heresy. See PATRIPASSIANS.

Noko'mis: town (incorporated in 1867); Montgomery co., Ill. (for location of county, see map of Illinois, ref. 7-D); on the Cleve., Cin., Chi. and St. Louis Railway; 16 miles N. E. of Hillsboro, the county-seat, 85 miles N. E. of St. Louis. It is in an agricultural, fruit-growing, and stock-raising region; contains 6 churches, graded public school, a national bank with capital of \$50,000, and 3 weekly newspapers; and has a flour-mill and 2 grain elevators. Pop. (1880) 1,062; (1890) 1,305; (1894) estimated, 1,450.

EDITORS OF "FREE PRESS-GAZETTE."

No'la: town; in the province of Caserta, Italy; about 14 miles N. E. of Naples (see map of Italy, ref. 6-F). The Castello Cicala and the ex-convent of the Capuchins on a hill above the town give it a picturesque aspect, but the interior has a desolate appearance. Of the sixteen churches, the old Italian Gothic cathedral is the only one of interest. Nola was one of the most ancient and renowned cities of Campania, being of older origin than Rome itself. The

Sannites first conquered the Pelasgian settlers, were in turn driven out by the Romans, but recovered it during the Social wars, and the inhabitants burned it rather than yield to Sulla; Spartacus occupied it afterward. In the time of Vespasian it was called *Augusta Felix*, and this was its most flourishing period. It was strongly walled, had twelve gates, magnificent temples, and two large amphitheaters, between which rose the temple of Augustus, said to have been erected on the site of the house in which that emperor died. Pop. (1881) 7,496.

Nöl'deke, THEODOR: Orientalist; b. at Harburg, Hanover, Mar. 2, 1836; was educated at the gymnasium in Lingen, Hanover, and at the University of Göttingen; was privat docent in Göttingen 1861-64; professor in Kiel 1864-72; has been Professor of Semitic Languages at Strassburg since 1872; is author of *Geschichte des Korans* (1860); *Untersuchungen zur Kritik des alten Testaments* (1869); *Grammatik der neugriechischen Sprache* (1868); *Mandäische Grammatik* (1875); *Syrische Grammatik* (1880); *Geschichte des Perserreiches zur Zeit der Sassaniden* (1879); *Aufsätze zur persischen Geschichte* (1887); *Orientalische Skizzen* (1892); besides a large number of important contributions to journals, etc. He is one of the first authorities in Arabic philology and Oriental history. B. I. W.

Nolet de Brouwere van Steeland, nō lā-dē-brow ā-rā-viān-stā-lānt, JOANNES CAROLUS HUBERTUS: Flemish poet; b. at Rotterdam, Holland, Jan. 23, 1815. After studying in the University of Louvain he went to Brussels, where he became instructor in the university, and where he has since lived. In 1849 he became a member of the Brussels Academy. For a generation he was the leading literary man of Belgium. His career as a writer began with a brief *Geschiedenis van het Joodsche Volk van de schepping der wereld tot na de verwoesting van Jeruzalem* (The Hague, 1835). His first important poetical work, however, was *Noami* (Louvain, 1840). This was followed by *Ambiorix* (1841); *Diehluimen* (1842); *Ernst en Boert* (1847); *Zwart op wit* (1853); *Het groote dietsche vaderland* (1857); *Gedichten, etc.* (2 Deel, 1859). In prose he has published the somewhat caustic book *Een Reisje in het Noorde* (1843); *Het Communismus in zijne vroegere en latere vormen*, 1871, etc. In his earlier years he was an ardent admirer of Germany and of German ideas (cf. his *Aen de Germanen*, 1847); but after 1866 he conceived a deep antipathy for Prussia, and strove against German influence upon Belgian literature. This feeling he has most clearly expressed in his academic address, *Du pan-germanisme et de ses influences sur la littérature flamande* (1868). His *Œuvres complètes* (7 vols., 1859-84) contain his *Gedichten* (3 vols., 1859-71), his earlier prose works (2 vols., 1873), his later *Poëzij en Proza* (1877), and *Poëzij en lettercritiek* (1884). A. R. MARSH.

Nolhae, nō lāak', PIERRE, de: scholar; b. at Ambert, Puy-de-Dôme, France, Dec. 15, 1859. After studying in Paris he passed three years (1882-85) in Rome, as a member of the French school. Returning to Paris he was for a brief time attached to the Bibliothèque Nationale, and was then (1886) appointed Professor in the École des Hautes Études, and associate director of the Museum of Versailles. He has occupied himself chiefly with the beginnings of humanism and of the Renaissance in Italy and France, and has published numerous brilliant studies in this field. Among these are *Le dernier amour de Ronsard* (1882); *Lettres de Joachim du Bellay* (1883); *La bibliothèque d'un humaniste* (1883); *Les collections d'antiquités de Fulvio Orsini* (1884); *Le Canzoniere autographe de Pétrarque* (1886); *Fac-similés de l'écriture de Pétrarque et notices sur sa bibliothèque* (1887); *Petites notes sur l'art italien* (1887); *La bibliothèque de Fulvio Orsini* (1887); *Érasme en Italie* (1888); *Les études grecques de Pétrarque* (1888); *Les correspondants d'Alde Manuce, matériaux nouveaux d'histoire littéraire, 1483-1514* (1889); *Pétrarque et l'humanisme* (1892); *Études sur la cour de France: La reine Marie-Antoinette* (1892). Besides these de Nolhae has published a volume of verse, *Paysages d'Auvergne* (1888). A. R. MARSH.

Nol'tekens, JOSEPH, R. A.: painter; b. in London, England, Aug. 11, 1737; son of a painter from Antwerp; became a pupil of the sculptor Schumaker; afterward studied at Rome, where he remained ten years; was very successful in executing bas-reliefs, groups of figures, and busts; settled in London 1770; made busts of George III., Fox, Pitt, Warren Hastings, Johnson, Garrick, and the principal celebrities of the time, which were generally considered excellent likenesses; executed numerous commissions for public

monuments and statues, as well as mythological groups; married a lady of rank, and accumulated a handsome fortune. D. in London, Apr. 23, 1823.

Nolle Prosequi [Lat., to be unwilling to prosecute]: a declaration or undertaking by the plaintiff or prosecuting officer in an action or prosecution at law that he will discontinue further proceedings in the cause against the defendant. It is entered upon the records of the court, and puts an end to the particular proceeding or litigation, in the course of which it is introduced. It was formerly a common practice to enter a *nolle prosequi* both in civil and in criminal cases, but in civil actions other modes of effecting a discontinuance of the proceeding are now more generally adopted. In criminal prosecutions, however, the former practice still remains commonly in force. It usually lies in the discretion of the prosecuting officer to enter a *nol. pros.* (as the phrase is commonly abbreviated), but it is sometimes provided that he must obtain the leave of the court before such a course can be taken. The causes which most frequently induce such action are, that there is an insufficiency of evidence to procure the defendant's conviction, or that the testimony of one of several defendants who have been indicted is desired to be introduced against the others. Such a step might also be taken because, on account of the state of public opinion at a particular time, it was improbable that a jury could be obtained which would be likely to convict the prisoner, or because the trial would be detrimental to the public interests. A *nolle prosequi* may be entered at any stage of the case; but according to the preponderance of authority a *nolle prosequi* entered after the completion of the impaneling of a jury in the case will have the same effect as an acquittal. Otherwise it does not operate as an acquittal, but only as an indefinite suspension of the proceedings, and the prosecution may be again instituted against the defendant when the prosecuting officer deems it desirable. See Bishop's *Criminal Procedure* and Bishop's *Criminal Law*. Revised by F. STURGES ALLEN.

Noma: See CANCRUM ORIS.

Nom'bre de Di'os: a former Spanish settlement on the northern coast of the Isthmus of Panama. Nicuesa's transient settlement of that name was probably on or near the site of the modern Porto Bello; it was abandoned in 1511. In 1519 a new town of Nombre de Dios was founded on the Bay of San Blas, and this became the northern terminus of the route over the isthmus from Panama. During the sixteenth century all the trade of Peru, and much of that from Western Mexico, Guatemala, and the Spice islands, passed through it; it was thus one of the most important ports in America. Owing to its unhealthy location it was only frequented by the merchants on the arrival of the annual fleets from Spain; about sixty of the houses were built of wood, the rest being thatched. The town was attacked by Drake in 1572, and destroyed by him in 1595. It was abandoned in 1597, Porto Bello taking its place. H. H. S.

Nome'idæ [Mod. Lat., named from *No'meus*, the typical genus]: a family of small fishes related to the mackerels. The body is oblong, compressed, and covered with cycloid scales; the lateral line continuous and unarmed; the head compressed; the opercula unarmed; the nostrils double; the mouth with a lateral cleft, upper jaw scarcely protracile; teeth small and conical, on the palate as well as jaws; branchial apertures extensive; branchiostegal rays five or six; dorsal more or less divided, and with the spinous portion shorter than the soft. The skeleton has numerous vertebrae (in *Nomeus* 16 + 26); the stomach very numerous pyloric appendages. The species are all marine, and found in tropical or warm temperate seas.

Nominalism: the doctrine of the NOMINALISTS (*q. v.*).

Nom'inalists [from Lat. *nomen*, *nominis*, name]: those Schoolmen who held the doctrine that universals (general notions, such as those of man, animal) have no real existences corresponding to them, but are mere names or words (*flatus vocis*). The chief Nominalists were Roscellinus and William of Occam (*q. v.*). In modern times their doctrine has been adopted by Thomas Hobbes (but not consistently, inasmuch as he holds the doctrine that the state is a general power, or leviathan, more real than the individual citizen) and John Stuart Mill. Herbert Spencer, though claiming to be a Nominalist, is likewise a Realist when he holds that the persistent force is an ultimate reality producing and annulling the particular forces. Abelard was a Conceptualist or moderate Nominalist, and in this class we are

to place John Locke, Thomas Reid, Dugald Stewart, Dr. Thomas Brown, Sir William Hamilton, and other modern psychologists. See also CONCEPTUALISM, REALISM, and PHILOSOPHY (*History of Philosophy*). WILLIAM T. HARRIS.

Nominating Conventions: in the U. S., meetings of delegates of a political party to nominate candidates for national, State, or local offices. Such nominations were formerly made by the legislative CAUCUS (*q. v.*), which in the case of State elections began to give place to the nominating convention in 1825. In national elections the choice of candidates by the congressional caucus occasioned much complaint, and in 1824 the nominees of the caucus were defeated in the presidential election. From that time there was a steady tendency toward a more popular method of choosing candidates, and in 1831 the first national nominating convention was held by the Anti-Masonic party at Baltimore. Similar conventions were held by the two great national parties in 1832, and since 1840 all candidates for the presidency have been chosen in this way. The conventions meet in the summer immediately preceding the presidential election, which is held in November. They are composed of delegates chosen by the voters of the party, each State being entitled to twice as many delegates as it has persons representing it in Congress. Delegates from the Territories and the District of Columbia are also admitted, though these political divisions have no vote in the presidential election.

Nomination: in politics, an act of designation to office, the ratification of which depends upon another person or body of persons. The President of the U. S. nominates to the Senate the incumbents of high Federal offices, and makes the appointments only after approval. The head of an executive department nominates to the President those whom he desires as his subordinates, and a national, State, county, or town convention of a political party nominates its candidates for office in anticipation of the elections. See NOMINATING CONVENTIONS.

Nomos: one of the territorial divisions of ancient Egypt. See EGYPT, ANCIENT.

Nomsz, JOHANNES: poet; b. at Amsterdam, Holland, in 1738. Little is known of his life, except that it was dissipated and unstable. For a time his name was in everybody's mouth, and he was confidently expected to be one of the greatest stars in the constellation of Dutch poets; but his conduct and the fickleness of his political opinions brought him into discredit, and he died neglected in a hospital at Amsterdam, Aug. 25, 1803. In the course of his life he had tried his hand at almost all kinds of literature, though with best success as a playwright. His first work was a translation of Piron's *Ferdinand Cortez* (1764). He made many other translations during his life, among them Racine's *Athalie*, Corneille's *Le Cid*, Voltaire's *Zaïre*, La Fontaine's *Fables*, part of Tasso's *Gerusalemme Liberata*, etc. He wrote more than fifty dramatic pieces of his own, the best among them being perhaps *Maria van Lalain*, *De Ruiter*, and *Anthonyus Hambroek, of de Belegering van Formosa*. He composed two considerable epic poems: *Willem de Eerste, of de Grondlegging der nederlandsche vryheid* (Amsterdam, 1779); and *Maurits van Nassau, Prins van Oranje* (1789). Other poetical work was his *Triomf der Teekenkunst* (1768), and occasional pieces in his *Mengelwerken* (Amsterdam, 1782). In prose he essayed the romance, with mediocre success even in his best work, *Mohammed, of de Hervorming der Arabieren* (1780). In his *Vertelsels* (3 parts, 1781-85) he imitated the *Contes moraux* of Marmontel. Dramatic criticism is the subject of his *Historie van Piet Snot de Toneelspectator*; personal reminiscences of *Myne Uitspanningen* (2 parts, 1789). The literary model of Nomsz was, more than any one else, Voltaire; but it is clear that he never really understood the purposes which the Frenchman cherished in spite of his scourgings.

A. R. MARSH.

Non-commissioned Officers: army officers intermediate between the privates and the commissioned officers, such as corporals, sergeants, sergeant-majors, etc. They are not commissioned, but (in the U. S.) receive a warrant; in the British army the latter is the case only with the higher grades. In the U. S., besides those above mentioned, there are ordnance, quartermaster, commissary, and saddler-sergeants, hospital stewards, drum-majors, orderly sergeants, and certain musicians who have the rank of sergeant or corporal. In the British army there are included bombardiers, master gunners, staff clerks, band-masters, etc.

Non-conductors: See ELECTRICITY.

Nonconformists, or Dissenters: a name applied to those residents of Great Britain and her colonies who are not connected with the Church of England. There are nearly 300 denominations in Great Britain. The larger and more important may be traced back to the Presbyterians, Brownists (afterward called Independents), Anabaptists, and Roman Catholics of the sixteenth century, or to the Methodists, who arose much later. See the articles on those religious bodies; also FRIENDS.

Nonius, MARCELLUS: a Latin grammarian from Africa, of the beginning of the fourth century, whose work, *Compensiosa doctrina ad filium*, in twenty books, is extremely valuable because of its numerous citations from earlier writers, no longer extant. The compilation in itself is mechanical, and shows little scholarship or judgment. See editions of L. Quicherat (Paris, 1871) and L. Müller (2 vols., Leipzig, 1888).

M. WARREN.

Nonjurors: those members of the Church of England who refused to take the oath of allegiance to William and Mary. Sancroft, Archbishop of Canterbury, with several of the bishops and about 400 priests, declined to take it, upon the ground that they were already bound by their oath of allegiance to King James II. In consequence of their refusal they were deprived by act of Parliament in 1691 of their ecclesiastical preferments. The deprived bishops were Sancroft, Turner, Frampton, White, Ken, and Lloyd. Many of the laity, regarding the deprivations as unlawful, adhered to these prelates and formed a religious communion, which they called the faithful remnant of the Church of England. The earlier Nonjurors were not Jacobites. On the contrary, many of them had opposed the violent measures of King James, and most of them were disposed to submit peaceably to the new settlement of the succession. They were willing to live as orderly citizens, but not to bind themselves by new oaths during the life of King James, nor to recognize the claims of Parliament to deprive bishops of their sees. Some of the chief men in the kingdom in influence and learning were among the Nonjurors. The motives of the first Nonjurors appear to have been strictly religious; those of their successors were political. After the death of James II. and of Lloyd and Ken, the last of the deprived bishops, many of them returned to the Established Church, while the rest, looking forward to the possible restoration of the exiled royal family, determined to keep up an episcopal succession. Dissensions, however, arose among them, and they were divided into two communions. Gordon, the last bishop of the original line, died in 1779, and Boothe, the last bishop of the Nonjurors of the Separation, in 1805. Nonjuring congregations continued to exist a little longer; and it is said that a nonjuring clergyman was living as late as 1815. The regular body adhered strictly to the doctrine and discipline of the Church of England, but the separation introduced many changes. A book of *Devotions for Primitive Catholics*, compiled by Dr. William Deacon, one of their bishops, was used for some time in the congregations of the latter body. It differs widely from the Book of Common Prayer. The Nonjurors, being to a great extent cut off from active life, devoted themselves to literature. The celebrated historian Jeremy Collier was one of their bishops. Leslie, the controversialist, William Law, the able polemic and mystic, and Robert Nelson, the well-known commentator on the feasts and fasts, belonged to their communion. Among the more celebrated of their writings were Deacon's *Devotions*, already mentioned; a treatise on the *Intermediate State*, by Archibald Campbell, a Scottish bishop resident in London; and a learned and elaborate folio called *The Hereditary Right of the Crown of England*. This is believed to have been written by Harbin, a nonjuring clergyman, during the reign of Queen Anne, at a time when the restoration of the Stuarts was thought to be possible. Hil-kiah Beaford, however, another nonjuror, assumed the responsibility of it, and was fined and imprisoned for publishing a seditious libel. A history of the Nonjurors was published in 1845 by the Rev. Thomas Lathbury.

Revised by W. S. PERRY.

Nonnus: a Greek epic poet of Panopolis, in Egypt. His date is uncertain, but he is commonly assigned to the fifth century A. D. Originally a heathen, he became a Christian in his old age. The heathen side is represented by the *Dionysiaca* (*Διονυσιακά*), or *Adventures of Bacchus*, a vast epic in forty-eight books, without plan, without unity, of endless details, of extravagant fancies, a strong contrast to the simplicity and plastic clearness of the old epic. Yet

Nonnus is a genius in his way, and his versification is unequalled for rapidity and smoothness, though fatiguing by reason of its uniform flow. An edition was published by Graefe (1819-26) and one by Köchly (1859). The Christian side of Nonnus is represented by his hexametrical transcription of the Gospel of St. John. See editions by Passow (1834), Marcellus (1861). B. L. GILDERSLEEVE.

Non-residence: See CITIZEN.

Nonsuit, or, more fully, **Judgment of Nonsuit:** in law, a judgment allowing or ordering the plaintiff to discontinue the action which he has instituted. A nonsuit is generally granted on the ground of a default or insufficiency of the evidence offered by the plaintiff, and in case of a nonsuit the plaintiff pays the costs of the action. A nonsuit may generally be taken either at any time before the rendering of the verdict by the jury or a judgment by the court, according to the common-law practice; or, as in some of the U. S., at any time before the case is finally submitted to the jury or the court.

A nonsuit, being merely a default, is no bar to another action on the same ground; and the plaintiff frequently finds it to his advantage to elect to be nonsuited, in order that he may begin his suit over again, or prosecute it at a later time, when his evidence may be more conclusive or other circumstances more favorable. He may submit to a nonsuit by failing to appear for the trial of the case, by absents himself when the verdict of the jury is about to be rendered, etc. When the judgment for nonsuit is the result of his voluntary act, he can not appeal from the judgment or have it set aside. He may be nonsuited involuntarily on the motion of the defendant when his evidence is insufficient, or for any other cause for which a nonsuit may be ordered. Formerly, in the English practice, a compulsory nonsuit on the ground of the insufficiency of the evidence could not be ordered by the court against the plaintiff, but he might insist that the case should go to the jury; but it was usual for the plaintiff in such a case to submit to a nonsuit, with leave to make a motion to the full court to set the judgment aside. By the judicature acts, however, it has been provided that a nonsuit may be ordered by the judge at or after the hearing or trial upon such terms as to costs, and as to any other action and otherwise as may seem fit; and if the plaintiff does not appear when the action is called for trial the defendant is entitled to a judgment dismissing the action. It was also provided that any judgment of nonsuit, unless the court otherwise directed, should have the effect of a judgment upon the merits, except in case of mistake, surprise, and accident; but this provision has been abrogated.

The former English practice still prevails in the Federal courts of the U. S. and in several of the States, and no nonsuit can be ordered without the consent of the plaintiff; but in other States the plaintiff can be compelled to be nonsuited for insufficiency of evidence. In those States in which a code of civil procedure has been adopted a nonsuit is called a dismissal of the complaint. For a fuller treatment, see the works on practice referred to under the article PRACTICE.

F. STURGES ALLEN.

Noot'ka Dog: a large dog found among the Indians of Vancouver's island, British Columbia, chiefly remarkable for its long woolly hair, which is spun and woven into cloth by the natives.

Nootka Indians: See WAKASHAN INDIANS.

Noph (Ezek. xxx. 16; Isa. xix. 13; Jer. ii. 16), or **Moph** (Hos. ix. 6): the Hebrew name of Memphis, capital of Lower Egypt.

Norbertines: the name of a monastic order, better known as PREMONSTRATIENSIS (q. v.).

Nord, nör: the most northerly department of France; bounded N. E. by Belgium and N. W. by the Straits of Dover. Area, 2,193 sq. miles. The ground is generally low and the surface flat, with the exception of the southeastern part, where some hills and low mountains occur which are rich in coal and iron. The soil is fertile and excellently cultivated, yielding large crops of wheat, hemp, flax, beetroot, tobacco, and fruits. The Aa and the Scheldt, with their numerous tributaries, all navigable, pass through the country, which, moreover, is traversed by several canals. Manufacturing of linen, silk, cotton, and woolen goods, lace, beetroot-sugar, porcelain, chemicals, and iron is extensively carried on; the fisheries, too, are important. The department is strongly fortified, and has many battle-fields. Pop. (1891) 1,736,341.

Nordenskjöld, nör'den-skyöld, ADOLF ERIK: explorer; b. at Helsingfors, Finland, Nov. 18, 1832; descended from a Swedish family whose members through several generations had distinguished themselves as scientists. He studied geology, mineralogy, and natural history in the university of his native town, and very early received appointment in the mining department; but he could not avoid incurring the suspicion of the Russian Government, and was finally compelled to leave the country. He settled in Sweden, and was appointed superintendent of the mineralogical museum of Stockholm in 1858; accompanied Torell on his Arctic expeditions in 1859 and 1861; led similar expeditions himself in 1864, 1868, and 1872, and made a scientific journey to Greenland in 1870. The results of his researches were published in geographical and mineralogical monographs, and especially in his *Redogörelse för en Expedition till Grönland* (1871). Meanwhile, his attention had been turned to Siberian explorations, and in 1875 he sailed through the Karian Sea to the mouth of the Yenisei, ascended the river in a small boat, and returned home overland. The next year he repeated the voyage, but returned from the Yenisei by sea. His experiences having given him a reasonable hope of accomplishing the northeast passage, he started in July, 1878, in the Vega, supported partly by the Swedish Government and partly by two merchants. Thus the Vega became the first vessel which doubled the northernmost point of the Old World, Cape Tchelyuskin. She wintered in Bering Straits, and reached Japan on Sept. 2, 1879; and the northeast passage was found. On his return home Nordenskjöld was created a baron and loaded with honors. The full report of his voyage was published in Swedish, English, German, and French in 1884.

Nordhausen, nört how-zen: town of Prussia, province of Saxony; at the foot of the Harz Mountains, on the Zorge; 48 miles by rail N. N. W. of Erfurt (see map of Germany, ref. 4-E). It has large distilleries, manufactures of tobacco, chemicals, and leather, and an active trade. It was founded in 874, and was finally annexed to Prussia in 1815. Pop. (1890) 26,847.

Nordhoff, nört'höf, CHARLES: journalist; b. at Erwitte, in Westphalia, Prussia, Aug. 31, 1830. In 1835 his parents emigrated to the U. S.; in 1843 he was apprenticed to a printer in Cincinnati; at the age of fourteen went to sea, and was a sailor for nine years; then worked in newspaper offices. Between 1861 and 1871 he was editorially connected with the New York *Evening Post*, subsequently served as a correspondent of *The New York Tribune*, and became an editor of *The New York Herald*. Among his published works are *Man-of-war Life* (Cincinnati, 1855); *The Merchant Vessel and Whaling and Fishing* (Cincinnati, 1855-56); *Cape Cod and Along Shore*, a collection of stories (New York, 1868); *California for Health, Pleasure, and Residence* (New York, 1872); *Northern California, Oregon, and the Sandwich Islands* (New York, 1873); *The Communist Societies of the United States* (New York, 1874); *Politics for Young Americans* (1875); *The Cotton States in the Spring and Summer of 1875* (1876); *God and the Future Life* (1881); *Peninsular California* (1888).

Revised by H. A. BEERS.

Noreen, ADOLPH GOTTHARD: philologist; b. at Östra Emtervik, Sweden, Mar. 13, 1854; was educated at the gymnasium of Karlstad in Värmland and at the University of Upsala (1873-77); privat docent at Upsala 1877-87; since 1887 Professor of the Scandinavian Languages at the same university; author of *Aldre Västgötalagen* (1876); *Frysksdalsmålet Gudläre* (1877); *Ordbok öfver Frysksdalsmålet* (1878); *Svensk språklära* (l. 1881); *Altisländische und altnorwegische Grammatik* (1881; 2d ed. 1892); *Föreläsningar i urgermansk judläre* (1888-90; also in Germ. transl.); *Geschichte der nordischen Sprachen* (in Paul's *Grundriss*, 1889); besides many lesser works, articles in journals, and reviews. He is one of the most active and aggressive of the younger school of comparative philologists, and a leading authority in the field of Scandinavian grammar. B. I. W.

Norelius, E. D. D.: clergyman; one of the pioneers of the Swedish Lutheran Church in the U. S.; b. in Hasseln, Sweden, Oct. 26, 1833; emigrated to the U. S. 1850; studied at Columbus, O. After a pastorate of a year at Lafayette, Ind., he became in 1856 missionary in Minnesota, with Red Wing as his center, and published in 1857 the first Swedish paper in Minnesota. Almost his entire ministerial life has been spent in that State. He has been president of the Augustana synod, and editor of *Augustana*, the organ of that

body. He published in Swedish a history of the Swedish Lutheran churches of the U. S. (1892). H. E. JACOBS.

Norfolk, *nôr'fôk*: county of England; bounded N. and N. E. by the North Sea, S. and S. E. by Suffolk, and W. by Cambridge, Lincoln, and the Wash. Area, 2,119 sq. miles. The surface is level or slightly undulating, well tempered, and well watered, the principal rivers being the Ouse, the Yare, the Bure, and the Waveney, which in their course link together the numerous broads of the northeastern district. The soil consists chiefly of a sandy loam. Barley, turnips, and mangold are the chief agricultural products, and cattle and poultry, especially geese and turkeys, are extensively reared for the London market. There are manufactures in NORWICH (*q. v.*), and important herring-fisheries connected with Yarmouth and other ports. Pop. (1891) 456,474.

Norfolk: city; Madison co., Neb. (for location of county, see map of Nebraska, ref. 9-F); on the Chi., St. P., Minn. and Om., the Fremont, Elk. and Mo. Val. and the Union Pac. railways; 75 miles S. W. of Sioux City, 130 miles N. W. of Omaha. It is in an agricultural and sugar-beet raising region; has 8 churches, 5 public-school buildings, electric lights, electric street-railway, and a daily and 4 weekly newspapers; and contains the largest beet-sugar factory in the State (established 1891). Pop. (1880) 547; (1890) 3,038; (1894) estimated, 7,000. PUBLISHER OF "DAILY NEWS."

Norfolk: city, port of entry, and U. S. naval station (settled in 1705, bombarded and nearly destroyed by the British in 1776, chartered as a city in 1845); Norfolk co., Va. (for location, see map of Virginia, ref. 7-1); on the Elizabeth river (an arm of Chesapeake Bay), the Albemarle and Chesapeake Canals, and the Norfolk and W., the Ches. and O., the N. Y., Phila. and Norfolk, the Norfolk, Alb. and Atlantic, the Norfolk and Carolina, and the Norfolk and Southern railways; 8 miles from Hampton Roads, 17 miles from the Atlantic Ocean, 88 miles S. E. of Richmond. It has an excellent harbor, large, safe, and of sufficient depth to accommodate the largest war vessels, and is in regular steamship communication with various U. S. and European ports. The climate is genial, tempered by the Gulf Stream, which runs nearer the shore off Capes Henry and Hatteras than at any other point on the Atlantic coast. Norfolk and Portsmouth, on the opposite side of the river, constitute the largest naval station in the U. S., and a single U. S. customs district. The foreign trade in the calendar year 1893 was represented by imports of merchandise valued at \$110,680, and by exports of domestic articles valued at \$10,689,522. The city is an important coaling-station, handling 1,600,000 tons annually; has a cotton business of about 1,000,000 bales annually, an annual oyster business valued at \$1,000,000, and an annual truck business valued at about \$4,000,000; and is the principal peanut-market of the country. There are 30 churches, an academy, a mission college, a college for young ladies, public-school property valued at over \$100,000, 3 libraries (Norfolk Literary Association, founded 1870; Norfolk Law, founded 1884; and the Webster Scientific and Literary Association) containing nearly 12,000 volumes, 2 national banks with combined capital of \$600,000, 6 State banks with capital of \$584,250, 2 private banks, board of trade, and cotton exchange. Norfolk has the Holly system of water-works, drawing its supply from several lakes 7 miles distant; thorough sewerage; gas and electric light plants; and 4 daily, 5 weekly, and 2 monthly periodicals. The census returns of 1890 showed that 366 manufacturing establishments (representing 56 industries) reported. These had a combined capital of \$3,120,819, employed 2,791 persons, paid \$1,292,613 for wages and \$2,288,516 for materials, and had products valued at \$4,634,263. The principal manufactures reported were: Lumber and mill products from logs and bolts, 6 establishments, \$776,202 capital, and \$704,953 value of products; and agricultural implements, 3 establishments, \$303,585 capital, and \$281,750 value of products. In 1893 the assessed valuation of taxable property was \$22,082,920, and on Feb. 15, 1894, the net debt, including a water debt of \$700,000, was \$3,130,200. Pop. (1880) 21,966; (1890) 34,871.

EDITOR OF "VIRGINIAN."

Norfolk, DUKES OF (1483), Earls of Arundel (1139), of Surrey (1483), and of Norfolk (1644): a family of the English nobility which enjoys the distinction of hereditary earl-marshall, premier duke, and premier earl of England. The earldom of the East Angles was conferred by Henry I. (1135) upon Hugh Bigod, who lost that title by rebellion against Stephen and Henry II., but was reconciled to the

latter monarch and made Earl of Norfolk 1167. His grandson, Roger, was made earl-marshall on the failure of the male line of the Earls of Pembroke 1225, but both titles became extinct on the death of his nephew, of the same name, 1307. After having been held by Thomas of Brotherton, brother of Edward II. (1313-38), and by Thomas Mowbray (1386-1413), both titles were granted by Richard III., June 28, 1483, to JOHN HOWARD, lord-admiral of England, France, and Aquitaine, a distinguished statesman and military leader, who was killed at the battle of Bosworth Field, Aug. 22, 1485, and attainted shortly afterward.—His son, THOMAS HOWARD, who had been ennobled (as Earl of Surrey) at the same time as his father, whose attainder he also shared, was restored to his original title 1488; distinguished himself in war and diplomacy; was made earl-marshall 1510, and second Duke of Norfolk Feb. 1, 1514, as a reward for having gained the battle of Flodden Field; d. at Framlingham, May 21, 1524.—His son, THOMAS HOWARD, third duke, in many respects the most noted member of the family, b. about 1474, took a very prominent part in public affairs; repeatedly commanded armies of invasion against Scotland; presided over the court which sentenced Queen Anne Boleyn to death, May 19, 1536; suppressed the rebellion known as the "Pilgrimage of Grace" 1537; was thrown into the Tower Dec., 1546, sentenced to death and attainted Jan. 27, 1547, but escaped through the opportune death of Henry VIII. on the following day; had his title restored by Queen Mary; d. Aug. 25, 1554. The cause of his fall might doubtless be traced to the previous misconduct and disgraceful death of his niece, Catharine Howard, third queen of Henry.—His brother, Lord EDWARD HOWARD, had been lord high admiral of England, and was killed in an attempt to destroy the French fleet 1513; while his eldest son, HENRY HOWARD, celebrated as a poet under the title of Earl of Surrey, aspired to the hand of the Princess Mary, and was beheaded on Tower Hill, Jan. 19, 1547.—Surrey's son, THOMAS HOWARD, b. about 1536, became fourth duke; intrigued for the hand of Mary, Queen of Scots, and was beheaded at London, June 2, 1572.—His grandson, THOMAS HOWARD, b. 1592, was restored in blood by act of Parliament as Earl of Arundel and of Surrey 1603; was distinguished in the service of Charles I.; was restored to the earldom of Norfolk 1644, and is known to history under the title of Arundel, through the great collection of Grecian marbles made in his name.

Revised by C. K. ADAMS.

Norfolk Island: an island in the South Pacific, about half way between New Caledonia and New Zealand; lat. 29° S., lon. 168° E.; area, 10 sq. miles; pop. 750; under the supervision of the governor of New South Wales. It is one of the most solitary and inaccessible of the islands of the globe. Originally it was inhabited, and was discovered by Cook in 1774. From 1788 to 1805 and from 1825 to 1842 it was used as a penal colony by New South Wales. In 1856 many of the descendants of the mutineers of the Bounty were transported thither from Pitcairn island. These numbered 149 at the time of the transfer; their descendants now comprise all the inhabitants except those of the Melanesian mission station and school established here. Pop. (1896) 750. The climate is agreeable and healthful, and the soil fertile, but the inhabitants are indolent. M. W. H.

Nor'icum: province of the Roman empire, extending between the Danube and the Save, and bounded E. by Pannonia and W. by Vindelicia and Rhætia. It corresponded approximately to the portion of Austria proper S. of the Danube, together with the provinces of Styria, Carinthia, and Salzburg. It was conquered late in the reign of Augustus. Its principal city was Noreia (the modern Neumarkt in Styria).

Revised by G. L. HENDRICKSON.

Normal [from Lat. *nor'ma*, carpenter's square, rule; etymol. doubtful, possibly for **nōnma*, ninth, ninth letter, in allusion to the shape of letter L; cf. *germen* < **genmen* (†), *carmen* < **canmen* (†)]: a term used in mathematics. A normal to a plane curve is a straight line in that plane perpendicular to a tangent at the point of contact. The equation of the normal in rectangular co-ordinates is

$$y - y' = - \frac{dx'}{dy} (x - x'),$$

in which y' and x' are the co-ordinates of the point on the curve. When the length of a normal is spoken of, we generally mean the distance from the point of normality to the

point in which the normal cuts the axis of x . In this case the formula for the length is

$$N = y \sqrt{1 + p'^2},$$

in which y is the ordinate of the point of contact, and p the corresponding value of the first differential coefficient of the ordinate. The distance from the point on the curve to the center of the corresponding osculating circle is sometimes taken as the length of the normal, in which case this length is given by the formula

$$N = \frac{(1 + p'^2)^{\frac{3}{2}}}{p'}$$

p' having the same signification as before, and p' being the corresponding value of the second differential coefficient of the ordinate.

A normal to a curve of double curvature is a straight line lying in the osculating plane and perpendicular to the tangent at its point of contact. In this case the length of the normal is the same as the length of the radius of the osculating circle to the curve at the point of contact. A plane is said to be normal to a curve at any point when it is perpendicular to the tangent at that point. A normal line to a surface is a straight line perpendicular to a tangent plane to the surface at the point of contact. Any plane through a normal line to a surface is a normal plane.

Revised by S. NEWCOMB.

Normal: city; McLean co., Ill. (for location of county, see map of Illinois, ref. 5-E); on the Chi. and Alton and the Ill. Cent. railways; 2 miles N. of Bloomington, 124 miles S. S. W. of Chicago. It is noted as the seat of the Illinois State Normal University, organized in 1857, which in 1890-91 had 19 instructors and 682 professional and graduate and 145 non-professional students. It is also the seat of the Illinois Soldiers' Orphans' Home, founded in 1869. The Normal University has a library of over 7,000 volumes, and the Orphans' Home one of over 3,000. The city is in a coal region, has extensive nurseries, and contains a national bank, a savings-bank, and 3 periodicals. Pop. (1880) 2,470; (1890) 3,459.

Normal Schools: See SCHOOLS.

Norman: village (founded in 1889); capital of Cleveland co., Okl. (for location, see map of Oklahoma, ref. 3-D); near the Canadian river, and on the Atch., Top. and Santa Fé Railroad; 50 miles S. of Guthrie. It is in a corn, grain, and cotton region, and contains the University of Oklahoma, 8 churches, 2 public-school buildings, High Gate Female College (Methodist Episcopal South), 3 State banks, flour and cottonseed-oil mills, and a daily, a monthly, and 3 weekly periodicals. Pop. (1890) 787; (1894) estimated, 3,000.

EDITOR OF "STATE DEMOCRAT."

Normandy [Fr. *Normandie*, deriv. of *Normand*, Norman. See NORMANS]: an old province of France, bordering on the English Channel, and comprising an area of 10,534 sq. miles; now divided into the departments of Seine-Inférieure, Eure, Orne, Calvados, and Manche. The ground is naturally fertile, and the inhabitants are descendants of the old NORMANS (q. v.). When, in 1066, their duke, William I., conquered England, Normandy entered into a close political relation to that country, which continued, generally as a formal union, until, in 1204, Philip Augustus conquered the province and made it a part of France. After the battle of Agincourt, in 1415, the English once more held it, but only till 1449, when Charles VIII. finally united it to France.

Norman French: properly, the French dialect or dialects of Normandy, or the region occupied by the invading Normans or Northmen, which was granted their leader by Charles the Simple early in the tenth century. In English the term is used to designate the Old French brought into England as a result of the Norman conquest, and there having a history somewhat different from that of any form of French in France. At the time of the conquest the French brought into England was not very different from that which is the parent of the modern literary French, but some words of a distinctly different dialect type came in also (cf. *catch* and *chase*, respectively from *cacier* and *chacier* in Old French, the latter of which has become the modern *chasser*, the origin of both being the same). In England certain changes arose; for instance, the diphthong *ie* became close *e*, and, at a later time, *a* before a nasal followed by a consonant appears very often as *au*, whence our frequent spellings with *au* as in *branch*, *ant*, *around*, *haunt*, etc. The original French diphthong *ei* became to a great extent *oi* in literary French, even in the Old French time, but this

change did not take place in Anglo-French. The letter *u* had two distinct values in the early French of England, one like or nearly like that of modern French *u*, the other about like English *u* in *rude* (short or long). Of these two sounds the second was often represented later by *ou*, while in many such words the literary French developed a sound written *eu*; hence in modern English, for example, the common adjective ending *-ous* (= Lat. *-ōsus*), corresponding to modern French *-eur*, as in *generous*, Fr. *généreux*. The Old French *ch*, *j*, and *g* before *e* and *i* still keep in English in old borrowings from French their Old French sounds, as in *chant*, *gist*, *Jew*, *jest*, etc., while in modern literary French they have changed their value. Some words were rather early taken into English from the literary French, and such borrowings have continued up to modern times. In consequence of this and of borrowings directly from Latin and other languages at various times in the history of English, our language shows two or more different forms for many words. Compare *chair* and *chaise* (and even *shay*); *petrify* and *pier*; *peer* and *par* (cf. also *pair*); *cavalier* and *chevalier*, *feeble* and *foible*, etc. A dictionary of the French as used in England is much needed. For the language and its relations to English, see especially Behrens, *Beiträge zur Geschichte der französischen Sprache in England* (in *Französische Studien*, v.), and the same in Paul's *Grundriss der germanischen Philologie*, i., 799-836; also Skeat, *Principles of English Etymology*, 2d series, *The Foreign Element* (1891; this book is reviewed in *Modern Language Notes*, Nov., 1892).

E. S. SHELDON.

Normans [from Fr. *Normand*, from Dan. *Normand*, liter., Northman]: I. *The Northmen*.—Toward the end of the eighth century Western Europe began to be scourged by the inroads of Scandinavian pirates, known to the inhabitants of the British isles as "East-men" and "Danes"—to those of the Continent as "North-men." They were of Teutonic stock, a vigorous, seafaring race, not yet Christianized, peopling the coasts and islands of the Baltic and of the peninsulas of Jutland and Scandinavia. Need and the national thirst for adventure and for strife drove forth swarms of Vikings (i. e. bay-men, frequenters of bays and inlets) from the thickening population down upon the sunnier, richer, weaker south. These scoured the coasts of England, Germany, and France, pressed with their small, sharp, open vessels up the narrowest streams, burned, slew, and plundered, and sailed away laden with booty and with slaves. About the middle of the ninth century these raids began to assume an altogether new character and importance. The consolidation of the three great Scandinavian kingdoms broke the power of the petty kings and independent nobles, and drove many of them forth, with their followers, to seek a freer life in some new home. Northmen threw themselves in larger bands upon England, which the Wessex kings had not yet fairly centralized; upon the Frankish kingdoms, fast falling asunder under the later Carolingian rulers; harried the country, besieged and sacked the cities, wintered at the mouths of the rivers, and by the end of the century had wrested from Alfred half his kingdom, and had begun to plant colonies upon the coasts of France. Northmen ravaged Spain and the shores of the Mediterranean, fell upon Western Italy, penetrated Greece and Asia Minor, and there met others of their countrymen who had pressed down through Russia. In the Russia of that day Scandinavian invaders (Varangians) had become the ruling class, a military aristocracy; and those who made their way still farther south had formed the famous Varangian body-guard of the Byzantine emperors, which maintained its existence and its distinctive character for five centuries. During the latter half of the ninth century, also, Scandinavians, sailing westward, found and settled Iceland, where the old free Germanic community life held for nearly 400 years; whence Greenland was visited and colonized; whence, also, it seems, navigators made their way farther down the North American coast to a "Vinland" where settlements were attempted, and to a still more southerly "Hvitramanaland."

With the establishment, early in the tenth century, of settlements upon the Continent, with the occupation which Scandinavian energy found at home in wars between the three new kingdoms, and with the gradual triumph of Christianity in the north, Europe gained, at last, comparative rest. England's period of misery and humiliation under Ethelred (979-1016), which terminated with the establishment of a Danish dynasty (1017-42), marks the last great outburst of the pent-up heathenism.

II. *Normandy*.—Of all the settlements of the Northmen, one alone was destined to play a really important part in history. By the treaty of Claire-sur-Epte (912) Charles the Simple enfeoffed a viking, Rolf or Rollo, with the lands upon either side of the Seine of which he and his followers were in actual possession. In return the new duke of the Northmen recognized the Carolingian king as his overlord, and received baptism. It seemed highly probable that this latest Teutonic settlement would prove a powerful diversion in favor of the waning authority of the Frankish kings of Laon against the increasing influence of the French duchy of Paris, which had first risen to importance as a mark against the Northmen, and at whose expense the "Terra Northmannorum" was now created. Duke Rolf, indeed, remained loyal to his Carolingian lord, and, fighting in his cause, won for himself the Bessin; but William "Longsword" (927-943), who added to his domains the Cotentin, was largely French in feeling, and his allegiance to the Carolingians was a wavering one. The third duke, Richard "the Fearless" (943-996), became the "man" of Hugh the Great of Paris, and, later, of his son "Capet," to whose establishment upon the throne he lent decisive aid. It was thus the settlement of these northern pirates, says Freeman, which finally made Gaul French in the modern sense. It was at the same time the alliance with Romanic France which brought the Northmen fully under the influence of French language, law, and custom, which made them *Normans*, the foremost apostles alike of French chivalry and of Latin Christianity. Under Richard "the Good" (996-1026) Norman arms began to be borne beyond the borders of the Norman duchy. Robert of Toesny warred against the infidel in Spain; Rainulf began his career of conquest in Apulia. To the brothers Richard III. (1026-28) and Robert "the Devil" (1028-35) succeeded the "Bastard of Falaise," William the Conqueror. The duchy of Normandy—which before his conquest of England (1066) he had widened by the winning of Maine (1063)—he left at his death (1087) to his first-born Robert, from whom it was wrested (1106) by his brother, Henry I. of England. Thenceforth it was held by the English kings until its seizure by the French crown in 1203.

For the Norman conquest of England and its political consequences, see ENGLAND, HISTORY OF. For the influence which Norman institutions exercised in the development of the English common law, see MUNICIPAL LAW of England.

III. *The Normans in the Sicilies*.—The Sicilies at the beginning of the eleventh century were divided and disputed between Langobards, Greeks, and Saracens. A band of Norman knights, entering Apulia upon a pilgrimage, lent their aid to the Langobards, who were Latin Christians, in an attempt to expel the Greeks. This enterprise miscarried; but the reckless courage and strict discipline of the Normans brought their further assistance into great demand, and won them soon great fame and influence. In 1030 they built the city of Aversa; eight years later their leader Rainulf received from Conrad II. of Germany the title of count. Such beginnings drew from overcrowded Normandy fresh swarms of adventurers, with whose aid the Greek viceroy won from the Moslems (1038) the greater part of the island of Sicily. Swindled in the sharing of the booty, the Normans attacked the Greek possessions in Southern Italy with such success that their leader, William "Iron-arm," son of Tancred d'Hauteville, soon styled himself Count of Apulia; in which title we find his brother and successor, Drogo, confirmed by the German emperor, Henry III. With the third Apulian count, Humphrey, Pope Leo IX. came into strife over Benevento. Defeated and captured in the battle of Civitate (1053), the pontiff was fain to strike a peace upon the condition of Norman vassalage to the holy see. Still another son of Tancred, the famous Robert Guiscard, succeeded his brother Humphrey (1056). "By the grace of God and of St. Peter, Duke of Apulia and Calabria," he spent the first twenty years of his long rule in making good his title over Greek, Langobard, and Norman. Meanwhile his younger brother, Roger, passing with a few hundred knights into Sicily, won a series of brilliant victories, and finally, with Robert's aid, made himself master of the island. In 1081 Robert invaded Greece and defeated the East Roman emperor at Durazzo in Albania. Already Byzantium trembled, when disturbances in Apulia and the repeated summons of the pope, in hot strife with Henry IV. of Germany, drew the Guiscard back to Italy. Bursting into the Campagna with 6,000 horse and 30,000 foot, he pressed back the German emperor, delivered Gregory (besieged in St. Angelo),

and sacked Rome (1084). Dying the next year, he left the ducal title to his second son, Roger. His first-born, Boemund, won great fame in the first crusade and established an independent principality in Antioch. In 1127 the Guiscard line became extinct, and Roger, second Count of Sicily, united the conquests of the house of Tancred, reigning as King of Sicily and Naples; as did also his son and grandson after him, William I. (1154-66) and William II. (1166-89). From the raising of the siege of St. Angelo, through all the conflicts between the papacy and the German empire, the former found in the Sicilies, under the Norman supremacy, its firmest support; but in 1186, through the marriage of Henry VI. of Germany with Constance, aunt and heiress of the childless William II., the succession to the Sicilian throne passed over to the imperial house of Hohenstaufen. Upon William's death (1189) the pope and the Norman nobility set up the illegitimate Tancred; but in 1194, invading the Sicilies with a German army, Henry crushed out all opposition. His son by Constance, Frederick II., afterward united and ruled both realms. Under the Norman kings and the half-Norman Frederick the Sicilies furnished the one example of the time of full religious toleration. Greek and Saracen dwelt together in the enjoyment of civil equality and freedom of faith. The art and the learning of both races found generous encouragement. Sicily and Spain, the points at which the Eastern civilization touched the Western most closely, became the centers from which the culture of the Saracen and the reawakening of scientific study spread throughout Europe. In 1266 Charles of Anjou, in league with the papacy, defeated and slew King Manfred, Frederick's son, and made himself master of the Sicilies. After the overthrow of their supremacy, the Normans, as in France and in England, became blended with the races they had ruled.

LITERATURE.—Palgrave, *History of Normandy and England* (London, 1857); Freeman, *History of the Norman Conquest of England* (Oxford, 1870), especially vol. i., ch. iv., and vol. ii., ch. viii. MUNROE SMITH.

Norns (Icelandic plural *Nornir*): the goddesses of fate in Scandinavian mythology. There are three—Urd (the Past), Verdané (the Present), and Skuld (the Future). They dwell near Urd's fountain, by one of the roots of the great ash Ygdrasil, where the gods meet in council. They water the branches of Ygdrasil to keep the tree from withering and fading. They weave the web of men's lives, stretching it from the radiant dawn to the glowing sunset. The destiny of the world is in the hands of the norns, and even the gods must submit to their decrees. The three witches in Shakespeare's *Macbeth* have their origin in the Scandinavian norns. RASMUS B. ANDERSON.

Noronia, *nō-rōn'yā*, GASPARD MARÍA DE NAVA ÁLVAREZ, Conde de: poet and soldier; b. at Castellón de la Plana, Spain, May 6, 1760; d. in Madrid in 1815. He became a royal page in 1766; captain of dragoons in 1778. He greatly distinguished himself in the siege of Gibraltar. When peace with Great Britain was declared, he was sent as ambassador to Russia. In 1792 he returned to the army, and became lieutenant-general in command of part of the Spanish army in Galicia. Throughout his career he cultivated letters as a pastime. He wrote a tragedy in verse, *Madama González*; and two comedies in prose, *El Hombre marcial* and *El Cortejo enredador*. He wrote also many lyrics and occasional poems (published under the title *Poesías*, 2 vols., Madrid, 1799), and a dull epic, *Ommiada* (2 vols., Madrid, 1816). He translated into Spanish various poems from the Arabic, Persian, and Turkish (*Poesías asiáticas*, Paris, 1833). The best of his work is to be found in vol. lxiii. of Rivadeneyra's *Biblioteca de Autores Españoles* (Madrid, 1871).

A. R. MARSH.

Noronha, FERNANDO, de: See FERNANDO DE NORONHA.

Norridgewocks: See ALGONQUIAN INDIANS.

Norris, WILLIAM EDWARD: novelist; b. in London, 1847, a son of Sir William Norris, chief justice of Ceylon. He was educated at Eton, and admitted to the bar in 1874. Among his novels, which have been likened to Thackeray's, are *Matrimony* (1881); *Thirlby Hall* (1884); *Adrian Vidal* (1885); *The Rogue* (1888); *Marcia* (1890); *Mr. Chaine's Sons* (1891); *His Grace* (1892); *A Deplorable Affair* (1893). H. A. B.

Norris, WILLIAM FISHER: ophthalmologist; b. June 6, 1839, in Philadelphia, Pa.; was educated at the University of Pennsylvania; is assistant surgeon and brevet captain

U. S. army; surgeon of the Wells Eye Hospital; Professor of Ophthalmology, University of Pennsylvania. He is author of *Medical Ophthalmology* (in Peppar's *System of Medicine*), and, with Charles A. Oliver, of *A Text-book of Diseases of the Eye*. C. H. T.

Norristown: borough (incorporated in 1812, enlarged in 1853); capital of Montgomery co., Pa. (for location of county, see map of Pennsylvania, ref. 6-J); on the Schuylkill river, the Schuylkill Canal, and the Phila. and Reading, the Penn. and the Stoney Creek railways; 16 miles N. W. of Philadelphia. It is in an agricultural and mineral region, and in some parts is 200 feet above the river. The water-supply is from the Schuylkill river, the distribution being from a reservoir at a height of nearly 200 feet above the level of the river. Several bridges across the river connect the borough with that of Bridgeport. The borough is the seat of one of the State hospitals for the insane, having twenty buildings and accommodations for nearly 2,000 patients, and has over 20 churches, public-school property valued at \$200,000, 3 national banks with combined capital of \$550,000, 4 libraries (the Norristown Library Association, founded 1796; Montgomery County Law, founded 1869; the William McCann High School, founded 1870; and the insane hospital, founded 1880) containing together over 20,000 volumes, and 3 daily, 5 weekly, and 2 other periodicals. The industries include the manufacture of cotton and woolen goods, shirts, hosiery, glass, carpets, brick, flour, and iron furnace and rolling-mill products. Pop. (1880) 13,063; (1890) 19,791.

EDITOR OF "HERALD."

Norrköping: town of Sweden, in lat. 59° N., on the Motala, near the Baltic. The river is here crossed by several substantial bridges, and lined with commodious quays and spacious docks (see map of Norway and Sweden, ref. 12-F). Norrköping ranks as the second manufacturing city in Sweden; it has important ship-building and sugar-refining establishments, a salmon-fishery, and manufactures of paper, tobacco, leather, cotton, linen and woolen goods, and other articles. In 1888 its factories numbered 75. Pop. (1891) 32,826.

Revised by R. B. ANDERSON.

Norse Literature: See EDDA.

Norse Mythology: See SCANDINAVIAN MYTHOLOGY.

North, CHRISTOPHER: See WILSON, JOHN.

North, EDWARD, L. H. D., LL. D.: educator; b. at Berlin, Conn., Mar. 9, 1820; graduated at Hamilton College in 1841; was principal of the Grammar School, Clinton, N. Y., 1841-42; was Dexter Professor of Greek and Latin in Hamilton College 1843-62; has been Professor of Greek Language and Literature in the same institution since 1862. He has been necrologist of the alumni society; editor of the *Triennial*, and of *Alumniiana* in the *Hamilton Literary Monthly*; since 1881 a member of the board of trustees; was acting president 1892.

C. K. HOYT.

North, FRANCIS: jurist; Baron Guilford, son of the fourth Baron North; b. in England, Oct. 22, 1637; studied at Cambridge and at the Middle Temple; was called to the bar 1661; was retained by the crown in important cases; was knighted and became solicitor-general 1671; appointed attorney-general 1673, chief justice of the common pleas 1675, privy councillor 1679, lord keeper of the great seal 1682; created Baron Guilford Sept., 1683. D. Sept. 5, 1685.—Of his brothers, Sir DUDLEY, b. May 16, 1641, was a wealthy Turkey merchant and M. P., author of *Discourses upon Trade*, etc., which entitles him to a high rank among the political economists of the seventeenth century, and even anticipates the doctrines of Adam Smith and the Manchester school. D. Dec. 31, 1691.—JOHN, b. in London, Sept. 3, 1645, became a fellow of Cambridge, Professor of Greek, master of Trinity College, doctor of divinity, and editor of Plato's *Dialogues*. D. at Cambridge, Apr., 1683.—ROGER, b. about 1650, became attorney-general under James II., was author of biographies of the above three brothers (1740-42) and of several treatises on law, politics, and music. D. Mar. 1, 1734.

North, FREDERIC, Earl of Guilford, best known as Lord NORTH: statesman; b. in England, Apr. 13, 1733; educated at Eton and at Trinity College, Oxford; entered the House of Commons as a Tory at an early age; became a lord of the treasury 1759, and in 1763 moved the expulsion of John Wilkes; supported the American Stamp Act 1765; became joint paymaster of the forces 1766; became Chancellor of the Exchequer and leader of the House of Commons on the death of Charles Townshend 1767; First Lord of the Treas-

ury and Prime Minister 1770; proposed the colonial tea duty 1773, and the Boston Port Bill Mar., 1774; retired from office Mar. 20, 1782; became joint Secretary of State with Fox in the "coalition ministry" 1783; became blind 1787; succeeded to the earldom 1790; died Aug. 5, 1792.

North Adams: town; Berkshire co., Mass. (for location of county, see map of Massachusetts, ref. 2-C); on the Hoosac river, and the Boston and Albany and the Fitchburg railways; at the west terminus of the Hoosac tunnel. (See TUNNELS AND TUNNELING.) It is surrounded by the high and picturesque Berkshire hills, comprises several villages, and has Greylock, the highest mountain in Massachusetts, and Hudson's brook, where there is an interesting natural bridge of soft marble, in its vicinity. The town contains a large number of cotton and woolen mills and shoe-factories, and was one of the first manufacturing places in the Northern and Eastern States to make use of Chinese labor. It has 2 national banks, capital \$700,000, 2 savings-banks, a daily and 3 weekly newspapers, and a public library (founded 1884) with over 10,000 volumes. Pop. (1880) 10,191; (1890) 16,074; (1895) 19,135.

EDITOR OF "TRANSCRIPT."

North America: See AMERICA.

Northampton, or Northamptonshire: an inland county of England; bounded N. by Leicester, Rutland, and Lincoln. E. by Huntingdon, Bedford, and Bucks, S. by Oxford, and W. by Warwick. Area, 984 sq. miles. The surface is finely diversified with richly wooded hills and well-watered valleys, and the soil, consisting mostly of a black mould or a brown loam, is very fertile. Wheat and green crops are largely grown. On the broads many cattle are grazed and dairy farming is carried on. The principal minerals are limestone and ironstone of a good quality. It returns four members to Parliament. Pop. (1891) 302,184.

Northampton: capital of the county of Northampton, England; on the Nene; 50 miles S. E. of Birmingham (see map of England, ref. 10-I). It has a fine town-hall, a free library, a museum, schools of science and art, and thirteen churches, among which is St. Sepulchre's, one of the few remaining round churches in England. In the neighborhood of the town is a fine racecourse at which there are two meetings annually. Its manufactures of hosiery and lace have declined, but those of leather, boots, and shoes are very important; also its breweries, iron-foundries, and flour-mills. The parliamentary borough returns two members to Parliament. Pop. (1891) 61,016.

Northampton: city (settled in 1754); capital of Hampshire co., Mass. (for location of county, see map of Massachusetts, ref. 3-E); on the Connecticut river, and the Boston and Maine, the Conn. River, and the N. Y., N. H. and Hart. railways; 17 miles N. of Springfield, 95 miles W. of Boston. It has an elevated site, affording a fine view of Mt. Holyoke and Mt. Tom, and is connected with Hadley by a bridge across the river. Among its notable institutions are Smith College for young women (non-sectarian, chartered 1871), the Clarke Institution for Deaf Mutes (founded 1867, endowed by John Clarke with \$3,000,000), a classical school for girls, the State Lunatic Asylum (established 1858), and a Soldiers' and Sailors' Memorial Hall (cost \$75,000). There are 6 libraries (Public, Smith College Reference, Clarke Institution, Burnham Classical School, Hampshire County Law, and Lunatic Asylum) containing over 40,000 volumes; 3 national banks with combined capital of \$1,150,000, 2 savings-banks, and a monthly, 2 daily, and 2 weekly periodicals. The industries include the manufacture of baskets, sewing-machines, pocket-books, cotton, woolen, and silk goods, brushes, paper, buttons, and cutlery. The beauty and salubrity of its location have made it a popular summer resort. Pop. (1880) 12,172; (1890) 14,990; (1895) 16,716.

EDITOR OF "HERALD."

North Anna, BATTLES OF: See WILDERNESS, BATTLES OF THE.

North Attleboro: town; Bristol co., Mass. (for location of county, see map of Massachusetts, ref. 4-I); on the N. Y., N. H. and Hart. Railroad; 14 miles N. by E. of Providence, 30 miles S. S. W. of Boston. It is noted for its manufactures of jewelry, and contains a public library, national bank with capital of \$150,000, savings-bank, and a daily newspaper. Pop. (1890) 6,727; (1895) 6,576.

North Baltimore: village; Wood co., O. (for location of county, see map of Ohio, ref. 2-D); on the Balt. and O. and the Cin., Ham. and Dayton railways; 38 miles E. of Defiance. It is in a natural-gas region, has manufactures

of lumber and staves, and contains a national bank with capital of \$60,000, a State bank with capital of \$37,500, and two weekly newspapers. Pop. (1880) 701; (1890) 2,857.

North Bay: a town of Ontario, Canada; on the north shore of Lake Nipissing; station on the Northern Pacific Railway; 244 miles N. W. of Ottawa (see map of Ontario, ref. 1-E). It was founded in 1884 and develops rapidly. Population, principally French Canadian, 1,400. M. W. H.

Northbrook, THOMAS GEORGE BARING, Viscount: statesman; eldest son of the first baron; b. at Stratton Park, near Winchester, England, in 1826; graduated at Oxford 1846; was successively private secretary to Mr. Labouchere at the Board of Trade, to Sir George Grey at the Home Office, to Sir Charles Wood at the India Board and at the Admiralty; entered Parliament in the Liberal interest 1857; was a lord of the admiralty 1857-58; Under Secretary of State for India June, 1859-Jan., 1861, for War from the latter date to June, 1866, and again on the accession of Mr. Gladstone to office Dec., 1868, till Feb., 1872, when he was appointed Viceroy and Governor-General of India, having succeeded to the barony in Sept., 1866. In 1876 he resigned and was created a viscount; in 1880 he was appointed First Lord of the Admiralty in Gladstone's cabinet, but in 1886 opposed the home-rule policy of the Premier.

North Brookfield: town; Worcester co., Mass. (for location, see map of Massachusetts, ref. 3-F); on the North Brookfield branch of the Boston and Albany Railroad; 20 miles W. of Worcester, one of the county-seats. It is in an agricultural and dairying region, is extensively engaged in the manufacture of shoes, and has two libraries (Appleton, founded 1859, and Free Public, founded 1880) containing over 10,000 volumes, a savings-bank, and a weekly newspaper. Pop. (1880) 3,427; (1890) 3,871; (1895) 4,635.

North Cape: See CAPE NORTH.

North Carolina [Mod. Lat. (sc. *terra*, land), land of Charles, liter., femin. of *Carolinus*, pertaining to Charles, deriv. of *Carolus*, Charles. Named in honor of Charles I.];



Seal of North Carolina.

one of the U. S. of North America (South Atlantic group); the twelfth of the original thirteen States that ratified the Federal Constitution.

Location and Area.—It lies between 33° 50' and 36° 33' N. lat. and 75° 27' and 84° 20' W. lon.; is bounded on the N. by Virginia, on the E. and S. E. by the Atlantic Ocean, on the S. by the Atlantic, South Carolina, and part of Georgia, on the W. by Tennessee. Extreme length from E. to W., 503½ miles; extreme breadth N. to S., 187½ miles; average breadth, 100 miles. Area, 52,250 sq. miles, of which 3,670 are water surface.

Physical Features.—A line drawn from Weldon, on the Roanoke river, to Raleigh, and thence to Columbia, S. C., divides the State into two geologic regions—the eastern or coastal plane region, the formations of which are comparatively recent in age and are composed mainly of sands and clays, with occasional composites of marl and limestone; and the western, the formations of which are of older rocks, mostly granites, gneisses, and crystalline schists, containing two narrow and irregular strips of coal-bearing red sandstone and shale (Triassic or Newark). Along the western

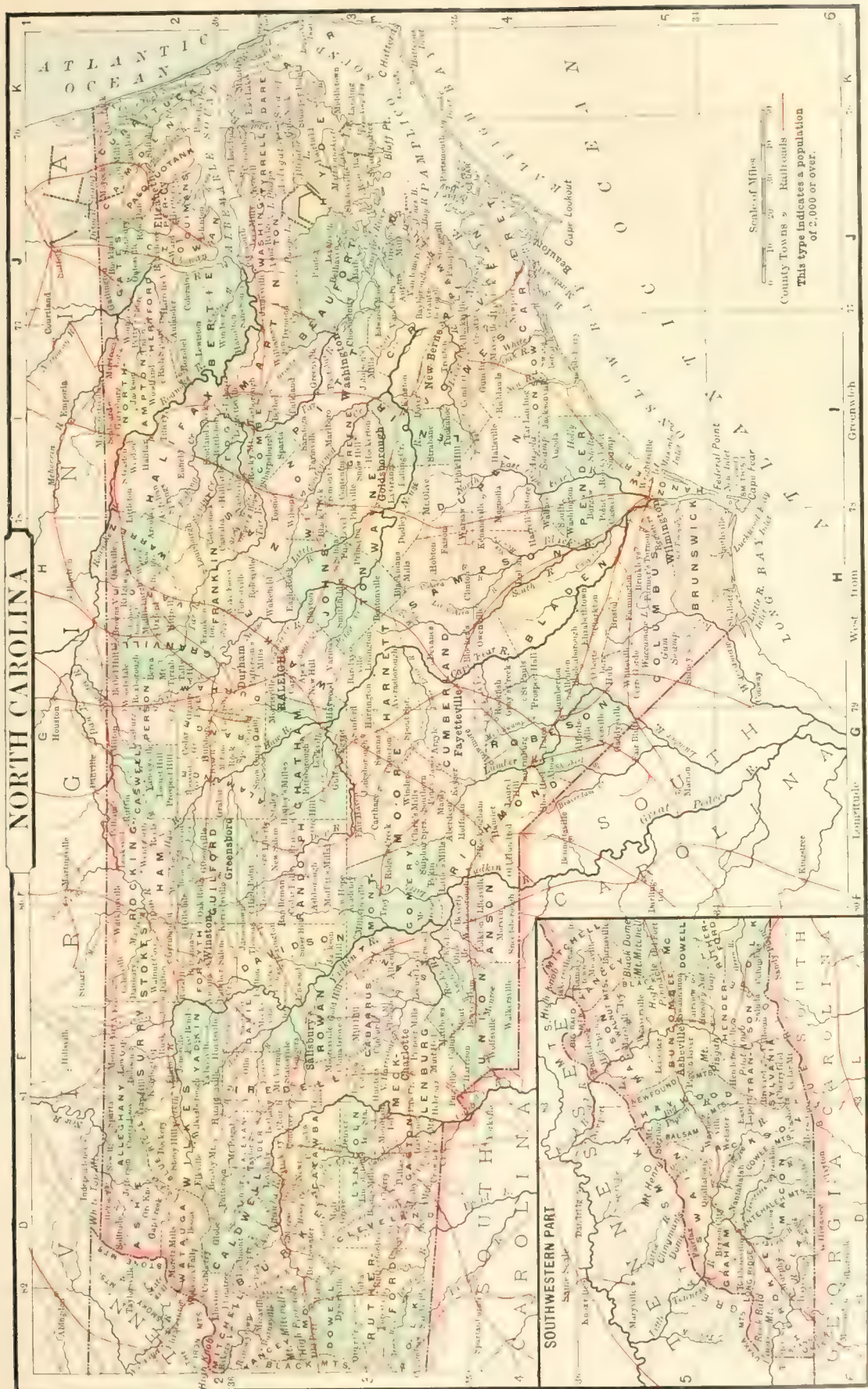
border of this eastern region the surface is undulating, and has an elevation varying from 200 to 300 feet above the sea. Eastward, approaching the ocean, the elevation decreases to but a few feet above the sea, and the surface becomes nearly level, in many places marshy, and extensively intersected by the sounds and estuaries of the rivers. The western region, undulating along its eastern border, becomes more hilly westward through the middle and Piedmont counties until the hills become small mountains, and these in turn give place to the Blue Ridge and adjacent mountain chains, which reach their maximum development in the Black Mountains. The eastern region contains large areas of the finest farming lands of the State and valuable forests of pine. The occasional economic mineral products are marls, limestone, and phosphate. In the middle and western counties the mineral products occur on a larger scale. Granite and granitic gneiss suitable for building, monumental, and paving stone are widely distributed. Sandstones—brown, red, and gray—are found in the middle section, and marble—white, pink, and blue—occurs in the western. Slate suitable for roofing has been quarried in two counties; the conglomerates of the Triassic are successfully used as millstones; kaolin occurs in large quantities and of excellent quality. Talc is mined on a considerable scale in the extreme southwest; agalmatolite is found abundantly in Chatham and Moore Counties; baryta occurs extensively, and is mined in Madison County; corundum is extensively mined in Jackson, Macon, and Clay Counties; mica occurs as large crystals associated with quartz and feldspar; and veins of bituminous and anthracite coal in the Triassic formations in Chatham, Moore, Rockingham, and Stokes Counties. Iron ores, copper, silver, and gold are widely distributed through the State. For nearly a century gold-mining has attracted attention, and upward of \$22,000,000 worth has been obtained. More than 180 species of minerals have been discovered, including gems such as the diamond, ruby, sapphire, hiddenite, emerald, beryl, amethyst, garnet, and zircon.

North Carolina is well drained, though none of its streams are large. In the mountain plateau are the Hiwassee, Tennessee, Pigeon, French Broad, Nolichucky, and the Watauga, all flowing toward the Mississippi river. The New river flows northward into the Ohio. Eastward of the Blue Ridge, the Broad, Catawba, and Yadkin flow to the Atlantic through South Carolina, the Broad becoming the Wateree and the Catawba the Congaree, the two uniting to form the Santee. The Yadkin, uniting with the Uwharrie, becomes the Pedee. The Dan, the longest river in the State, has part of its course in Virginia. Other rivers rising at some distance from the mountains are the Tar, near its mouth called the Pamlico, the Neuse, the Cape Fear, formed by the Haw and the Deep, the Lumber, changing its name in South Carolina to Little Pedee, and the Waccamaw. All of the rivers E. of the Blue Ridge are navigable 100 or more miles for light craft.

The largest sheets of inland water are Albemarle and Pamlico Sounds. The former is about 50 miles long and of variable width, the maximum being about 15 miles, and Pamlico is about 75 miles long and 15 to 25 miles broad. Between them and the ocean are long, narrow islands of sand, which extend into the ocean, in some places 100 miles, forming dangerous shoals, of which Cape Hatteras, Cape Lookout, and Cape Fear are the most prominent visible points. Lakes are found only in the eastern section. The largest is Mattamuskeet, in Hyde County, 15 miles long and 5 to 7 wide. Waccamaw Lake, in Columbus County, is 8 miles long and about 5 miles broad.

The area occupied by the swamps is nearly 4,000 sq. miles, mostly in the counties bordering on the ocean and the sounds. Some are mere peat-bogs, having a growth of juniper and cypress, while the best have black gums, poplars, ash, and maple. The largest continuous area of swamp is between Albemarle and Pamlico Sounds, nearly 3,000 sq. miles. More than 100 sq. miles of the Great Dismal Swamp is in North Carolina.

The mountain section is a high plateau bounded on the E. by the Blue Ridge and on the W. by the chain known under the names of Iron, Smoky, and Unaka Mountains. Between these are the cross chains, called, beginning at the N., the Black, Craggy, Pisgah and New Found, Balsam, Cowee, Nantehala, Valley River, Cheowah, and Long Ridge Mountains. The average elevation of the Blue Ridge is about 4,000 feet, the highest peaks being the Grandfather and the Pinnacle, nearly 6,000 feet high. The Smoky Mountains have peaks higher than this, as Clingman's Dome (6,660) and Mt. Guyot (6,636 feet). The highest E. of the Rocky Moun-



tains are among the Black Mountains, Mt. Mitchell being 6,688 feet high. In all there are 43 peaks over 6,000 feet high and 82 between 5,000 and 6,000 feet. East of the Blue Ridge are various lower and smaller detached ranges, such as the Sauratun, Brushy, South, Linville, Green River, Tryon, and Hungry Mountains. Belonging to the first named is the picturesque, solitary peak called the Pilot, with the Pinnacle, a sheer mass of rock like a castle.

Flora and Fauna.—North Carolina has an extraordinary variety of flora. Out of 22 oaks indigenous to the U. S. she has 19. She has all the 8 pines, 4 of the 5 spruces, 6 of the 8 hickories, and all of the 7 magnolias. Some of the best varieties of grapes had their origin here. No country has a more abundant display of rhododendrons, kalmias, honeysuckles, jasmines, ferns, and grasses. In the waters and swamps of the east are turtles and terrapins, including the much-sought diamond-backed variety. Swarms of wild geese, swans, ducks, and the other aquatic fowls attract the sportsman, as does the quail (or partridge) on the uplands. Large catches of mackerel, bluefish, flounder, mullets, etc., are made in the ocean, and of herrings, shad, rock bass, etc., in the sounds and rivers. Immense numbers of menhaden and other fish are caught to be made into fertilizers.

Soil and Productions.—The soil varies considerably in character, being generally a loam which becomes more sandy in the eastern and frequently more clayey in the central and western regions. The great variety of soils and the wide range of climate give rise to a rich and varied forest growth. In the southeastern counties, under the influences of the Gulf Stream, are found the magnolias, palmettos, live-oaks, and other semi-tropical trees, while on the higher mountains of the west are the spruces and firs, characteristic of Canada and New England. The pines (chiefly *Pinus taeda* and *P. palustris*) are the characteristic timber trees of the eastern counties; oaks predominate in the midland and western counties, but in the mountain forests they are interspersed abundantly with chestnut, hemlock, and the tulip-tree. Hickories and other hard-wood trees also abound in the central and western counties, and to a less extent in the east.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.
Total number of farms.....	157,609	178,359	13.2
Total acreage of farms.....	22,363,558	22,651,896	1.3
Value of farms, with buildings and fences.....	\$135,793,602	\$183,977,010	35.5

* Increase.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1893:

CROPS.	Acreage.	Yield.	Value.
Corn.....	2,435,310	29,954,313 bush.	\$14,977,157
Wheat.....	724,111	5,337,710 "	4,275,151
Oats.....	544,220	7,653,502 "	3,376,341
Rye.....	55,908	430,492 "	301,344
Tobacco.....	88,208	44,897,872 lb.	3,591,830
Potatoes.....	18,321	1,777,137 bush.	1,066,282
Hay.....	182,805	310,769 tons	3,452,644
Totals.....	4,048,883		\$31,040,749

In 1895 the cotton crop amounted to 339,499 bales.

On Jan. 1, 1894, the farm animals comprised 134,517 horses, value \$9,712,005; 109,762 mules, value \$8,521,935; 274,794 milch cows, value \$4,119,162; 386,463 oxen and other cattle, value \$4,308,446; 376,309 sheep, value \$559,195; and 1,334,966 swine, value \$5,328,916.

Climate.—The following table shows the mean monthly and annual temperature in degrees Fahrenheit.

MONTHS.	Eastern District.	Central District.	Western District.	State.
January.....	43.6	40.7	38.5°	40.8
February.....	46.0	41.2	41.8	44.3
March.....	49.5	49.2	46.0	48.0
April.....	55.8	50.8	50.3	52.7
May.....	67.4	68.2	64.1	66.9
June.....	75.1	75.7	70.9	74.4
July.....	78.8	78.7	74.4	77.8
August.....	77.2	76.0	72.2	75.8
September.....	72.3	69.8	66.2	70.2
October.....	62.4	59.2	55.3	59.7
November.....	52.7	49.1	45.6	49.7
December.....	45.2	43.2	39.8	42.7
Year.....	60.7	59.5	55.9	59.0

The following table shows the mean monthly and annual precipitation in inches. It will be noticed that North Carolina belongs to the region of the U. S. characterized by the largest precipitation.

MONTHS.	Eastern District.	Central District.	Western District.	State.
January.....	4.60	4.30	4.55	4.52
February.....	3.48	4.35	5.40	4.25
March.....	4.64	4.21	5.56	4.90
April.....	4.29	3.75	3.75	3.84
May.....	4.01	4.00	4.34	4.31
June.....	4.40	4.00	4.34	4.34
July.....	5.98	4.66	5.19	5.44
August.....	6.66	5.23	5.42	6.09
September.....	5.64	4.40	3.88	4.66
October.....	4.04	3.47	3.38	3.65
November.....	3.42	3.53	3.35	3.40
December.....	4.16	3.73	3.92	4.00
Year.....	55.23	49.85	53.32	53.29

The average fall of snow is less than 5 inches. The average date of the first killing frost is Oct. 10. Tornadoes with funnel-shaped clouds occur at rare intervals. The storms on the Atlantic coast, especially off Hatteras, are violent and destructive to shipping.

Divisions.—For administrative purposes the State is divided into ninety-six counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Alamance.....	2-G	14,613	18,271	Graham.....	991
Alexander.....	2-D	8,355	9,430	Taylorsville.....	525
Alleghany.....	2-D	5,486	6,523	Sparta.....	55
Anson.....	4-F	17,994	20,027	Wadesboro.....	1,500
Ashe.....	2-D	14,437	15,628	Jefferson.....	413
Beaufort.....	3-J	17,474	21,072	Washington.....	3,545
Bertie.....	2-J	16,399	19,176	Windsor.....	522
Bladen.....	4-H	16,158	16,763	Elizabethtown.....	212
Brunswick.....	5-H	9,389	10,900	Southport.....	1,207
Buncombe.....	3-C	21,909	35,266	Asheville.....	10,235
Burke.....	3-D	12,809	14,939	Morganton.....	1,557
Cabarrus.....	3-E	14,964	18,142	Concord.....	4,339
Caldwell.....	2-D	10,291	12,298	Lenoir.....	673
Camden.....	2-K	6,274	5,667	Camden.....	100
Carteret.....	4-J	9,784	10,825	Beaufort.....	2,007
Caswell.....	2-G	17,825	16,028	Yanceyville.....	450
Catawba.....	3-D	14,946	18,689	Newton.....	1,038
Chatham.....	3-G	23,453	25,413	Pittsboro.....	350
Cherokee.....	3-A	8,182	9,976	Murphy.....	803
Chowan.....	2-J	7,900	9,167	Edenton.....	2,305
Clay.....	3-A	3,316	4,197	Hayesville.....	111
Cleveland.....	3-D	16,571	20,394	Shelby.....	1,394
Columbus.....	5-G	14,439	17,856	Whiteville.....	372
Craven.....	4-I	19,729	20,533	Newbern.....	7,843
Cumberland.....	4-G	23,836	27,321	Fayetteville.....	4,232
Currituck.....	2-K	6,476	6,747	Currituck.....	50
Dare.....	3-D	3,243	3,768	Manteo.....	100
Davidson.....	3-F	20,333	21,702	Lexington.....	1,410
Davie.....	2-E	11,096	11,621	Mocksville.....	562
Duplin.....	4-I	18,773	18,690	Kennansville.....	251
Durham.....	2-G	26,181	18,041	Durham.....	5,485
Edgecombe.....	2-I	26,181	24,113	Tarboro.....	1,924
Forsyth.....	2-F	18,070	28,344	Winston.....	8,018
Franklin.....	2-H	20,829	21,090	Louisburg.....	667
Gaston.....	3-D	14,254	17,764	Dallas.....	441
Gates.....	2-J	8,897	10,252	Gatesville.....	252
Graham.....	3-A	2,255	3,313	Robbinsville.....	100
Granville.....	2-H	31,286	24,484	Oxford.....	2,967
Greene.....	3-I	10,037	10,030	Snow Hill.....	288
Guilford.....	2-F	23,585	28,052	Greensboro.....	3,317
Habifax.....	2-I	30,300	28,508	Habifax.....	361
Harnett.....	3-G	10,862	13,700	Lillington.....	107
Haywood.....	3-B	10,271	13,346	Waynesville.....	455
Henderson.....	3-C	10,281	12,589	Hendersonville.....	1,216
Hertford.....	2-I	11,843	13,851	Winton.....	419
Hyde.....	3-K	7,765	8,903	Swan Quarter.....	100
Iredell.....	3-E	22,675	25,462	Statesville.....	2,318
Jackson.....	3-B	7,343	9,512	Webster.....	209
Johnston.....	3-H	23,461	27,239	Smithfield.....	559
Jones.....	4-I	7,491	7,403	Trenton.....	207
Lenoir.....	4-I	15,614	14,879	Kinston.....	1,726
Lincoln.....	3-D	15,586	15,586	Limehinton.....	957
McDowell.....	3-C	9,836	10,939	Marion.....	799
Macon.....	3-B	8,064	10,102	Franklin.....	281
Madison.....	2-C	12,810	17,865	Marshall.....	366
Martin.....	3-I	13,140	15,321	Williamston.....	751
Mecklenburg.....	3-E	34,175	42,674	Charlotte.....	11,557
Mitchell.....	2-C	9,435	12,807	Rakersville.....	476
Montgomery.....	3-F	9,374	11,239	Troy.....	131
Moore.....	3-G	16,821	20,479	Carthage.....	18
Nash.....	2-H	17,731	20,707	Nashville.....	401
New Hanover.....	5-H	21,376	24,026	Wilmington.....	20,056
Northampton.....	2-I	20,032	21,242	Jackson.....	750
Onslow.....	5-I	9,829	10,404	Jacksonville.....	170
Orange.....	2-G	23,698	14,948	Hillsboro.....	662
Pamlico.....	4-J	6,323	7,146	Rayboro.....	170
Pasquotank.....	2-J	10,369	10,748	Elizabeth City.....	3,251
Pender.....	5-H	12,468	12,514	Burgess.....	100

* Reference for location of counties, see map of North Carolina.

COUNTIES AND COUNTY-TOWNS—CONTINUED.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Perquimans.....	2-J	9,466	9,293	Hertford.....	733
Person.....	2-G	13,719	15,151	Roxboro.....	421
Pitt.....	3-I	21,794	25,519	Greenville.....	1,937
Polk.....	3-C	5,062	5,902	Columbus.....	100
Randolph.....	3-F	20,386	25,195	Asheboro.....	510
Richmond.....	4-F	18,245	23,948	Rockingham.....	1,600
Robeson.....	4-H	23,880	31,483	Lumberton.....	584
Rockingham.....	2-F	21,744	25,363	Wentworth.....	242
Rowan.....	3-E	19,965	24,123	Salisbury.....	4,418
Rutherford.....	3-C	15,198	18,770	Rutherfordton.....	.....
Sampson.....	4-H	22,894	25,096	Clinton.....	839
Stanly.....	3-F	10,505	12,136	Albemarle.....	248
Stokes.....	2-F	15,353	17,199	Danbury.....	144
Surry.....	2-E	15,302	19,281	Dobson.....	178
Swain.....	3-B	3,784	6,577	Bryson City.....	.....
Transylvania.....	3-C	5,340	5,881	Brevard.....	327
Tyrrill.....	3-K	4,545	4,225	Columbia.....	209
Union.....	4-E	18,056	21,259	Monroe.....	1,866
Vance.....	2-H	.....	17,581	Henderson.....	4,191
Wake.....	3-H	47,939	49,207	Raleigh.....	12,678
Warren.....	2-H	22,619	19,360	Warrenton.....	740
Washington.....	3-J	8,928	10,600	Plymouth.....	1,212
Watauga.....	2-D	8,160	10,611	Boone.....	144
Wayne.....	3-H	24,951	26,100	Goldsboro.....	4,017
Wilkes.....	2-D	19,181	22,675	Wilkesboro.....	336
Wilson.....	3-H	16,064	18,644	Wilson.....	2,126
Yadkin.....	2-E	12,420	13,790	Yadkinville.....	175
Yancey.....	2-C	7,694	9,490	Burnsville.....	100
Totals.....		1,399,730	1,617,947		

* Reference for location of counties, see map of North Carolina.

Principal Cities and Towns, with Population for 1890.—Wilmington, 20,056; Raleigh, 12,678; Charlotte, 11,557; Asheville, 10,235; Winston, 8,018; Newbern, 7,843; Durham, 5,485; Salisbury, 4,418; Concord, 4,339; Fayetteville, 4,222; Henderson, 4,191; Goldsboro, 4,017; Washington, 3,545; Greensboro, 3,317; Elizabeth City, 3,251.

Population and Races.—In 1860, 992,622; 1870, 1,071,361; 1880, 1,399,750; 1890, 1,617,947 (native, 1,614,245; foreign, 3,702; males, 799,149; females, 818,798; white, 1,055,382; colored, 562,565, including 561,018 of African descent.

Industries and Business Interests.—The census of 1890 showed that 3,667 manufacturing establishments reported. These had a combined capital of \$32,745,995, employed 36,214 persons, paid \$7,830,536 for wages and \$22,789,187 for materials, and had products valued at \$40,375,450. In 1894 there were 146 cotton-mills, with 665,000 spindles and 9,128 looms; 14 woolen-mills; 28 fruit-canning and 14 oyster-canning establishments; 16 fertilizer works; 14 oil-cake factories; 8 hosiery-mills; 16 building-stone quarries; and more than 100 factories manufacturing tobacco in some form. The tobacco industry has made rapid progress, and the towns of Durham, Winston, and Henderson have been created by it. Durham has manufactured in a single year 620,200,000 cigarettes, 4,865,835 lb. of plug and smoking tobacco, 2,263,250 cigars, and 71,500 lb. of snuff, and paid a revenue tax on these manufactures of \$616,129; and Winston has paid a revenue tax of over \$660,000 on similar manufactures. The manufacture of wagons, carriages, furniture, sash, doors, and blinds, paper, and of miscellaneous iron-work, shows a rapid increase and a large volume. The fisheries industry represents a capital of \$506,560, employs over 5,000 persons, 95 vessels, and nearly 2,800 boats.

Finances and Banking.—Under the compromise offered by the State of its admitted indebtedness, \$3,298,950 of coupon bonds, bearing 4 per cent, payable semi-annually, have been issued. If all the bonds outstanding should be brought in for exchange, the total 4 per cent. debt would be \$3,615,570. There is also a debt of \$2,720,000, for which \$3,000,000 stock in the North Carolina Railroad Company is held. These bonds bear 6 per cent. interest, but the dividends on the stock are more than sufficient for their payment.

The assessed valuations in 1892 were: Real estate, \$155,083,714; personal, \$82,410,049; railway, \$24,223,963—total, \$261,717,726. In 1893 there were 24 national banks, with combined capital of \$2,676,000, surplus and profits of \$1,168,867, and deposits of \$3,907,043; 33 State banks, with capital of \$1,913,530, surplus of \$373,896, and deposits of \$2,446,621; and 4 savings-banks, with capital of \$40,000 and deposits of \$301,234.

Post-offices and Periodicals.—On Jan. 1, 1894 there were 2,883 post-offices, of which 36 were presidential (8 second-class, 28 third-class) and 2,847 fourth-class; 305 were money-order offices. Of newspapers and periodicals there were 18 of daily publication, 163 weekly, 1 bi-weekly, 5 semi-monthly, 20 monthly, and 1 quarterly—total, 208.

Means of Communication.—At the close of 1893 there were within the limits of the State 3,577.33 miles of railway, of which the Atlantic Coast Line system had 714.97 miles; the Richmond and Danville Line system, 1,128.69; the Seaboard Air Line system, 661.65; and miscellaneous lines, 1,072.02. The total cost of all the railways was \$91,799,192.47. The Albemarle and Chesapeake Canal is an important communication between the eastern counties and Norfolk, and the portion in North Carolina is valued at about \$100,000.

Churches.—The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organiza- tions.	Churches and halls.	Members.	Value of church property.
Baptist, Regular, South.....	1,480	1,479	153,648	\$1,662,405
Baptist, Regular, Colored.....	1,193	1,198	196,856	717,862
Methodist Episcopal South.....	1,388	1,230	114,385	1,471,135
African Meth. Episcopal Zion.....	541	540	111,949	485,711
Presbyterian in the U. S.....	282	284	27,477	678,565
Methodist Episcopal.....	287	282	16,433	195,645
Methodist Episcopal, Episcopal.....	61	147	16,156	112,998
Disciples of Christ.....	199	194	14,351	126,800
Primitive Methodist.....	186	153	12,437	71,157
Lutheran, United Synod in the South.....	317	315	11,914	130,100
Protestant Episcopal.....	119	110	11,759	263,690
Presb. in the U. S. of America.....	178	171	8,186	546,010
	109	105	6,516	89,180

Schools.—In 1892 there were 594,577 children (380,718 white, 214,907 colored) of school age, of whom 330,719 (214,907 white, 115,812 colored) were enrolled in the public schools, and 34,800 (34,400 white, 400 colored) in private schools. The appropriations for support of the public schools aggregated \$608,564 (\$405,231 for white schools, \$203,333 for colored). There are 12 colleges for women, 106 endowed academies, seminaries, and other private secondary schools, and the following institutions for higher education: University of North Carolina, at Chapel Hill (non-sectarian, chartered 1789); Biddle University, at Charlotte (Presbyterian, organized 1867); Davidson College, at Davidson (Presbyterian, organized 1837); Guilford College, at Guilford; North Carolina College, at Mt. Pleasant (Evangelical Lutheran, organized 1859); Catawba College, at Newton; Shaw University, at Raleigh (Baptist, organized 1865); Rutherford College, at Rutherford (non-sectarian, organized 1852); Livingstone College, at Salisbury (American Methodist Episcopal Zion); Trinity College, at Trinity College (Methodist Episcopal South, organized 1852); and Wake Forest College, at Wake Forest (Baptist, organized 1834). There are an agricultural and mechanical college for white students and one for colored, five State normal schools for colored teachers, a number of county normal schools for white teachers, graded schools, supported by special taxation, in nearly all the prosperous towns, and a State normal and industrial school for girls at Greensboro.

Charitable, Reformatory, and Penal Institutions.—The various charitable institutions are under the supervision of a State board of public charities. The State maintains hospitals for the insane at Raleigh and Morganton for whites, and at Goldsboro for colored patients; an institution for the blind at Raleigh; an institution for the deaf and dumb at Morganton; and appropriates \$10,000 annually toward the support of the Oxford Orphan Asylum, a Masonic institution. There are also orphan asylums maintained by the Presbyterian, Baptist, and Protestant Episcopal Churches, and by the order of Odd Fellows. The State penitentiary has an extensive farm for the employment of convicts.

Political Organization.—The executive department is composed of the Governor, Lieutenant-Governor, secretary of State, auditor, treasurer, superintendent of public instruction, and attorney-general. The Governor is ineligible for re-election until after an intervening term. He has full pardoning power after conviction; can be removed from office by the House of Representatives beginning an impeachment, but resumes office if acquitted; has no veto power; and does not sign legislative acts. The Senate and the House of Representatives are limited to 50 and 120 members respectively. The judges of the Supreme and Superior courts are elected by the people for eight years; justices of the peace are elected by the General Assembly. The distinction between law and equity practice is abolished. Among the declarations of the constitution are that the State has no right to secede from the Union; that the primary allegiance of citizens is due to the U. S.; that the

State shall not lend its credit except by a vote of the people; that the General Assembly shall provide public schools, the white and colored races to be taught separately, and support the university; that capital punishment shall be inflicted only for murder, arson, burglary, and rape; that the suffrage shall be allowed to males, twenty-one years old or upward, born in the U. S., or naturalized, and residents of the State twelve months and of the county ninety days; and that all voters are eligible to hold office, excepting such as deny the being of Almighty God.

History.—The first charter for a settlement was granted to Sir Walter Raleigh in 1584. He sent a fleet under Amadas and Barlow, who sighted the coast on July 27 of that year. The next year a colony was sent to Roanoke island under Ralph Lane, as governor, but the colonists returned to England in 1586, shortly before Sir Richard Greenville arrived with succor. In 1587 another colony arrived with John White as governor, who shortly went to England for re-enforcements, leaving among the colonists his daughter, wife of Ananias Dare, and her infant, Virginia, the first white child born in America. In 1629 a charter was granted for part of the territory previously known as Virginia, between 31° and 36° 30' N. lat., under the name of Carolina, to Sir Robert Heath. Nothing having been accomplished under this charter, Charles II. in 1663 conveyed the territory between 36° and 31° N. lat., under the same name, to eight lords proprietors, and in 1665 enlarged the grant to 36° 30' and 29° N. lat. Palatine powers were granted to the lords proprietors and they inaugurated a government under the "fundamental constitutions," drawn by John Locke. This "grand model" was singularly unsuited to the character and condition of the people, was never fully put into operation, and was after a while abandoned. In 1712 Edward Hyde was commissioned Governor of North Carolina, as distinguished from South Carolina. In 1728 (often erroneously stated as 1729) the shares of seven of the lords proprietors were sold to the crown for £2,500 each, but John, Lord Carteret, afterward Earl Granville, retained his one-eighth part of the soil, surrendering only the jurisdiction. In 1744 his share was laid off to him in severalty, a rectangular area bounded by the Mississippi river and the Atlantic, lat 35° 34' N., and the Virginia line. Much land was sold by him prior to the Revolutionary war. After the sale to the crown and transfer of jurisdiction the colony increased rapidly in prosperity, gaining much immigration, especially from Virginia, Pennsylvania, north of Ireland, the highlands and lowlands of Scotland, and from the Protestants of Germany, including Moravians. As the governors and other chief officers represented first the lords proprietors and then the crown, collisions with the people sometimes occurred. The first, called the "Culpepper rebellion," in 1678, seems to have arisen from harsh attempts to enforce the navigation laws. The second, called the "Cary rebellion," in 1708-10, apparently had its beginning in the unwillingness of the Quakers to take oaths of office, and degenerated into a party squabble between the aristocracy and the democratic element. In Gov. Johnston's time (1734-52) the counties of old Albemarle refused to submit to an attempt to deprive them of their larger number of representatives, and set at naught the enactment of the Legislature. Afterward they refused to submit to the authority of the superior courts because the crown disallowed the court law passed by the General Assembly. These disputes were settled without bloodshed, but in Gov. Tryon's incumbency a body of men, chiefly in the district allotted to Earl Granville, calling themselves regulators, exasperated at the large fees of officers and the pressure of taxes and quit-rents, combined with the scarcity of currency, rose in arms, broke up a court, and threatened to march on the capital, Newbern. They were easily defeated by Tryon with the militia, May 12, 1771. In 1711 occurred the Tuscarora war, in which the Indians were defeated by aid of a force sent from South Carolina, and the remnant afterward joined the Five Nations in New York, making the Six Nations. North Carolina was forward in resisting the measures of the British Parliament which led to the War of Independence, and in co-operating with the other colonies. The first provincial congress was held on Aug. 25, 1774. The General Assembly of the State has placed on its seal the date of May 20, 1775, as that of the resolutions passed by the people of Mecklenburg demanding independence. On Apr. 12, 1776, the first resolutions authorizing delegates in the Continental Congress to vote for independence were passed by the provincial congress of North Carolina. In July and August following a large

force of militia crushed the power of the Cherokee Indians. On Dec. 18, 1776, the first State constitution was adopted. Troops of the State fought gallantly in all the battles of the Revolutionary war from Brandywine to Yorktown. In 1780-81 the people suffered terribly from the invading army, but, in spite of a considerable Tory element, continued steadfast. They assisted in winning the battle of King's Mountain and crippling Cornwallis at Guilford Court-house, and by their persistent hostility forced him to his fate at Yorktown.

North Carolina sent delegates to the Constitutional Convention in 1787, but her convention of 1788 decided to postpone the question of ratification of the Federal Constitution, in order to secure certain amendments. Finding that the most important of these were certain of adoption, ratification was carried by a large majority in 1789. In the same year the General Assembly offered to cede the territory of Tennessee to the U. S., which was accepted in 1790. In 1791 the General Assembly took steps for the location of the seat of government, which had been theretofore migratory. The new capital was called the city of Raleigh. The University of North Carolina was chartered in 1789 and opened in 1795. In 1820 much attention was given to improvement of the river transportation by slackwater navigation, and there was large waste of money on insufficient works. This fever, and the subsequent rise of the railway excitement, led to a heated contest between the eastern and western counties for a change of the constitution under which each county elected a Senator and two members of the lower House. The agitation culminated in a convention held in 1835, which required the division of the State into fifty senatorial districts, each paying one-fiftieth of the public taxes, and, confining the House to 120 members, gave one to each county and divided the remainder among the counties in proportion to the federal population. The public school system had been pressed as early as 1820, but little was done until the distribution of the surplus money of the U. S. in 1837, North Carolina investing her share in bank and railway stock and devoting the stock to the schools. A good system was being developed when the civil war made the fund worthless. What has been done since that war has been effected by taxation.

North Carolina did not at first favor secession from the Union as the best mode of settling the questions relating to slavery and its extension into the territories. When the question of calling a convention of the people for considering these matters was had the vote in Feb., 1861, was adverse by a few hundred majority; but when war broke out she promptly and by a unanimous vote in convention, May 20 following, passed an ordinance of secession, and supported it by large levies of money and of troops, who formed a great part of the army of Gen. Lee in Virginia. In August following Fort Hatteras was captured by the Federal forces. In the spring of 1862 the whole of the country along the sounds from Beaufort to the Virginia line was in their hands. Plymouth was recaptured, with 1,600 prisoners, by the Confederates under Gen. Hoke in Apr., 1864, but recovered by the Federals in October. Wilmington was largely used by the Confederates as a point from and to which their steamers could run despite the blockade. An unsuccessful attempt was made in Dec., 1864, to stop this by capturing Fort Fisher at the mouth of the Cape Fear. Another attack (Jan. 15, 1865) succeeded. Wilmington was soon after captured; Sherman's army marched into Raleigh on Apr. 13, and on the 26th Johnston's army was surrendered. The scheme of reconstruction inaugurated by President Johnson was begun on May 29, 1865, by the appointment of W. W. Holden as provisional governor, who called a convention of the people for which only the white men included in the President's amnesty proclamation were allowed to vote. This convention repudiated the war debt, abolished slavery, and declared the ordinance of secession void. The government, under the "reconstruction laws" of Congress, was inaugurated July 1, 1868. The General Assembly ratified the fourteenth amendment to the U. S. Constitution on the next day, and the fifteenth amendment on Mar. 4, 1869. During the Ku-Klux Klan excitement Gov. Holden declared martial law in Alamance and Caswell Counties, and made many arrests of leading citizens. For his conduct connected with this movement he was impeached and convicted. The present constitution was adopted in 1876, the centennial of the adoption of the first constitution of free North Carolina. Since the civil war, although her losses therein were immense both in men and money, the people of the State have made notable progress.

GOVERNORS OF NORTH CAROLINA.

Under the Lords Proprietors.

William Drummond.....	1663-67
Samuel Stephens.....	1667-70
Peter Carteret.....	1670
Samuel Stephens.....	1670-74
Peter Carteret.....	1674-75
John Jenkins (acting).....	1675
John Harvey (acting).....	1675-76
Thomas Eastchurch.....	1676-77
Thomas Miller (acting).....	1677-78
John Harvey (acting).....	1678
John Jenkins.....	1678-81
Henry Wilkinson.....	1681-83
Seth Southwell (Sothel).....	1683-89
Philip Ludwell.....	1689-91
Alexander Lillington.....	1691-94
Thomas Harvey.....	1694-99
Henderson Walker.....	1699-1704
Robert Daniel.....	1704-05
Thomas Cary.....	1705-06
William Glover (acting).....	1706-07
Thomas Cary (acting).....	1707-08
Thomas Cary and William Glover, contestants.....	1708-10
Edward Hyde.....	1710-12
Thomas Pollock (acting).....	1713-14
Charles Eden.....	1714-22
Thomas Pollock (acting).....	1722
William Reed (acting).....	1723-24
George Burrington.....	1724-25
Edward Mosely (acting).....	1725
Sir Richard Everard.....	1725-29

Under the Crown.

George Burrington.....	1729-34
Nathaniel Rice (acting).....	1734
Gabriel Johnston.....	1734-52
Nathaniel Rice (acting).....	1752
Matthew Rowan (acting).....	1752-54
Arthur Dobbs.....	1754-65
William Tryon.....	1765-71
James Hazell (acting).....	1771
Josiah Martin.....	1771-75

Governors of the State.

Richard Caswell.....	1777-79
Abner Nash.....	1779-81
Thomas Burke.....	1781-82
Alexander Martin.....	1782-84

AUTHORITIES.—Reports of the North Carolina Geological Surveys, by W. C. Kerr and Joseph A. Holmes, State geologists; Curtis, *Woody Plants*; *Handbook of North Carolina*, issued by the State Board of Agriculture; *Climatology of North Carolina, 1820-92*, issued by the State agricultural experiment station; State auditor's Report; State treasurer's Report; Reports of presidents of the State hospitals and other institutions; Constitutions of North Carolina (1776, 1835, 1868, 1876); Saunders, *Colonial Records* (10 vols. fol., with prefatory notes); Acts of the Assembly; Journals of the State Senate and House, and of the State conventions; U. S. Census Report of North Carolina; Hawkes, *History of North Carolina*; Wheeler, *History of North Carolina*; Moore, *History of North Carolina*.

KEMP P. BATTLE.

Northcote, Sir STAFFORD HENRY, F. R. S.: statesman; b. in London, England, Oct. 27, 1818; educated at Eton and at Balliol College, Oxford, and graduated with honors 1839; was called to the bar at the Inner Temple 1847; was one of the secretaries of the Universal Exhibition of 1851; entered Parliament as a Conservative 1855; took an active part in all questions relating to art and education; was president of the Board of Trade in Lord Derby's third administration 1866; Secretary of State for India Mar., 1867-Dec., 1868; elected governor of the Hudson Bay Company Jan., 1869; was a member of the high joint commission which drew up the Treaty of Washington 1871; became Chancellor of the Exchequer in Disraeli's cabinet 1874; published *Twenty Years of Financial Policy* (1862); became Earl of Iddesleigh (1885). D. in London, Jan. 12, 1887.

North Dakota: one of the U. S. of North America (North Central group); the twenty-sixth State admitted to the Union.

Location and Area.—It lies between lat. 46° and 49° N. and lon. 96° 25' and 104° W. of Greenwich; is bounded on the N. by the Canadian provinces of Assiniboia and Manitoba, on the E. by Minnesota, on the S. by South Dakota, on the W. by Montana; and has an area of 70,795 sq. miles, of which 600 sq. miles are water surface; capital, Bismarck.

Physical Features.—The State is naturally divided into the Red river valley, the James river valley, the Devil's Lake and Turtle Mountain region, the Mouse river section, the coteau or Missouri slope country, and the West North

Dakota division. The valley of the Red River of the North is a broad level plain from 50 to 60 miles wide, sufficiently elevated above the river to be free from overflows, and contains the richest of bottom-land mould.

The James river valley is one of the most noted artesian-well districts in the world. Immediately N. of Devil's Lake, a veritable inland sea, is the Turtle Mountain and Big Couleecountry. The mountains are a range of hills extending over a region 20 by 40 miles, the greater part in the State and the remainder in Manitoba. Bear and St. Paul's buttes are the highest points, and have an elevation of only a few hundred feet. The Mouse river enters the State from Assiniboia in the middle of Ward County, and after a long sweep in oxbow shape passes out of the State at the northwest corner of Bottineau County into Manitoba. There are valuable deposits of coal along the river, and the territory it incloses is particularly adapted to stock-raising. The valley of this river shows a general depression of from 200 to 300 feet below the level of the surrounding plain. The Rivière de Lacs, a tributary of the Mouse, has a valley 75 miles long, with an abundance of wood and coal in the bluffs. The coteau or Missouri slope country lies W. of the divide between the James and the Missouri rivers, is full of small hills, and has large geological interests. The West North Dakota division lies W. of the Missouri river, is more undulating than the eastern section of the State, has widely separated hills, broad valleys, and conical buttes, is well watered, and has but little snow. Besides the rivers mentioned, good drainage is afforded by the Sheyenne, Goose, Pembina, Maple, Heart, Knife, Cannon Ball, Green, Sweetbriar, Curlew, Little Missouri, and other streams. The rainfall generally is sufficient to mature crops.

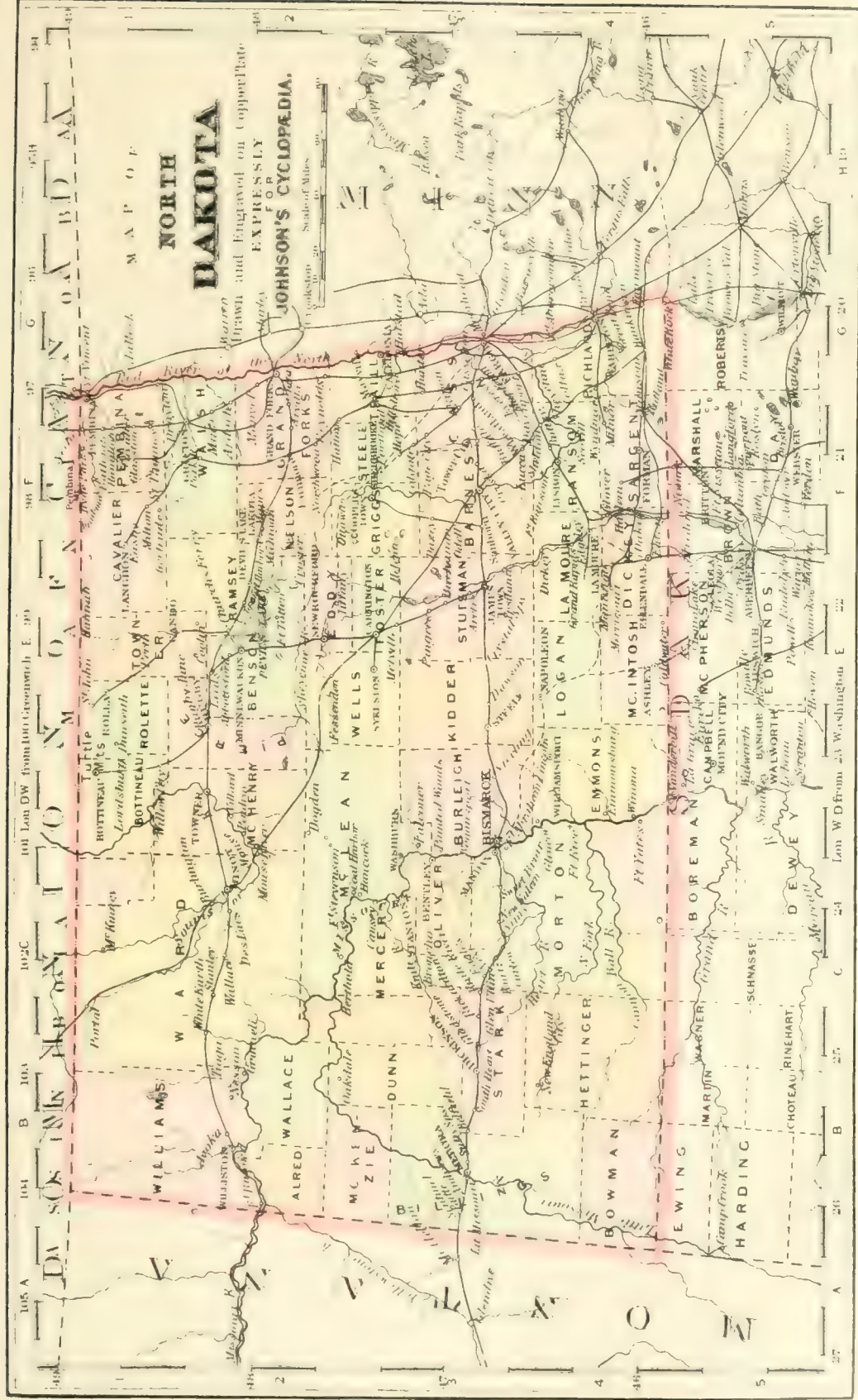
Geology.—In the valley of the Red river a glacial drift is found beneath lake mud, and cuttings for railways in the territory between the valley proper and bordering lands disclosed lake shore lines with sand and gravel beds. These have been traced around the entire valley, proving it an ancient lake, which has been named Lake Agassiz. Lignite is the principal mineral. The whole of the country W. of the Missouri river and a large part of that E. of it are underlaid with deposits cropping out in veins from 4 to 20 feet in thickness, and in many localities farmers can dig their own supplies from the hillsides. The Turtle Mountain region contains a large variety of building and foundation stones; the Red river valley, salt, limestone, and hydraulic lime; and in other localities are iron, natural gas, and pottery and brick clays.

Soil and Productions.—Almost the entire soil is exceedingly fertile, and some parts are exceptionally so, especially in the Red river valley, which contains the great wheat farms. Much of the surface is underlaid by limestone and glacial drift. The Red river valley is well wooded in parts; the Devil's Lake region contains oak and other timber; the Turtle Mountains have poplar, balm of Gilead, ash, and oak; and along the Missouri river are cottonwoods of large size. In 1890 North Dakota had 27,611 farms, containing 7,660,333 acres, valued at \$75,310,305. The following table is for the calendar year 1893:

CROPS.	Acres.	Yield.	Value.
Corn.....	20,142	416,939 bush.	\$158,437
Wheat.....	2,753,980	26,438,208 "	11,368,429
Oats.....	490,963	10,752,090 "	3,010,585
Barley.....	186,964	2,841,853 "	880,974
Potatoes.....	19,550	1,348,950 "	660,986
Hay.....	429,280	553,771 tons	2,060,028
Totals	3,900,879		\$18,139,439



Seal of North Dakota.



On Jan. 1, 1894, the farm animals comprised 163,499 horses, value \$9,436,849; 7,840 mules, value \$563,274; 140,700 milch cows, value \$2,784,453; 250,566 oxen and other cattle, value \$4,219,914; 370,880 sheep, value \$754,973; and 99,275 swine, value \$654,226—total head, 1,032,760; total value, \$18,412,789.

Climate.—The winters are cold and rainless and usually break in March. Farming begins early and plowing generally continues till about the middle of November. The dryness of the atmosphere renders the low temperature endurable by man and beast. Summers are warm by day and cool by night, with quite constant breezes. The autumnal weather is the most delightful of the year and frequently extends far into December. The mean annual temperature at the widely separated signal stations is: Bismarck, 39°4'; Fargo, 37°; Pembina, 34°4'; and Fort Buford, 38°7'; and the mean annual rainfall, Bismarck, 20.10 inches; Fargo, 27.17; Pembina, 21.91; and Fort Buford, 13.91.

Divisions.—For administrative purposes the State is divided into 45 counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	P. p. 1880.	P. p. 1890.	COUNTY-TOWNS.	Pop. 1890.
Adair	2-B				
Barnes	3-F	1,585	7,045	Valley City	1,089
Benson	2-E		2,460	Minnewaukon	
Billings	3-B	1,323	170	Medora	
Bottineau	1-D		2,893	Bottineau	145
Bowman	4-B		6		
Burlingame	3-D	3,246	4,247	Bismarck	2,186
Cass	3-F	8,998	19,613	Fargo	5,664
Cavalier	1-F		6,471	Langdon	291
Dickey	4-E		5,573	Ellendale	761
Dunn	3-B		159		
Eddy	2-E		1,377	New Rockford	
Emmons	1-D	38	1,971	Williamsport	
Foster	2-E	37	1,210	Carrington	
Grand Forks	2-F	6,248	18,357	Grand Forks	4,979
Griggs	2-F		2,817	Cooperstown	368
Hettinger	4-B		81		
Kidder	3-E	80	1,211	Steele	133
La Moure	4-E	20	3,187	La Moure	309
Logan	4-E		597	Napoleon	
McHenry	2-D		1,584	Towner	211
McIntosh	4-E		3,248	Ashley	
McKenzie	2-B		83		
McLean	2-C		860	Washburn	
Moreau	3-C		428	Stanton	
Morton	3-C	200	4,728	Mandan	1,328
Nelson	2-F		4,203	Lakota	227
Oliver	3-C		464	Sanger	
Pembina	1-F	4,862	14,334	Pembina	670
Pierce	2-D		965	Rugby	
Ransom	2-E	281	4,418	Devil's Lake	846
Ransom	4-F	537	5,393	Lisbon	945
Richland	4-F	3,597	10,751	Wahpeton	1,510
Rolette	1-E		2,427	Rolla	355
Sargent	4-F		5,076	Forman	178
Stark	3-C		3,304	Dickinson	897
Steele	2-F		3,177	Sherbrooke	
Stutsman	3-E	1,007	5,266	Jamestown	2,296
Towner	1-E		1,450	Cando	300
Trail	2-F	4,123	10,217	Caledonia	267
Wallace	2-B		24		
Walsh	1-F		16,587	Grafton	1,594
Ward	1-C		1,681	Minot	575
Wells	2-E		1,212	Sykeston	
Williams	1-B	14	109	Williston	295
Unorganized ter.+			511		
Totals		136,969	182,719		

* Reference for location of counties, see map of North Dakota.

+ Formerly part of Bismarck County, Dakota Territory.

† This footing includes population of the following counties not existing in 1894, viz.: Howard (12), Mountrail (13), Stevens (247), Wall (12).

‡ This footing includes population of the following counties not existing in 1894, viz.: Buford (304), Church (14), Elmery (124), Garfield (33), Mountrail (122), Renville (99), Sheridan (5), Stevens (16).

Principal Cities and Towns, with Population for 1890.—Fargo, 5,664; Grand Forks, 4,979; Jamestown, 2,296; Bismarck, 2,186; Grafton, 1,594; Wahpeton, 1,510; Mandan, 1,328; and Valley City, 1,089.

Population and Races.—1890: 182,719 (natives, 101,258; foreign, 81,461; males, 101,590; females, 81,129; white, 182,123; colored, 596, comprising 373 persons of African descent, 28 Chinese, 1 Japanese, and 194 civilized Indians).

Industries and Business Interests.—The census reports of 1890 showed that 382 manufacturing establishments reported. These had a combined capital of \$2,894,553, employed 1,847 persons, paid \$1,002,881 for wages and \$3,087,161 for materials, and had products valued at \$5,028,107. The principal manufactures are flour, lumber, butter, leather, cigars, bricks, and woolen goods, and the most important indus-

tries are farming and stock-raising. The various grain elevators and warehouses along the lines of the principal railways had in 1893 a capacity of 89,511,000 bush.

Finance and Banking.—In 1893 the assessed valuations of taxable property aggregated \$90,105,280, and the State debt was \$795,807. There were 32 national banks, with combined capital of \$2,215,000, surplus and profits of \$752,123, and deposits of \$4,137,014, and 72 State banks, with capital of \$1,092,340, surplus of \$282,425, and deposits of \$1,848,005.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 518 post-offices, of which 22 were presidential (2 second-class, 20 third-class) and 496 fourth-class, and 145 were money-order offices. Of newspapers and periodicals there were 9 daily publications, 118 weekly, 1 bi-weekly, 1 semi-monthly, and 6 monthly—total, 135.

Means of Communication.—The State is crossed from E. to W. by the Northern Pacific and the Great Northern railways, while three other large systems enter it from the S. E., and S. E.—the Minneapolis, St. Paul and Sault Ste. Marie, the Chicago, Milwaukee and St. Paul, and the Chicago and Northwestern. The mileage of these within the State and of several minor local lines on June 30, 1893, aggregated 2,223. The construction of the Northern Pacific line through the State was promoted by a Government grant of 10,000,000 acres of land, and aided materially the development of the central part of the State.

Churches.—The constitution guarantees perfect toleration of religious sentiment, declares that no inhabitant of the State shall ever be molested in person or property on account of his or her mode of religious worship, and makes these provisions irrevocable without the consent of the U. S. and the people of the State. The State constitutes a missionary district of the Protestant Episcopal Church with a bishop, and Jamestown is the seat of a bishopric of the Roman Catholic Church. The census of 1890 gave the following statistics of the principal religious bodies:

DENOMINATIONS.	Organiza- tions.	Churches and halls.	Members.	Value of church property.
Roman Catholic	115	115	26,427	\$171,550
Lutheran, United Norwegian	162	144	10,283	77,550
Methodist Episcopal	131	132	4,804	139,985
Presb. in the U. S. of America	99	91	2,036	126,425
Lutheran, Norwegian Evangelical	53	52	2,784	22,975
Baptist	54	53	2,298	90,300

Other leading denominations were the Congregational, with 1,616 members; the Lutheran, General Council, 1,582 members; and the Lutheran, Synodical Conference, 1,136.

Schools.—The constitution made it the duty of the Legislature to provide and maintain a system of public schools which should be open to all children of the State and be free from sectarian control. It also provides that this requirement shall be irrevocable without the consent of the U. S. and the people of the State, and that no money raised for the support of the public schools shall be appropriated to or used for the support of any sectarian school. All proceeds of the public lands granted by the U. S. for the support of the common schools, all per centum that may be granted by the U. S. on the sale of public lands, the proceeds of property that shall fall to the State by escheat, the proceeds of all gifts and donations to the State for common schools unless otherwise specified, and all other property otherwise acquired for common schools, are constituted a perpetual trust fund for the support of public schools, and the State is pledged to make good all losses the fund may sustain. The U. S. granted the State for educational purposes 2,000,000 acres of land. Prior to the creation of North and South Dakota the Territory had expended for public education \$10,000,000 in five years, and North Dakota entered the Union with 1,362 public schools and with high and graded schools in its principal cities and towns. State institutions include a university and school of mines at Grand Forks, an agricultural college at Fargo, and normal schools at Valley City and Mayville, and the constitution provided for the establishment of a school of forestry to be located in one of four specified counties as the electors might decide, and for a scientific school or other educational or charitable institution at Wahpeton. Denominational colleges are maintained at Fargo and Wahpeton.

Charitable, Reformatory, and Penal Institutions.—These include a school for the deaf at Devil's Lake, State Hospital for the Insane and Home for the Feeble-minded at James-

town, Soldiers' Home at Lisbon, and State penitentiary at Bismarck.

Political Organization.—The constitution provides that every man may freely write, speak, and publish his opinions on all subjects, being responsible for the abuse of that privilege, and in all trials for libel the truth may be given in evidence. Every citizen is free to obtain employment wherever possible, and any person, corporation, or agent thereof maliciously interfering or hindering in any way any citizen from obtaining or enjoying employment already obtained from any other corporation or person is deemed guilty of misdemeanor. Women qualified by age, residence, and citizenship may vote for public-school officers and on all questions pertaining solely to school matters, and are eligible to any school office. All elections are by secret ballot. The executive authority is vested in a Governor, a Lieutenant-Governor, secretary of State, auditor, treasurer, superintendent of public instruction, commissioner of insurance, three commissioners of railways, attorney-general, and a commissioner of agriculture and labor—all elected for terms of two years. The Governor may disapprove of separate items in a bill. The Legislative Assembly holds biennial sessions limited to sixty days, and comprises a Senate, limited to from 30 to 50 members, and a House of Representatives, limited to from 50 to 140 members; Senators elected for four years, Representatives for two. The judicial authority is vested in a Supreme Court of three justices having appellate jurisdiction only, in district and county courts, in courts that may be created in special districts, cities, and towns, and in justices of the peace. The number of Supreme Court justices may be increased to five when the population of the State reaches 600,000.

History.—Capt. Lewis and Capt. Clarke, U. S. A., in their expedition of 1804-06, spent their first winter in camp among the Mandan Indians near the present town of Mandan. Lord Selkirk built a fort at Pembina, on the Red river, in 1810; the first steamer ascended the upper Missouri river in 1830; and John C. Frémont crossed the country from the Missouri river to the James and penetrated as far N. as Devil's Lake in 1839. George Catlin made many sketches of Indian life here in 1841, and Lieut. Warner explored the region for the U. S. Government in 1855. The region was a part of the Louisiana purchase. In 1851 the first land was obtained of the Sioux Indians, and in 1857 the first settlement was made at Sioux Falls, now in South Dakota. The eastern part of the Dakotas was included in the region allotted to Minnesota on its creation as a Territory in 1849. In 1861 the Territory of Dakota was created, extending from lat. 42° 28' to 49° N., and from Minnesota to the Rocky Mountains. From this tract Idaho, Montana, and Wyoming were set off as Territories. A long agitation for statehood led to a division of the Territory and the creation of the States of North Dakota and South Dakota, both of which were admitted to the Union Nov. 2, 1889.

GOVERNORS OF NORTH DAKOTA.

John Miller.....	1889-91	Frank A. Briggs.....	1897-
Andrew H. Burke.....	1891-93		
Elmer C. D. Shortridge.....	1893-95		
Roger Allin.....	1895-97		

Revised by W. H. H. BEADLE.

North East: borough; Erie co., Pa.; on the Lake Shore and Mich. S. and the Nickel Plate railways; 15 miles N. E. of Erie, the county-seat (see map of Pennsylvania, ref. 1-A). It is in the heart of a rich agricultural region; has a fine park, electric lights, and gravity water-works; a furnace, 2 woodenware and 2 grape-basket factories; a tannery, a winery, tempered-copper works, and a wire-goods factory, and 3 banks. Many stores and residences are lighted and heated with natural gas. The borough has a Roman Catholic college, a graded public school, an opera-house, and 3 newspapers. Pop. (1890) 1,538; (1894) estimated, 2,252. EDITOR OF "THE SUN."

Norther: a cold, piercing northerly wind occurring in Mexico and Texas, coming on with great suddenness and following warm and moist weather. It usually advances with a bar of stratus cloud, and strikes the observer when this cloud is about 45° above his horizon. There is often a fall of 35° in temperature in two hours, and this fall is said to amount sometimes to 70°. Northers may be either wet or dry, the latter being more frequent. They occur forty or fifty times a year, generally in the months between September and May.

Northers are simply "cold waves" which flow southward instead of eastward, or southeastward, as in the better known

types of such waves. They occur in the rear of well-marked "lows" or cyclones, when the cold northern air is drawn bodily into lower latitudes. The cold current of air is shallow, but may be of great horizontal extent. They frequently extend over the Western Gulf, causing very cold weather and dangerous seas, and occasionally they extend to Guatemala, causing frost on the higher lands, and to the Pacific Ocean to the southward. M. W. HARRINGTON.

Northern Crown: See CORONA BOREALIS.

Northern Lights: See AURORA.

Northfield: town; Franklin co., Mass.; on the Connecticut river, at the point where the States of Massachusetts, New Hampshire, and Vermont meet (see map of Massachusetts, ref. 1-E). It is 50 miles N. of Springfield, Mass., and 12 miles S. of Brattleboro, Vt., on the Vermont Central Railroad. It is a beautiful town, the birthplace of Dwight L. Moody, who has made it a center of Christian work and influence by founding (1879) a seminary for young women of ability and earnest purpose. The seminary offers general, college preparatory and English courses, has large grounds, nine buildings, and is attended by about 350 students annually. At Gill, 4 miles from Northfield, is Mt. Hermon School, for boys, founded in 1881 by Mr. Moody and friends. There are two Protestant and one Roman Catholic churches, and two hotels. The larger and newer one (the Northfield) is used from October to April as a training-school for Christian workers. There are also a corn-canning factory and a creamery. The business interests are chiefly agricultural. Pop. (1890) 1,869; (1895) 1,851. EVELYN S. HALL.

Northfield: city; Rice co., Minn. (for location, see map of Minnesota, ref. 10-E); on the Chi., Mil. and St. P. and the Minn. and St. L. railways; 37 miles S. of St. Paul. It is in an agricultural region, and contains Carleton College (Congregational, chartered in 1866), St. Olaf College (Lutheran, chartered in 1874), a national bank with capital of \$75,000, a State bank with capital of \$50,000, and 2 weekly, a bi-weekly, and 2 monthly periodicals. Pop. (1880) 2,296; (1890) 2,659; (1895) 3,456.

Northfield: town; Washington co., Vt. (for location of county, see map of Vermont, ref. 5-C); on the Central Vt. Railroad; 10 miles S. S. W. of Montpelier, 40 miles S. E. of Burlington. It is in a highly productive granite and slate region, is the seat of Maverick University (chartered in 1834), and has a national bank with capital of \$100,000, a savings-bank, and a weekly and a monthly periodical. Pop. (1880) 1,313; (1890) 1,222.

North Holland Canal: a waterway extending from Buiksluyt, opposite Amsterdam, to the Helder, a distance of 51 miles. In the sixteenth century Amsterdam was one of the first commercial ports of Europe. The gradual advancement of the art of navigation, together with the increase in draught of vessels, demanded an access more favorable than was afforded by the difficult and shoal channels through the Zuyder Zee. To supply such an access the North Holland Canal was cut. It is 124 feet broad at the surface and 31 feet at the bottom, and is available for vessels drawing 18 feet of water. See also NORTH SEA CANAL.

North Platte: city; capital of Lincoln co., Neb. (for location, see map of Nebraska, ref. 10-D); near the confluence of the North and South Platte rivers; on the Union Pacific Railway; 291 miles W. of Omaha. It is in an agricultural and stock-raising region, and contains railway shops, 2 national banks with combined capital of \$125,000, and 3 weekly newspapers. Pop. (1880) 363; (1890) 3,055.

North River: See HUDSON RIVER.

Northrop, CYRUS, LL. D.: educator; b. at Ridgefield, Conn., Sept. 30, 1834; graduated at Yale College in 1857, and at the Yale Law School in 1859; practiced law at Norwalk, Conn.; was clerk of the State House of Representatives in 1861; of the State Senate in 1862; editor-in-chief of *The New Haven Daily Palladium* 1862-63; Professor of Rhetoric and English Literature in Yale College 1863-84; collector of customs under Presidents Grant and Hayes; was elected president of the University of Minnesota in 1884, and still holds that position.

North Sea, or German Ocean (anc. *Ma're Germanicum*): a body of water lying between Great Britain and the continent of Europe, having the former and the Orkney and Shetland isles on the W., and Norway, Denmark, Germany, Holland, Belgium, and part of France on the E. and S. Its extreme length from Dover Straits to the most northern of

the Shetland isles, between which and the coast of Norway it merges into the North Atlantic, is about 700 miles; greatest breadth about 420 miles. By the Skager Rack Inlet and its extension, the Kattegat, between the coasts of Denmark and of Norway and Sweden, it communicates with the Baltic Sea. By the Straits of Dover and ENGLISH CHANNEL (*q. v.*) it has its southern communication with the Atlantic. The depth varies from 66 to 500 feet, the greatest depths being in the northern portions between the north of Scotland and Norway. (See *Johnston's Physical Geography*.) If a line be drawn from the northern point of Denmark to the mouth of the Humber, all S. has 30 fathoms or less, which is said to be the average depth. A line from the same point to Edinburgh will leave S. of it nearly all the 50-fathom depths. Farther N. the depth increases rapidly, and is said to attain 190 fathoms near the Norway coast. The bed of the sea is traversed by several vast shoals, the greatest of which, the Dogger Bank, occupies the center of the sea from lat. 54° 10' to 57° 24' N., lon. 1° to 6° 7' E.; another extends from the Firth of Forth, Scotland, in a northeasterly direction, a distance of 110 miles, while others run from Holstein and Jutland more than 100 miles to the N. W. The great oceanic tidal wave, deflected around the British isles, enters this sea from the N. Pursuing its course southward, it rules the tides as far S. as the Thames and opposite coast, sensibly affects the tides of the Continent through the Channel, but, encountering the tide wave from the English Channel in the southern portions, the tidal phenomena are there the result of the conflict, or rather the union, of the two distinct waves, each exaggerated by a shelving bottom and the contraction between converging shores. At the Orkneys the rise is but 12 feet, at the mouth of the Humber and Thames 18 to 20 feet. The North Sea, notwithstanding the manifest dangers due to its currents, fogs, banks, and contracted area, teems with shipping, and is to the northern nations what the Mediterranean was to the ancients. Its fisheries of cod, mackerel, herring, etc., are important, and contribute in no small degree to the wealth and characteristic development of its marginal population. The island of HELIGOLAND (*q. v.*) is the only one which properly belongs to the North Sea. The numerous islands along the coast of Norway, Denmark, and Holland are rather fragments of a broken coast-line than islands in the sea. One-ninth of the total river discharge of Europe is received by the North Sea from the Humber, Thames, the Rhine and Scheldt, Eider, Elbe, Weser, etc., and from the firths and floods of the Scotch and Norway coasts. The ZUYDER ZEE (*q. v.*), which is entered from the North Sea at the Helder, is separated by the chain of sand islands, Texel, Terschelling, etc., which are the existing fragments of the ancient coast-line. The NORTH SEA CANAL (*q. v.*) makes Amsterdam virtually a seaport of the North Sea. See *Zur Physik des Meeres*, by Dr. Meyer, from the second annual report of the Kiel commission for investigation of the German seas (Berlin, 1874).

Revised by MARK W. HARRINGTON.

North Sea Canal of Holland (called in Holland **The Amsterdam Canal**): a waterway connecting Amsterdam with the North Sea. Such a canal had been proposed even before making the NORTH HOLLAND CANAL (*q. v.*). That work answered the existing exigencies, but was found not equal to those arising from the modern developments of commerce. The bold project of a *direct* water communication with the North Sea was revived in 1854. Nine different "commissions" of engineers and other experts successively studied and reported upon the subject; and it was not until Jan., 1863, that the law authorizing the construction was perfected and the work undertaken. The project involved the shutting off of Lake Y at its eastern end from the Zuyder Zee by a dam one mile in length with locks adequate to the purposes of all the coasting trade of the Zuyder, and of the lighter draught vessels for the North Sea, which still may enter by the Helder. The formation of this dam and the construction of its triple locks, founded by means of a coffer-dam 550 feet in diameter in 18 feet of water on 9,000 piles, are among the most remarkable works of modern hydraulic engineering.

The canal is 23 feet deep and 14½ miles long. In passing through the Y and Wijkermeer Lakes, the depth of which averages about 6 feet, the channel is limited by two embankments 443 feet apart, formed of material mostly dredged from the bottom. There are 38½ miles of these embankments. Through the sand downs of the isthmus separating the Wijkermeer from the North Sea, the channel is formed

for about 4 miles by a cut 90 feet wide at the bottom. The great sea-lock called the Ymuiden is situated two-thirds of a mile from the shore-line. It has a double (in length) lock-pond nearly 400 feet long, 60 feet wide, with 25 feet depth on the lock-sills. An artificial harbor was constructed at the sea entrance (for which see HARBORS). The canal was opened for traffic on Nov. 1, 1876. The waters of the Y and Wijkermeer are drained into the canal, reclaiming 13,142 acres of arable land. To keep the level of the canal down to 1½ feet below high water at Amsterdam, and thus permit the adjacent lands to be drained, centrifugal pumps driven by steam-power are placed at the Zuyder Zee locks, pumping from the canal into the Zuyder Zee, and also at eight points along the reclaimed land. At low water natural drainage can be effected through the North Sea through the sea-lock. The works cost about \$15,000,000. The traffic on the canal is large and constantly increasing. For further particulars see *Professional Papers* No. 22, Corps of Engineers, U. S. army, by J. G. Barnard, and the work of Croizette Desnoyers; also a full description of the works in *Proc. Inst. C. E.*, vol. lxiii., 1880. Revised by J. J. R. CROES.

North Tonawanda, N. Y.: See TONAWANDA.

Northumberland: the northernmost county of England; bounded E. by the North Sea, separated from Scotland by the Tweed and from the county of Durham by the Tyne and Derwent. Area, 2,016 sq. miles. The western part of the county consists of the bare Cheviot Hills and wild moorlands, which, however, afford sustenance to numerous flocks of hardy sheep. Toward the east coast are large fertile valleys with good pasturage and soil fitted for tillage. The principal source of wealth is in the rich mines of lead, copper, and coal, especially the latter, in the Cheviot Hills, and the manufactures which depend upon coal. The number of collieries is about 115. The county returns four members to Parliament. Pop. (1891) 506,096.

Northumberland: borough; Northumberland co., Pa. (for location, see map of Pennsylvania, ref. 4-G); at the junction of the two branches of the Susquehanna river; on the Del., Lack. and W., the Penn., and the Phila. and Reading railways; 2 miles N. of Sunbury, the county-seat, 60 miles N. of Harrisburg. It contains rolling, flour, and saw mills, nail-factories, agricultural-implement works, and other manufactures, and a weekly newspaper. Pop. (1880) 2,293; (1890) 2,744.

Northumberland, ALGERNON PERCY, Fourth Duke of, F. R. S., F. S. A., D. C. L.: second son of the second duke; b. in England, Dec. 15, 1792; educated at Eton; entered the navy in childhood; retired in 1815; was created Baron Prudhoe 1816; spent many years in travel, especially in Egypt and other Eastern countries; collected a magnificent Oriental museum; founded churches, schools, and charitable institutions, and promoted historical, philological, and archaeological research; married Lady Eleanor Grosvenor, daughter of the Marquis of Westminster, 1842; succeeded his brother Hugh in the dukedom 1847; restored and decorated upon a splendid scale the ancient seat of the family, Alnwick Castle; was first lord of the Admiralty 1853; made a Knight of the Garter 1858; was president of the Royal Institution. D. at Alnwick Castle, Feb. 12, 1865.

Northumberland, JOHN DUDLEY, Duke of: statesman; b. in England in 1502; son of Edmund Dudley, the minister of Henry VII.; commanded the English squadron during the war with France 1544-45; was an executor of the king's will 1547; intrigued against the protector Somerset 1549; acquired chief power in the council 1550; was created Duke of Northumberland, lord high steward, and earl marshal 1551; married his fourth son, Lord Guilford Dudley, to Lady Jane Grey, May, 1553; prevailed on Edward to adopt Lady Jane as his successor, June; placed her on the throne July 10, and was executed as a traitor Aug. 22, 1553.

Northumbria: the largest kingdom of the Saxon Hephtharchy, embracing, as its name imports, the region N. of the Humber, and at one time extending to the Forth in Scotland. It was formed into a kingdom by Ida about 547 by the union of Bernicia and Deira. The kingdom was divided at the death of Ida, but reunited under Ethelfrith 593, became the leading British power under Oswald 634-42, and was extinguished by Egbert 827, when the name of England was first applied to the kingdom resulting from the aggregation of the minor states to Wessex and Northumbria. The present county of Northumberland shows a survival of the name of a kingdom many times greater in extent.

Northwestern University: an institution established at Evanston, Ill.; one of the largest universities in the U. S., having nearly 2,500 students and more than 200 professors. It maintains the following degree-conferring departments: A college of liberal arts, a medical school, a woman's medical school, a law school, a school of pharmacy, and a dental school. The Garrett Biblical Institute is the theological department of the university. The charter of the university requires a majority of its board of trustees to be members of the Methodist Episcopal Church, and the university is the largest and richest of the educational institutions in affiliation with that church. The college of liberal arts and the Garrett Biblical Institute are at Evanston, the other professional schools are in the city of Chicago. The campus at Evanston lies along the shore of Lake Michigan, N. of Chicago, and includes 50 acres of ground. The charter of the university prohibits the sale of liquor within 4 miles of the university. Provision is made in the college of liberal arts for graduate and undergraduate work. Its medical school, formerly known as the Chicago Medical College, was the first school of medicine in the U. S. to insist on an examination preliminary to admission, on a graded course of instruction, as well as on a lengthened period of study, and is one of the few medical schools of the country requiring a *bona fide* four years' course. Its law school, formerly known as the Union College of Law, is now one of the most thorough in the U. S. It prescribes fifteen hours of class-room work a week, and requires its law professors, with one or two exceptions, to devote their whole time to the work of the school, withdrawing them from active practice for that purpose. Its school of pharmacy is one of the largest of the kind in the U. S. The university holds property amounting in 1894 to \$4,000,000, and its ordinary income is \$250,000.

HENRY WADE ROGERS.

Northwest Passage: a communication by sea between the Atlantic and Pacific Oceans, which was long vainly sought by navigators. See POLAR RESEARCH.

Northwest Provinces, or Agra: a great political division of British India, situated around the upper and middle course of the Ganges. It consists of the provinces of Delhi, Merut, Rohilkhand, Agra, Allahabad, and Benares, and comprises an area of 83,286 sq. miles, with (1891) 34,254,254 inhabitants. Capital, Allahabad.

Northwest Territories: a portion of the Dominion of Canada, comprising the provisional districts of ALBERTA, ASSINBOIA, ATHABASCA, and SASKATCHEWAN (*qq. v.*), besides unorganized territory with an area of 906,000 sq. miles. This vast region is bounded S. by the 49th parallel, which divides it from the U. S. and touches the base of the Rocky Mountains at nearly 115° W. lon., thence the boundary runs N. W. along the summit of the Rocky Mountains until it reaches Alaska, and thence due N. to the Arctic Ocean. A marked feature of the region is its division into two plateaus, running generally N. W. and S. E., the more easterly one, with an average altitude of 1,600 feet, being adapted for agriculture, and that toward the W., reaching to the Rocky Mountains, with an average altitude of 3,000 feet, being adapted for grazing. The principal rivers are the Mackenzie, emptying into the Arctic Ocean, the Saskatchewan or Nelson, emptying into Hudson Bay, and the Athabasca, flowing into the lake of the same name. The most important timber is spruce; coal exists in a vast region E. of the Rocky Mountains extending from the frontier, with a width of from 150 to 200 miles, 1,000 miles N.; large coal deposits, as well as lignite and petroleum, exist also elsewhere throughout the territories. Iron, gold, silver, galena, and copper also occur. The product of the fisheries of the Northwest Territories for 1893 amounted to 19,836,000 lb., valued at \$793,549. The government of the Northwest Territories is administered by a lieutenant-governor and Legislative Assembly, the seat of government being at Regina. An executive committee, appointed by the Assembly, acts as an advisory body with the lieutenant-governor in the expenditure of territorial funds and money appropriated by the Parliament of Canada. Justice is administered by a stipendiary magistrate, with jurisdiction over all cases, civil and criminal, and by justices of the peace appointed by the lieutenant-governor. For the maintenance of order among the Indians and settlers there is a body of mounted police numbering 1,000. Pop. (1896) about 100,000, including Indians.

NEIL MACDONALD.

Northwest Territory: the name formerly applied in the U. S. to the tract of land included between the Missis-

sippi and Ohio rivers and the Great Lakes, comprising the present States of Ohio, Illinois, Indiana, Michigan, and Wisconsin. The original States had ceded it to the national Government, which provided for its administration by the ordinance of 1787. See TERRITORY.

Norton, CHARLES ELIOT: son of Rev. Andrews Norton (1786-1852); b. at Cambridge, Mass., Nov. 16, 1827; graduated at Harvard College 1846; engaged in commerce in Boston; went to India as supercargo 1849; returned home through Europe 1850; wrote *Considerations on some Recent Social Theories* (1853); edited, with Dr. Ezra Abbot, his father's posthumous writings (1855); resided in Europe 1855-57; published *Notes of Travel and Study in Italy* (1860); edited the papers of the Loyal Publication Society 1861-65; was associate editor of *The North American Review* (1864-68); issued a translation of Dante's *Vita Nuova* (1867); lived in Europe 1868-73; published *Historical Studies of Church-building in the Middle Ages* (1880), and a translation of Dante's *Divina Commedia* (3 vols., 1891-92); edited *Correspondence of Carlyle and Emerson* (1883); *Correspondence between Goethe and Carlyle* (1887); *Reminiscences and Letters of Carlyle* (5 vols., 1886-88); *Letters of James Russell Lowell* (2 vols., 1894). He was made Litt. D. by Cambridge University 1884 and LL. D. by Harvard 1887, and was president of the Archaeological Institute of America 1879-90. He has been since 1874 Professor of the History of Art in Harvard University.

Norumbega: the name given by early French explorers to a country, river, and city supposed to be situated somewhere in the eastern part of the U. S. or Canada, and said to have been discovered by Verrazano in 1524. The site of the city was given on a map published at Antwerp in 1570. In 1604 Champlain ascended the Penobscot, supposing that stream to be the Norumbega, but after going 22 leagues discovered no indications of a city or of civilization, except an old and moss-grown cross in the woods.

According to B. F. De Costa, in his *Norumbega and its English Explorers*, published in Justin Winsor's *Narrative and Critical History*, vol. iii., the name is found in the map of Hieronimus da Verrazano of 1529 as "Aranbega," the initial "N" being omitted, and De Costa says it is there restricted to a definite and apparently unimportant locality. The name, with a variety of spellings (*Norumbegue, Norumbergue, Anorabegra, Anorumbega*, etc.), occurs on many old maps and in the works of various French and English explorers of North America. Norumbega was by some writers thought to embrace all New England, while Lok, in 1582, according to De Costa, seems to have believed that the Penobscot formed its southern boundary. In his *Norumbega and its English Explorers* De Costa expresses himself with great caution in regard to the location of Norumbega, but in his *Lost City of New England* he is of the opinion that if the ruins of the city are ever found they will be found on the Penobscot.

Arthur James Weise, of Troy, N. Y., in his work *The Discovery of America to the Year 1525*, arrives at the conclusion that the name is a contraction of the Old French *L'anormée Berge* (The Grand Scarp), and claims that the adjective *anormée* and the noun *berge* definitely describe the wall of rocks known as the Palisades on the Hudson river above New York city. Weise has no doubt that by the term Norumbega river the Hudson is meant, and that the country around the Palisades was called by the French explorers *La terre d'anormée berge*, afterward contracted and corrupted into Norumbega and its numerous variations. Weise, in identifying the river called by the French writer "Norumbègue" with the present Hudson, lays great stress upon the statement by the same writer that the water of the river was salty to the height of 40 leagues, and shows that the Hudson is brackish beyond the city of Poughkeepsie.

Finally, in 1890, Prof. Eben N. Horsford, of Cambridge, Mass., presented an entirely new theory. In this year appeared his *Discovery of the Ancient City of Norumbega*. In it he claims to have found the precise site of the ancient city, and locates it with absolute confidence on the Charles river in Massachusetts, at its junction with Stony Brook near Waltham. He makes Norumbega identical with the Vinland of the Norsemen (see VINLAND), claiming that Norumbega is an Indian corruption of *Norvegr* (Norway), and that it has borne that name among the aborigines ever since the Norse explorers in the tenth and following centuries made their headquarters there. He takes Norumbega to be the name the explorers did not bestow, but found. So

NORWAY, SWEDEN
AND THE BALTIC

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thoroughly convinced was Prof. Horsford of the correctness of his theory that he built on the site which he identified as Norumbega a tower in commemoration of the Norse discoverers and colonists. Prof. Horsford's discoveries have not received much recognition among scholars. The origin of the name Norumbega and its site are still a matter of doubt. See VINLAND.

In addition to works already cited, see Horsford's *John Cabot's Landfall in 1492 and the Site of Norumbega and The Defenses of Norumbega*. RASMUS B. ANDERSON.

Norwalk: town (site purchased from the Indians in 1640, permanently settled in 1651, incorporated as a town in 1653, burned by the Hessians during the Revolutionary war, incorporated as a borough in 1836); Fairfield co., Conn. (for location, see map of Connecticut, ref. 12-D); on Norwalk river, about 2 miles from Long Island Sound, and on the N. Y., N. H. and Hart. Railroad; 42 miles N. E. of New York city, 60 miles S. W. of Hartford. It has an excellent harbor, regular steamboat communication with New York city, large coasting trade, and extensive oyster and flower interests. There are over 16 churches, 4 public halls, 2 public libraries, public park, public high school, institute, school for girls and young ladies, public-school property valued at over \$150,000. 3 national banks with combined capital of \$540,000, 2 savings-banks, and a daily and 2 weekly newspapers. The principal manufactures are felt, iron, and woolen goods, locks, flour, bolts, screws, fur hats, straw hats, shoes, machinery, and paper. The town contains the city of SOUTH NORWALK (q. v.). Pop. (1880) 13,956; (1890) 17,747.

EDITOR OF "GAZETTE."

Norwalk: city; capital of Huron co., O. (for location of county, see map of Ohio, ref. 2-F); on the Wheeling and Lake E. and the Lake Shore and Mich. S. railways; 56 miles W. S. W. of Cleveland. It is in a farming, dairying, and stock-raising region; has manufactories of organs, sewing and knitting machines, agricultural implements, tobacco, flour, and lumber; and contains 2 national banks with combined capital of \$150,000, 2 State banks with capital of \$88,000, a public library with over 6,000 volumes, and a daily, a monthly, and 5 weekly periodicals. Pop. (1880) 5,704; (1890) 7,195.

Norway [Old Norse, *Norvegr*, the northern way; Norw. *Norge*]: the western part of the Scandinavian peninsula; situated between 57° 59' and 71° 11' N. lat., and 4° 59' and 31° 11' E. lon., bordering on Russia and Sweden on the E., and surrounded on all other sides by the sea (see map of Norway and Sweden). Its length from S. W. to N. E. is 1,118 miles, its breadth 264 miles in its widest part. It has a coast-line of 1,700 miles; including the fjords there is a continental coast-line of 10,500 miles. The area is 124,445 sq. miles, three-fourths of which is uninhabitable.

Geology.—The mountains of Norway are of Archæan formation, with superincumbent strata of gneiss, hornblende, and quartz, in many places penetrated by masses of granite and gabbro. Above this foundation are strata of conglomerate and spargmite, or of Silurian and Devonian formations, containing the oldest fossil remains. The general configuration of the country presents a grand display of ice action, and extensive glaciers are still to be seen. The largest is the Jostedalstræ, with an area of 350 sq. miles, six times the size of the largest Swiss glacier.

Mountains.—The mountain system practically covers the whole kingdom. It presents no well-defined chains, but has numerous table-lands, among which individual peaks are very irregularly scattered. The Jotun-fjeldene (Giant Mountains) are the highest in Europe N. of the Alps, with Galdhøpiggen (8,528 feet), Glittertind (8,495 feet), and others of but slightly less altitude.

Fjords and Rivers.—The fjords are the most characteristic natural features. Unlike the Scotch firths, they are long and narrow arms of the sea, filling the deep excavations made by glacial ice. The two most famous, both for size and grandeur of scenery, are the Sogne and Hardanger fjords. The thirty larger ones have an average length of 60 miles. The rivers are numerous, but owing to falls and rapids only a few are navigable. Glommen, in the S. E., is the principal one. The lakes, in reality expansions of river-beds, are also numerous.

Islands.—With the exception of two short stretches, the whole coast has a chain of islands, called Skjærgaarden (the island belt). Between this rock rampart and the mainland there is a deep channel which affords shelter from the ocean storms, and makes coast and fjord navigation comparatively safe. Of the 50,000 islands 1,160 are inhabited, 195 being

of considerable size. The most important are the Lofoten (Loffoden) islands, within the Arctic Circle.

Climate.—On account of the Gulf Stream the climate is milder than that of any other country in the same latitude. Those parts that are removed from the influence of the sea have a cold winter and hot summer; the coast regions have a mild winter and cool summer. Only the more interior fjords freeze. Barley ripens as far north as 70° N. lat., and potatoes can be raised in the most northerly regions. The mean annual temperature of the southern part of the country and the coast is 44° F. At North Cape it is 35°, but in some parts of the interior it is below 32°, as at Karasjok (Finmark), where it is 26°. The rainfall is greatest on the western coast, where it is 77 inches; on the southwest coast it is 40 inches, in the Lofoten islands 45 inches, while in the most northerly and the southeastern parts it is only 12 inches.

Products.—The soil is not very fertile, except in a few of the valleys. Only about 1,000 sq. miles are under cultivation, but the arable area is much larger. The mineral products are silver, iron, copper, and some gold, nickel and zinc, but none are of much importance. The flora is not rich in species, except in arctic plants, but is quite luxuriant, the profusion of wild flowers being particularly distinguished by their large size and brilliancy of coloring. The principal forests (covering an area of 25,000 sq. miles) are of fir, pine, and birch. Wild fruits are not abundant, although some berries are exported, but the grasses are numerous and afford excellent pasturage. The fauna is varied. The elk, the largest terrestrial animal of Europe, is found in the southern part. The reindeer is the most important wild animal, large herds of which have been semi-domesticated by the Lapps. The bear and fox are numerous. Of marine animals, whales and seals have been abundant, but are rapidly disappearing. The eider duck is the most important bird, and is carefully protected by law. Fish abound along the coast and in nearly all the rivers and lakes. The cod, herring, and mackerel are the most valuable, and are exported in large quantities. Salmon, trout, and lobsters are also plentiful.

Population.—The Norwegians, with the Swedes, Danes, and Icelanders, belong to the Scandinavian branch of the Teutonic race. They are hardy, of great endurance, and usually of large stature. According to the census of 1891 the population was 2,000,917 (965,911 males and 1,035,006 females); of these, 474,129 lived in cities and towns. One and a half per cent. are of Ugro-Finnic race, engaged in herding reindeer and in fishing. Only 2 per cent. are immigrants, mostly Swedes.

Principal Towns.—The six largest cities, with population in 1891, are Christiania, the capital (151,239); Bergen (53,684); Trondhjem (29,162); Stavanger (23,899); Drammen (20,687); and Christiansand (12,813). Hammerfest, the most northerly city in the world (70° 39'), has 2,160 inhabitants.

Divisions.—The chief administrative divisions are the towns of Christiania and Bergen and 18 amts. These are subdivided for local government into over 560 communes. The amts, with area in square miles and population Jan. 1, 1891, are as follows:

AMTS.	Sq. Miles.	Population.
Christiania town	6	151,239
Akershus or Aggerhus	2,055	99,111
Smalenehe, Smalenehe	1,000	120,390
Hedemarken	10,421	104,129
Christiansand	9,793	108,076
Bustad	5,400	104,760
Jarlsberg og Larvik, Larvik	896	100,957
Bratsberg	5,965	92,014
Nedenes (Nedenas Røbygdalaget)	3,400	81,043
Luster og Mandal	2,805	78,738
Sauøy	3,532	117,008
Søndre Bergenhus, laus	6,026	128,213
Bergen town	5	53,684
Nordre Bergenhus	7,192	87,552
Romsdal	5,788	127,806
Søndre Trondhjem (Thronthjem)	7,184	125,807
Nordre Trondhjem	8,791	81,236
Nordland	14,517	101,800
Trønders	10,134	65,125
Finmarken, Finmark	18,296	29,170
Totals	124,445	2,000,917

Industries.—The principal pursuits are agriculture, fishing, navigation, cattle-raising, dairying, and lumbering. Agriculture is mainly confined to Southern Norway, and is making rapid progress, but breadstuffs are still imported;

the important products are potatoes, oats, barley, and rye. Fishing is carried on very extensively, engaging about 180,000 men, the annual proceeds (including the whale and seal fisheries) being about 24,000,000 kroner. The most important fisheries are along the Lofoten islands. Norway's shipping (80 per cent. of which is in the foreign carrying trade) is surpassed in tonnage only by Great Britain, the U. S., and France. In 1890 there were engaged 7,432 vessels, of 1,703,699 tons burden, with 58,205 sailors, the gross receipts of which were 121,824,000 kroner. In recent years there has been great progress in manufacturing, in which the enormous water-power furnished by the numerous streams and waterfalls has begun to be utilized.

Education.—Compulsory education obtains from the ages of eight to fifteen. Illiteracy does not exceed 2 per cent. In 1888 there were 6,282 schools with 3,845 teachers in the country districts, and in cities and towns 143 schools with 1,121 teachers. There are six seminaries for the education of teachers. Higher education is promoted by high schools, Latin schools, various private and technical schools, and the university at Christiania (founded 1811), with about 50 professors and (1892) 1,366 students. The state religion is Lutheran, but all other creeds are tolerated.

Government.—According to its constitution Norway is a free and independent kingdom, united with Sweden. The two countries have a king and the foreign service in common; in all other respects they are independent of each other, each having its own parliament, ministry, army, etc. The cabinet consists of two ministers of state and not less than seven councilors of state, of which one minister and two councilors are stationed at the Swedish capital in attendance upon the king. Since 1884 the cabinet officers have had seats in parliament. The legislative branch of the Government is vested in a Storting (parliament), which meets annually, consisting of 112 members, chosen indirectly by a college of electors. Elections to the Storting occur triennially. Although in reality unicameral, the Storting elects one-fourth of its number to form an upper house, the Lagthing, the remaining members constituting the Odelsting. In case both branches fail to agree, a two-thirds vote in joint session is necessary to pass a measure. The king has the right of a suspensive veto, but a bill passed by three successive triennial Storthings becomes law without the royal sanction. The Norwegian constitution is the only one to which the Napoleonic wars gave rise that survived the succeeding reaction. The jury system, in which a majority can convict, but available only in criminal procedure, was introduced in 1890. Direct taxation was introduced in 1893. The state debt (Jan., 1894) was \$33,648,912, mostly due to railway building, begun in 1854. In 1891 there were about 1,000 miles of railway; the construction of 500 miles more was ordered by the Storting in 1894. The metric system is used, and the monetary standard is the krone (\$2.68), divided into 100 öre. The army, with reserves, numbers about 30,000 men and 900 officers; the navy has 51 vessels with about 150 guns.

History.—Norway has been inhabited by the ancestors of its present population since time immemorial. It was long supposed that the aborigines were Lapps, and that Teutonic tribes settled there shortly before the Christian era; but archæologists have shown that the implements representing the stone age were made by the ancestors of the present inhabitants, and that the country has been continuously occupied by the same race ever since. In line with this the contention has been made with considerable force that the Baltic country, especially Denmark and Southern Sweden, was the cradle of the Aryans, or at least that this was the center of Aryan diffusion, and that here the blond, blue-eyed, dolichocephalic Teutonic race was developed. The earliest history of Norway must be studied in its archæological remains. The oldest Runic inscriptions date from between the third and fifth centuries A. D., but they are only of philological importance. The historical period does not begin until the ninth century. The traditions of the centuries preceding are covered over with a mantle of mythology. In 872 the numerous petty kingdoms were united by Harald Fairhair after a long and desperate struggle. At this time viking expeditions were common, and it was through them that the Norsemen became Christians. Harald's son, Haakon the Good, made a fruitless attempt to introduce Christianity, and his efforts were successfully continued by Olaf Trygvesson and Olaf the Saint (1030). From the time of Harald Fairhair until 1319, with the exception of three short intervals, Norway was ruled by kings

of the Fairhair line. Many of them were grand figures, and their lives are vividly portrayed in the sagas. The most important of them, after Harald, are: Olaf Trygvesson (995–1000), Olaf the Saint (1014–30), Sverre Sigurdson (1184–1202), and Haakon the Old (1217–63). Of these Sverre was the greatest. He was a soldier-statesman of a high order. Starting out with a handful of untrained men, he gathered an army with which he defeated the reigning king, and in the teeth of the opposition of the Church of Rome and the nobility he built up a democratic kingdom. During Haakon the Old's reign Norway was at the height of her power as a state. Foreign potentates sought Haakon's friendship "in view of his power and experience on the seas," and it is said that in 1256 the pope desired his election as Emperor of Germany. Haakon's successor was his son Magnus, known as the Lawmender. Of the four existing codes of law he compiled one for the whole kingdom that remained in force 400 years. His son Haakon (d. 1319) was the last independent Norwegian king, and with him the Fairhair kings in the male line became extinct. Haakon was succeeded by his grandson, Magnus Smek (the son of Duke Erik of Sweden), and he was King of both Norway and Sweden from 1332 to 1355, when Norway, under Magnus Smek's son, Haakon VI., again became independent, although only nominally. About this time (1349–50) the black death ravaged Norway, reducing the population one-third. Some of the valleys were entirely depopulated. This and the devastating wars of previous periods sapped the strength of the nation, and that proud spirit of independence characteristic of the old Norsemen seemed to have vanished. Haakon VI. married the Danish princess Margaret. Their son Olaf was in 1376 elected King of Denmark, and upon the death of the father, in 1380, he also became King of Norway. Olaf died in 1387, whereupon his mother, Queen Margaret, became ruler of the two countries. In 1397, by the Peace of Calmar, she effected a union with Sweden, thus bringing the whole Scandinavian race under one scepter. Sweden revolted in 1523, but Denmark and Norway remained united until 1814. During the long union with Denmark, Norway's interests were neglected by the Oldenburg kings, who considered the country a province of Denmark; but in the latter part of the eighteenth century the dormant national spirit was awakened. The condition of the Norwegian peasantry, due to their system of land tenure, gave them a feeling of personal independence, but the impulse that aroused the national spirit came from France. The new ideas of the times found expression in highly patriotic, though bombastic, verse, and when the opportunity for regaining their national liberty presented itself the people were prepared. Sweden had demanded Norway as remuneration for participation in the alliance against Napoleon, and after the battle of Leipzig Frederick VI. of Denmark was forced (Treaty of Kiel, Jan., 1814) to cede Norway to Sweden; but the Norwegians refused to be disposed of in this way, declared their independence (Apr. 10, 1814), and on May 17 adopted a free constitution. A Danish prince, Christian Frederick, was elected king. Bernadotte, who had been made Crown Prince of Sweden, invaded Norway to enforce submission, but met with indifferent success. Anxious to have peace before the Council of Vienna convened, Bernadotte offered an armistice, and at the convention of Moss pledged himself to accept the constitution of May 17 in case Norway would unite with Sweden under one king. As the Norwegian king had proved a failure, the proposition was accepted, but on the basis that Norway's equality in the union should be unconditionally recognized. The union was effected Nov. 4, 1814, the conditions of which are specified in an Act of Union (*Rigsakt*). Since that time Norway has made great progress industrially and intellectually; but she has had many a struggle with Sweden in defense of her constitutional rights. Especially since 1872 party spirit has run high on questions of national interest, particularly in relation to the consular and diplomatic service. The house of Bernadotte is still the ruling dynasty, the present (1894) representative of which is Oscar II.

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The Vikings in Western Christendom (New York, 1891) and *Norway and the Norwegians* (New York, 1892); Penka's *Die Herkunft der Auser* (Vienna, 1886); Rendahl's *The Cradle of the Argives* (London, 1889). JULIUS E. OLSON.

Norwegian Language: strictly the old written language in use in Norway down to the time of the Reformation, and the popular dialects that have succeeded it. The literary language since the Reformation is only Norwegian by virtue of local differentiation; in reality it is Danish, or more correctly Dano-Norwegian. Genetically, Norwegian proper forms with Icelandic the West Norse division of the Scandinavian branch of the Germanic languages. Chronologically, its history falls into two main periods, Old and New. Although minor dialectal differences are distinctly traceable even at the beginning of the Viking age in the eighth century, Old Norwegian first appears beside its offshoot, Old Icelandic, and the East Norse dialects, Old Swedish and Old Danish, as a separate dialect of Old Norse after the introduction of Christianity at the beginning of the eleventh century. Considered principally with reference to Icelandic, which, on account of its literature, is the far more important, Old Norwegian has had three periods of development. Of these the first extended from the year 1000 to 1200, down to which time there is but little difference in the forms of Iceland and Norway. In the second period, from 1200 to 1350, corresponding to the Classical period of Icelandic, the language becomes, however, differentiated in important points. (See ICELANDIC LANGUAGE.) In the third period, 1350 to 1530, or down to the Reformation, there were not only numerous phonetic changes within the language, but, more important still, there was brought to bear upon it, as the result of political conditions, the influence first of Swedish and then of Danish. At the end of the fourteenth century Danish influence became paramount. In the following century Norwegian was rapidly displaced by Danish in its last use in documentary writings, and at the time of the Reformation as a written language it had wholly disappeared. As a spoken language Norwegian still continues to exist in numerous popular dialects. Even in the oldest period a tendency toward dialectal division is noticeable, and doubtless this condition was afterward increased by the loss of the language from literature. A movement, headed by Ivar Aasen in 1848, has been made to rehabilitate popular Norwegian in a normalized form as the national language, but thus far without important result. The material for the history of Norwegian is contained in part in Runic inscriptions, which are, however, with few exceptions, subsequent to the first MSS. The oldest extant MSS. date from the end of the twelfth century. The ancient literature specifically Norwegian is neither large nor important.

The present linguistic condition of Norway owes its origin to the political connection with Denmark which followed the Calmar Union of 1397. Danish after this time not only quickly superseded native Norwegian as a written language, as has already been noticed, but presently became, besides, the official medium and the recognized language of culture, a condition that was still more deeply rooted by the advent of the Reformation by way of Denmark and the Danish translation of the Bible. The supremacy of the Danish language continues to-day with the difference that a Dano-Norwegian form has been developed that shows characteristic differentiations from the Danish of Denmark, both in vocabulary, which has incorporated from the dialects Norwegian words and idioms, and in the phonology of the spoken speech. It is, nevertheless, in all respects fundamentally Danish, and has followed, since the fifteenth century, Danish lines of development.

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WILLIAM H. CARPENTER.

Norwegian Literature: the written or printed expression of the thought of the people of Norway. It may with reason be said to have had its origin in the early Runic inscriptions, dating back as far as the sixth century A. D.;

but a literature proper did not arise until with the introduction of Christianity (about 1000 A. D.) there came the knowledge of the Latin alphabet and a more suitable writing material than wooden sticks or stone slabs. Norwegian literature in its earliest period is related to that of Iceland (see ICELANDIC LITERATURE), but is of less extent and less importance. Scaldic poetry was cultivated in Norway before the Icelandic scalds obtained a monopoly of praising the Norwegian kings in their "drápas." Eyvind Finnsson (called *Scaldaspillir*, the "spoiler of the scalds," because no other scald could stand comparison with him) has in his *Hákonarmál* given a vivid and poetic expression to his grief at the death of King Haakon the Good. Of the poems of the *Elder Edda* (see ICELANDIC LITERATURE) at least one, and one of the most important of them all, the *Hávamál*, bears intrinsic evidence of having been produced in Norway. The saga-writing, on the other hand, always remained a truly Icelandic art, and the thorough knowledge we possess of Norwegian history in the Middle Ages is due to Icelandic historians; so even when the Norwegian kings wanted their history written to order they applied to Icelanders. Of Norwegian historic writers we may mention Theodoricus Monachus, whose *Historia de Antiquitate Rerum Norvagensium* was written in Latin about 1175, and the unknown writer of the *Historia Norvegie*, written also in Latin about 1180 A. D. Of the historical sagas written in the Old Norse language hardly any can with certainty be attributed to Norwegian authors. The chief exponents of Norwegian prose literature in the Middle Ages, then, are the laws, *Frostapingslög*, *Gulapingslög*, *Bjarkeyjar Réttr*, *Hirskrá*, etc., all published in *Norges Gamle Love* (The Old Laws of Norway, 5 vols., Christiania, 1845-92); furthermore, translations of homilies, saints' lives, and romantic sagas. The *Konungs Skuggsjá*, or *Speculum Regale*, deserves particular attention. The anonymous author of this "King's Mirror" describes himself as a Norwegian, living in the far northern part of the country, Hålogaland. In the form of a dialogue between father and son, the book gives us a description of court customs and court morals as they ought to be. The author makes several interesting digressions on the physical history of Ireland, Iceland, Greenland, on whales, seals, etc. A little piece worth mentioning is the plea of King Sverri against the pope and clergy, who sided against him in the civil war, first edited by Werlauff under the title *Anecdota Sververi*, lately by G. Storm, of Christiania, under the title *En Tale mod Biskoperne*.

When Norway through the Calmar Union (1397) became united with Denmark the Norwegian language lost its prestige, and was gradually supplanted among the higher classes and in the cities by the Danish language, while the Norwegian language continued to live on the tongues of the country people. It was this same country people who, when the Norwegian literature fell into decay, harbored a treasure of national traditions embracing the popular ballads and tales which in recent times have been made an object of study, and served to strengthen national sentiments and inspire a national literature.

During the fourteenth and fifteenth centuries, as well as immediately after the Reformation, there was little literary activity in Norway, as was also the case in Denmark. Absalon Pedersøn, a chaplain of Bergen, about the middle of the sixteenth century, wrote *Bergens Kapitelsbog* and a *Norges Beskrivelse* (Description of Norway), where he shows himself to be inspired by a high patriotic feeling. Another ecclesiastic, Peder Claussøn Friis (1545-1614), rector of the parish of Undal, besides writing about the natural history, topography, and history of Norway (*Om Diur, Fiske, Fugle og Træer i di Norrige*, *Norriges og omlygende Øers Beskrivelse*, and *Kort Extract af Norriges Krønike*), made a very good translation of Snorri Sturluson's *Lives of the Norwegian Kings* (see ICELANDIC LITERATURE) and of the old Norwegian law. Particularly the former of these two translations served to arouse the national spirit, and thus pave the way for a subsequent national development.

In the eighteenth century Norway contributes to the common "Danish-Norwegian literature" two of its most prominent names, Holberg and Wessel, who were both born in Norway, and spent their childhood and early youth there. Holberg (see HOLBERG, LUDVIG, and DANISH LITERATURE), although he has been called the father of Danish literature, bears in many instances witness of his Norwegian origin, and Johan Herman Wessel (1742-85), whose *Kjærlighed uden Strømper* (Love without Stockings), a travesty of the then usual high-

sounding tragedies in the French manner, is still an attraction on the Danish and Norwegian stage, was one of the founders and the chief figure of Det Norske Selskab, a kind of Norwegian club in Copenhagen, where Norwegian students and literati met and discussed the questions of the day, made verses, and cultivated patriotism. Among the lesser lights of the Selskab may be mentioned Johan Nordal Brun (afterward bishop in Bergen, and author of two patriotic songs that are sung by every Norwegian), Claus Fast- ing, the two brothers Friman. Edvard Storm, who kept aloof from the society, wrote some fine romances in the Gudbrandsdal dialect, and his *Sinclairs Vise*, celebrating the destruction of the troops of the Scotch Col. Sinclair by Norwegian peasants, is still very popular. Another Norwegian poet of great local prestige was Petter Dass, rector of Alstahang parish, in Northern Norway (d. 1708). His *Nordlands Trompet*, although written in the Danish language, interspersed with many dialect words, is still to be found in every home in that part of the kingdom, and is one of the most widely read books in Norway.

The last century of the union with Denmark had witnessed a gradual development of national spirit in Norway; so when the dissolution of the union with Denmark came in 1814 the Norwegians felt themselves, as a nation, ready to take their fate into their own hands; but the first decenniums after the separation were not particularly well adapted for the development and growth of a national literature. The nation was still too much engaged in building up its political fortunes and restoring its financial and economic resources. Naturally the first products of Norwegian literature after the war were national songs that were direct expressions of joy and pride at the new-born liberty, high sounding and bombastic in phraseology. Among the poets of this period we may mention Simon Olaus Wolff (d. 1859) and Henrik Anker Bjerregaard (d. 1842), both authors of national songs. The last mentioned also wrote a national drama, *Fjeldeventyret*, in which two of the characters are representatives of certain national types. Mauritz Christoffer Hansen (d. 1842) was a novelist of some note; in his earlier rather fantastic productions he was influenced by the German and Danish romanticists, but some of his later novels, describing everyday life, have merit.

A great step in the direction of a national Norwegian literature was made by the poets of the following generation, chief among which stand Henrik Arnold Wergeland (1808-45) and Johan Sebastian Cammermeyer Welhaven (1807-73). Wergeland's father was a Lutheran minister and member of the constitutional convention at Eidsvold in 1814, who was distinguished by his intense Norwegian patriotism and his hatred toward Denmark, to which feeling he gave vent in a book entitled *Danmarks politiske Forbrydelser imod Norge* (Denmark's Political Crimes against Norway). This patriotism was to the full extent inherited by his son Henrik, with whom it took a distinctly practical turn; he was very active in the advancement of the common people, writing popular essays, establishing parish libraries, and editing a newspaper, *For Arbeidsklassen* (For the Working Class), where by means of short stories and treatises he exhorted the common people to thrift, cleanliness, industry, and patriotism, showing himself to be influenced in this work by Benjamin Franklin. Wergeland was also to a certain extent cosmopolitan in his tastes and studies, a pupil of Voltaire and the other eighteenth century philosophers. He was, as a poet, very productive, one of his first works being the unwieldy poem *Skabelsen, Mennesket og Messias* (The Creation, Man, and Messiah) in three volumes, afterward rewritten by the author on his deathbed, in one volume, *Mennesket*. Among the most beautiful of his poems are *Jøden* (The Jew), *Jødinden* (The Jewess), poetical pleas for the admission of the Jews into Norway, whence up to that time they were excluded by law; *Den engelske Lods* (The English Pilot); *Norges Størthing*; *Til min Gyldeklak*; *Jan van Huysums Blomstørstykke*. Some of his stories and poems for children are also excellent. Wergeland's excess of patriotism and his democratic tendencies made him distasteful to the "intelligent" party, which was headed by his great antagonist Welhaven, who in his cycle of poems *Norges Dæmring* (The Dawn of Norway, 1834) treated this excessive Norwegianism with such severe irony that he was considered by many as a traitor to his native country. In opposition to Wergeland he advocated the connection of Norwegian literature and civilization with Danish intellectual life. Welhaven is, in contradistinction to Wergeland, characterized by a great

critical ability (even exercised against himself). He has not written much; mostly romances, ballads, and other poems, all of exquisite poetical form and beauty, showing the influence of Goethe and the romanticists. In some of his poems Welhaven gives fine pictures of the natural scenery of Norway, as in *Bergens Stift*, and after Asbjørnsen and Moe had published their popular and fairy tales he took up national subjects in his romances (*Aasgaardsreien*, *Dyre fra Vaa*, *Eivind Boldt*, etc.); so the animosity that a large part of the people had borne against him gradually subsided, and when in 1867 he retired from his chair as professor of literature, Bjørnson, who may be said to be a pupil and successor of Wergeland, wrote one of his most beautiful poems in his honor, while the same Bjørnson in 1881 made the speech at the unveiling of the Henrik Wergeland monument in Christiania. Thus later times have acknowledged that these great antagonists, Wergeland and Welhaven, were equally important and necessary factors in the development of a Norwegian literature. Younger but less gifted contemporaries and partisans of Welhaven were P. A. Munch, the poet and dramatist (see MUNCH, PETER ANDREAS), and P. A. Jensen (d. 1867). Also Camilla Collett (b. 1813), a sister of Henrik Wergeland, was more closely allied to Welhaven's school than to her brother. Her chief work, the society novel *Amtmandens Dotre* (1857), where she raises the cry against the social oppression of woman, makes her a pioneer in the movement for the emancipation of woman, and also to a certain extent makes her a forerunner of the society novels of a recent day as represented by Lie and others.

We have seen how Welhaven's national romances were influenced by Asbjørnsen's and Moe's popular fairy tales. These two men were the earliest and most important representatives of the movement, started in the beginning of the forties, to study the national treasures of poetry, music, and language which for centuries had been neglected. As part of this movement must be considered M. B. Landstad's work in collecting and publishing national ballads, a work that was continued by the learned Sophus Bugge; at the same time Aasen (see AASEN, IVAR ANDREAS) wrote his grammar and dictionary of the Norwegian popular language, Lindemann collected national airs, while Eilert Sundt made the Norwegian gypsies and the condition of the working people the subjects of his particular study. At the same time the historical studies of Rudolph Keyser and P. A. Munch awakened or deepened the interest in the early history of the nation. This is a period of national romanticism: Tidemand and Gude made national scenery and home life a subject of their paintings; Kjerulf and Ole Bull produced a series of national compositions. The chief literary figure is still Welhaven, with P. A. Munch and some lesser lights (like H. H. Schulze, Nicolai Østgaard, Bernhard Herre, and Harald Meltzer) grouped around him.

In the year 1857 Bjørnson's novel (*Synnøve Solbakken*) appeared, opening a new era in Norwegian literature, the period of Bjørnson and Ibsen. Both these authors at first allied themselves with the romantic school of writers. Bjørnson (see BJØRNSON, BJØRNSTJERNE) in his novels treated subjects borrowed from the peasant life, of which he gives a characteristic, even if somewhat idealized, description, while he devoted his earlier dramas to historical subjects, and Ibsen's (see IBSEN, HENRIK) earlier productions are all of an historical nature. Since about 1870 both these authors, in their dramas and novels, have turned to reproducing Norwegian city and home life in a realistic manner, and their pictures of Norwegian social life have made them famous the world over. Around these two giants, as it were, of Norwegian literature are grouped other authors also of great talent, such as Jonas Lie, Alexander Kielland, Kristoffer Janson, and Arne Garborg. Janson and Garborg have partly been writing in the common literary language of the country, the Dano-Norwegian language, partly in the so-called *Landsmaal*, in which also Aasmund Olafsson Vinje wrote his poems. Of late years there has grown up in Norway a school of writers whose efforts have been directed toward naturalistic description and the study of individual psychology. These writers do not care about plots, but for minute psychological characterization. The above-mentioned Arne Garborg partly belongs to this school, although he does not participate in its vagaries, such as those indulged in by men like Hans Jæger in his *Kristiania Bohemen* (1885), a book that was confiscated by the police, its author being sentenced to prison. Another author belonging to this school is Knut Hamsun, whose name suddenly gained a cer-

tain notoriety by his book upon the intellectual life of modern America (*Fra det Moderne Amerikas Aandstliv*), and whose novels, *Sult* (Starving), *Mysterier*, *Ny Jord* (New Earth) show a marked resemblance to the style of Dostoevski and other Russians. Gunnar Heiberg has with his dramas (*Kong Midas*, *Balkonen*, *Kunstnere*) also gained a certain fame outside of Scandinavia, and Vilhelm Krag has shown himself to be a poet of considerable force.

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Norwich, nor'rij: capital of the county of Norfolk, England; on the Wensum, immediately above its confluence with the Yare; 114 miles N. N. E. of London (see map of England, ref. 9-L). It is a large, old, and prosperous town, covering the slopes of a hill which rises gradually from the river. It is irregularly built, but full of specimens of early architecture. The cathedral was founded in 1096 by Bishop Herbert de Lozinga. It still retains its original Norman plan to a great extent, but the spire (fourteenth century), 315 feet in height, is mixed Decorated and Perpendicular, while the cloisters (1297-1430) are mainly Decorated in style; and there are remaining two fine arches of the Early English Lady chapel (demolished about 1580). The total length is 407 feet, the length of the nave 204 feet, and the length of the transepts 178 feet. The castle, situated at the highest point of the city, originally extended as far as the fine market-place, but the keep is now the only part remaining. It was long used as a prison, but is now a museum well known for its collection of raptorial birds. The Grammar School, a Decorated building dating from the fourteenth century, was formerly a chapel. St. Andrew's Hall, in which since 1824 the triennial musical festivals have been held, is the nave of the Black Friars' church, rebuilt in the fifteenth century. It is a fine example of Perpendicular work. Among forty-four churches, mostly dating from the fifteenth century, St. Peter Mancroft is perhaps the finest parish church in England. It has an ornamented tower with a peal of twelve bells. There are manufactures of worsted, silk, and cotton fabrics, especially crapes; also of mustard, starch, ornamental ironware, and shoes, while breweries and nursery-gardens in the outskirts of the town give employment to many.

Norwich was the *Caer Gwent* of the Britons, and the *Venta Icenorum* of the Romans. The name *Nord Vic* (North town) probably has reference to the large Roman camp of Caister, 3 miles to the S. It was often plundered by the Danes, and in 1216 it was sacked by the French dauphin Louis. In 1336 several thousand Flemish weavers settled at Norwich, and during the latter part of the sixteenth century there was a large influx of Dutch and Walloon refugees, who did much to foster manufactures. In 1602 nearly half of the inhabitants died of the plague. Norwich has been the seat of a bishopric since 1096, and is a municipal and parliamentary borough, the last returning two members to Parliament. Pop. (1893) 104,184.

Norwich: city (site purchased from the Indians in 1659, settled in 1660, received city charter in 1784, present charter granted in 1871); one of the capitals of New London co., Conn. (for location of county, see map of Connecticut, ref. 10-K); on the Thames river, and the Cent. Vt. and the N. Y. and N. E. railways; 16 miles N. of Long Island Sound, 35 miles S. E. of Hartford. It is in a valley surrounded by hills, has excellent water-power, and is noted for its manufactures. It contains a free academy with a normal training department, an art school, and kindergarten; public-school property valued at nearly \$200,000; two libraries (Otis, founded 1848, and Norwich Circulating, founded 1871) containing over 23,000 volumes; 27 churches; 10 public halls; 5 national banks with combined capital of \$2,000,000, 3 savings-banks with surplus of over \$500,000, and a loan and trust company with capital of \$100,000; an art museum; a free public hospital; 5 public squares; and 2 daily, 2 weekly, and 2 monthly periodicals. There are gas and electric light plants, electric street-railway, thorough sewerage system, and improved system of water-works. Prior to 1812 the city had large commercial interests; since

then it has developed rapidly as a manufacturing center. Its principal manufactures are cotton, silk, and woolen goods, paper, firearms, wood-working and other machinery, printing-presses, envelope printing-presses, rolling-mill and foundry products, stoves and furnaces, leather-belt, rope, harness, hosiery, nickel goods, files, and corks. Pop. (1880) 15,112; (1890) 16,156.

EDITOR OF "BULLETIN."

Norwich: village; capital of Chenango co., N. Y. (for location of county, see map of New York, ref. 5-H); on the Chenango river, and the Del., Lack. and W. and the N. Y., Ont. and W. railways; 40 miles N. by E. of Binghamton, 90 miles W. of Albany. It is in an agricultural, dairying, and hop-growing region; contains 2 libraries (Academy and Union School, founded 1850, and the Norwich Circulating, founded 1875), 2 national banks with combined capital of \$225,000, and a daily, a semi-weekly, and a weekly newspaper; and has several creameries, blast furnace, foundry, shops of the N. Y., Ont. and W. Railway, brewery, and manufactories of pharmaceutical preparations, silk goods, hammers, chairs, and sash, doors, and blinds. Pop. (1880) township, 5,756; (1890) village, 5,212.

EDITOR OF "CHENANGO TELEGRAPH."

Norwood's Tincture: an alcoholic preparation of American hellebore (*Veratrum viride*), which is supposed to be saturated.

Nosebleed: See EPISTAXIS.

Nosology [Gr. *νόσος*, sickness, disease + *λόγος*, discourse, reason]: the doctrine or science of diseases, more especially as regards their classification and nomenclature. The classification of diseases may be based upon theories as to methods of causation, upon the symptoms produced, upon the parts affected, or upon the final results observed. No complete and satisfactory classification of all forms of disease can be made with the present knowledge upon any single one of these plans, for of some diseases we do not know the cause; most symptoms may belong to several different diseases; the same disease may affect very different localities, and the final pathological results are often very obscure unless a *post-mortem* examination has been obtained, and they may even then be doubtful. It is impossible to devise a single nosological scheme of classification which will be well adapted to all the different purposes for which such schemes are needed—that which will best meet the wants of the vital statistician or health officer will not suit the pathological anatomist. A very important part of a nosological scheme is the nomenclature of the individual forms of disease or of lesions which are to be classified. It is essential that different men, in different countries, and at different periods, shall know what is meant by the name of a disease, such as small-pox, pneumonia, diarrhoea, Graves's disease, or amyotrophic lateral sclerosis.

With increase of knowledge, the use of new means of diagnosis and of instruments of precision, and of more minute examination of diseased tissues, comes the recognition of the fact that disorders of function or of structure, formerly classed together under a single name, may differ so greatly as to cause and result as to make it necessary to give them different names. In the eighteenth century the differences between typhus and typhoid fever were unknown, and hence it is impossible to compare the statistics of that period with those of the present day to ascertain the relative prevalence or fatality of these two very distinct diseases. It must be remembered that a disease is not a distinct separate entity, as is commonly supposed, and implied in the way it is mentioned, as, for instance, when cholera is said to enter a house or ravage a town. It is a condition of the body, and for purposes of nomenclature it is usually a group of conditions more or less unusual. Sometimes a name is devised for a group of symptoms, such as locomotor ataxy, sometimes for a pathological lesion, such as spinal sclerosis. A considerable number of different groups of morbid conditions are known by the names of the persons who first discovered them, as, for example, Addison's disease, Bright's disease, and such names for a time serve a good purpose. Jonathan Hutchinson prefers to give the new disease the name of the patient instead of the name of the doctor.

The older attempts at a systematic classification of diseases, including those of Sauvages, the first of which appeared in 1731, of Linnaeus in 1763, of Vogel in 1764, of Cullen in 1772, of Pinel in 1813, and of Good in 1817, have long since passed into oblivion, and are now merely historical curiosities. The system devised by Dr. William Farr

for use in the statistical reports of the registrar-general of England has been the basis of most of the systems used by statisticians in Great Britain and America, its most complete development being the nomenclature of diseases issued by the Royal College of Physicians in 1884, as a large octavo volume of over 400 pages. It is proposed by the college to revise this every ten years, and the work of revision is now (1894) in progress.

The schemes of Dr. Farr and other vital statisticians include only those forms of disease which are reported as causes of death, for which between 200 and 400 terms are sufficient, while for the purposes of hospital registration and the needs of pathologists and systematic writers on the diagnosis and treatment of disease a much more extensive list is required. The classification of these into groups is a necessity due to the laws of mental action, since each one who studies and thinks about diseases must think of them in certain relations to each other and to the environment, but the groupings required for different purposes are very different. The nomenclature of the Royal College of Physicians divided all diseases into two great classes, viz., general and local diseases. The general diseases include those which affect the whole body, or which may be distributed in several parts at one time, and these are divided into several groups. Group A includes the diseases dependent on morbid poisons, or the specific febrile diseases, such as smallpox, measles, etc. Group B includes the diseases dependent on external agents other than morbid poisons, such as parasites, chemical poisons, effects of injuries, of climate, of errors of diet, etc. Group C includes the so-called developmental diseases, such as immaturity, malformation, and old age; and Group D includes a number of unclassified affections, such as gout, rheumatism, tubercle, scrofula, leprosy, cretinism, and diabetes. Recent discoveries in pathology and bacteriology make very extensive changes in this classification necessary. The list of parasitic diseases must be greatly extended, and this list can not form a homogeneous group. A nosology which groups together consumption, Asiatic cholera, typhoid fever, diphtheria, erysipelas, pyæmia, boils, glanders, gonorrhœa, pneumonia, and leprosy, all of which are probably due to vegetable micro-organisms, would be of very little use for any purpose except possibly to writers on bacteriology.

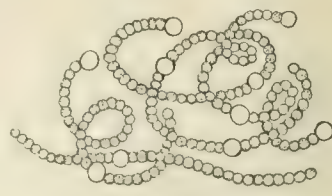
For the purposes of medical, sanitary, and vital statistics special forms of nosological classification are required, and in our present want of knowledge certain diseases must remain unclassified. It must be remembered that one of the most important means of advancing knowledge on these subjects is by comparing what is observed now with what was observed in times past, and hence the observations must be published in such a form that comparison is possible. If, for example, we are told that the number of deaths from zymotic diseases in New York in 1875 was 1,000, we can not compare it with the figures at a later period to much purpose, because the so-called zymotic diseases—which are Class I. in Farr's nosology—did not at that time include some diseases which would now be reckoned as belonging to it, as consumption, tetanus, and puerperal peritonitis.

The sanitarian wants a nosology based as far as possible upon causes of disease, yet he does not want all tubercular diseases reported together, but desires that the number of deaths due to consumption shall be stated apart from those due to tubercular meningitis or to tubercular disease of the bones, and he does not want a nosology which includes smallpox, typhoid fever, malarial fevers, and lobar-pneumonia in one group. For many purposes the simple arrangement of the diseases in alphabetical order is preferable to any nosological grouping, yet some grouping is absolutely necessary occasionally to save space. It is best applied to what are called local diseases, yet many of these would more properly be classed as manifestations of affections of the whole system, such as of gout or rheumatism. For most purposes cancer of the liver or of the breast should be classed under cancer, yet at times it must be considered in connection with diseases of the liver.

The majority of the cases of fatal disease are more or less complicated, and belong to several classes. The old idea that diseases can be divided into classes, orders, genera, and species, as is done for plants and animals, is now entirely abandoned, and it is evident that we must have not one nosological system, but several, adapted to different purposes; yet it is also extremely desirable that there should be more uniformity in the schemes used in reports of deaths than now exists.

J. S. BILLINGS.

Nostoc [Fr.; cf. Germ. *nostoch*]: a genus of Algae growing in fresh water or in damp places on the ground. All the species are composed of threads, consisting of small globular cells, between which are inserted, at intervals, larger cells called *heterocysts*. The threads are intricately wound round one another, and the whole surrounded by a mass of jelly. They reproduce asexually by division of their cells. Of the Nostocs proper there are twenty species in the U. S.



Nostoc threads.

CHARLES E. BESSEY.

Nostrada'mus, whose true name was MICHEL DE NOTRE-DAME: physician and astrologer; b. Dec. 14, 1503, at St. Rémi, in Provence, of Jewish parents; studied medicine at Avignon and Montpellier, and settled as a physician first at Agen, in the present department of Lot-et-Garonne, and afterward at Salon, near Aix. During the time of the plague, which at this period twice visited Southern France, he rendered great service. His immense fame, however, was built on his capacity as an astrologer. In 1555 he published his *Prophéties*, written in quatrains, and giving in an obscure and enigmatical manner prophecies concerning the coming centuries. Many royal persons—Catherine de' Medici, Henry II., Charles IX., and others—consulted him and loaded him with presents; the last-mentioned even made him his life-physician. In after times also the book found students and admirers; the latest is M. E. Baresté, whose *Nostradamus* appeared at Paris in 1842. In 1781 the book was forbidden by the pope, as it was found to contain a prophecy of the abolition of the papal authority. Nostradamus also published an almanac containing weather prophecies. D. at Salon, July 2, 1566.

Nostrils and their Diseases: The nostrils or nares are divided into the anterior nares, which can be seen by external inspection of the openings of the nose, and the posterior nares, to be seen only by aid of small circular mirrors placed in the back of the throat to reflect light, admitted through the mouth, to the nasal cavities above. The most common of their diseases is *catarrh*.

Nasal catarrh is produced by cold air, by insufflating dust, or by irritants. It is the beginning of many cases of laryngitis and bronchitis, and is an important local condition in a number of the infectious diseases, as in measles and influenza. Simple recent nasal catarrh produces a watery, alkaline serum. When more pronounced the catarrhal flow is less serous, contains mucous corpuscles, is viscid or even tenacious, and is yellowish in color and purulent. Chronic catarrh may result in constriction of the anterior nares, in the development of outgrowths of the mucous membrane, or even polypi. In the posterior nares, by extension to the throat, catarrh may result in permanent or obstinate nasopharyngeal catarrh. Such chronic catarrh may give rise only to habitual coughing and hawking of mucus, but it often impairs the hearing by tumefaction at the aperture of the Eustachian ducts or by extension to the middle ear. Nasal polypus is an attached tumor in the nostrils, originally a small projecting mass of granulations or enlarged glandular tissue. When chronic nasal catarrh has resulted in ulceration and death of the cartilages or bones of the nose, the discharge is often extremely offensive. This disease is known as *ozæna*. Close examination will discover particles of necrosed matter. *Ozæna* is more often the result of nasal catarrh in strumous, tubercular, and syphilitic persons. Epistaxis or nose-bleed is the result of local causes, as irritating or picking the nostrils; it is a frequent occurrence in persons having disease of the mitral valve of the heart; it is a symptom peculiar to typhoid fever; it is often due to excessive exercise and to excitement. The catarrhal diseases of the nostrils are treated by topical applications, inhalations, and sprays. *Ozæna* demands the insufflation or injection of antiseptic washes or the surgical removal of the dead bone. Polypus is removed by cutting or tearing. Nose-bleed is checked by cold applications on the nose, by plugging the nostril with lint, or the introduction of styptics, as tannic acid and persulphate of iron. In extensive bleeding from the nose the nostrils have to be plugged from behind as well as from before.

Revised by WILLIAM PEPPER.

Nota, ALBERTO, Baron: writer of comedies; b. at Turin, Italy, Nov. 15, 1775. His father had squandered his fortune, and the young man was obliged to toil for a livelihood. He studied law at Turin, and became an advocate at the age of eighteen. After struggling along in his profession for a time, he obtained official employment, and in 1811 he was made substitute for the procurator of the court at Vercelli. Somewhat later he became the secretary and librarian of the Prince of Carignano (later King Charles Albert). He was accused of liberalism, however, and had to give up his post. He removed to Milan, but had to return to Turin and resume his profession. In 1818 he once more entered the royal service, and was made under-general-intendant of the department of Nice. Thence he was transferred to Bobbio (1820), San Remo (1823), and finally became general-intendant at Casale (1833) and Coni (1840). D. at Turin, Apr. 18, 1847. During all his life he wrote comedies, the earlier and best of which show that his chief models were Molière and Goldoni. From the former he derived his fondness for general comic types, from the latter his method of depicting character. His defect, however, was a certain remoteness and generality of manner, markedly in contrast with the originality and *vis comica* of the greatest masters of the comic art. His first successful piece was *I Primi passi al mal costume* acted in Turin, 1808. This was followed by *Il Progettista* (1809); *Il Nuovo Ricco* (1809); *L'ospite francese* (1810); *I Litiganti* (1811); *Il Filosofo celibe* (1811); *L'Ammalato per immaginazione* (1813); *Il Ben-fattore e l'Ortana* (1814); *La Donna ambiziosa* (1817); *La Lusignhiera* (1818); *Alessina ossia la costanza rara* (1822); *La Fiera* (1826); *La Novella Sposa* (1826); *Il Torquato Tasso* (1826), etc. After the last date his comic style began to feel the sentimental influences of his time, and suffered greatly. Between 1816 and 1843 there were no less than twelve editions of his works, and many of the pieces were translated into the chief languages of Europe. The best Italian edition is *Commedie di Alberto Nota* (8 vols., Turin, 1842-43). A. R. MARSH.

Notables: in France, persons of noble birth or social distinction, from whom the members of the Assembly of the Notables were chosen. This body, which was first convened by the Valois king Charles V., owed its origin to the desire of the monarch to secure a more serviceable instrument of despotic power than the older States-General, which came into frequent collision with the royal will. As its members were dependent upon the crown, with which their interests were often identical, they generally consented to what the king proposed. The last Assembly of the Notables met in Nov., 1788. In the previous year it had accepted in part the reforms proposed by the Government, but now it refused to listen to the demand for the double representation of the Third Estate in the States-General. It opposed all innovations, and was dissolved Dec. 12, 1788.

Notacanthidae [Mod. Lat., named from *Notacanthus*, the typical genus; Gr. *νῆστος*, back + *ἀκανθα*, spine, thorn]: a family of fishes of the order *Opisthomi*. The body is elongated (but not eel-like), and the tail tapers strongly backward; it is covered with very small cycloid scales; the lateral line is conspicuous; the head is conic, and the snout more or less produced; the mouth is inferior, the cleft moderate, and the lower jaw quite movable; the teeth are minute and pointed; the branchial apertures are normally extended; there are about eight branchiostegal rays; the dorsal fin is only represented by a number (7-30) of short disconnected spines about the middle of the length; the anal is elongated, and armed with numerous (12-15) spines in front; the caudal small and (typically at least) connected with the anal; the pectorals are well developed, and the ventrals are abdominal and composed of spinous (2-4) and articulated (7-8) rays. Several species are known chiefly from the oceanic abysses. Revised by F. A. LUCAS.

Notary Public, or simply (as often called) **Notary**: a public officer existing among all civilized nations, and invested in almost every country in Europe and America with essentially the same functions and privileges accorded to notaries in ancient time—namely, the preparing and attesting of various instruments, the authenticating and certifying of examined copies of documents, the noting and protesting of bills of exchange, the administering of oaths and various other authenticating or solemnizing acts. The manner of appointment of notaries varies in different countries. In England they are appointed by the Archbishop of Canterbury, acting as the Court of Faculties; in Scotland they are admitted by the Lords of Session; in the States of

the U. S. they are ordinarily appointed by the Governor. The particular functions and duties and the dignity attached to the office of notary vary in different countries; thus in England (where a notary must have served a clerkship) and many of the countries of Europe notaries are called upon to draw up papers, such as wills, which in the U. S. would be prepared by an attorney and simply acknowledged or sworn to before a notary. In England notaries have always exercised the right of administering oaths, but in the U. S. they can administer oaths only when given the power so to do by statute, which has been done by the U. S. and many of the individual States. In Great Britain and the U. S. a notary may refuse to act if he sees fit, but in some countries, as France, he can not refuse his services.

A notary is a ministerial officer, and is liable to a party injured by the negligent performance of any duty undertaken by him. Statutes also frequently declare his responsibility for misconduct, both civil and criminal. It is clear that in the absence of any statute his conduct is governed by that general rule of law which prescribes that any person who enters upon an undertaking requiring ordinary care and skill is liable to any one injured by this failure to exercise such care and skill. Still a notary is not liable to his employer if he commits an error acting under his employer's direction. Where a bill of exchange is given to an agent for collection, and the agent employs a notary to make protest of it (see *BILL OF EXCHANGE*), and the notary is negligent and thus discharges the drawer and indorsers, there is much divergence of judicial opinion as to the respective liabilities of the agent and notary to the principal—some decisions holding that when the act is strictly notarial (i. e. when the bill is a foreign one) the notary alone is liable to the principal, and that when the bill is an inland bill he is liable only to the agent who employed him; other cases holding that in either case the remedy of the principal is solely against the notary.

A notary can not transfer his official powers or authority to another, and therefore when called upon to perform a strictly notarial act he must in general perform it personally; but where there is a settled commercial usage in a place where a foreign bill is to be protested, that protest may be made by a notary's clerk, a protest so made will be held valid elsewhere, since the protesting of foreign bills is a matter of mercantile usage subject to local customs. In Great Britain and the U. S. courts will generally take judicial notice of the seal of a notary; but the notary's certificate of a certain fact generally has no more legal weight as evidence than the certificate of any other person, except his certificate that a foreign bill was duly protested.

For fuller information, see Brooke's *Office and Practice of a Notary of England* (5th ed. 1890), and the works of Prof. fatt and Rex on *Notaries*. F. STURGES ALLEN.

Notation [from Lat. *nota'tio*, deriv. of *notare*, to note]: in mathematics, a conventional method of representing quantities and operations by means of symbols. It explains the meaning of individual symbols, both of operation and of quantity, and shows how to combine them so as to express in the simplest manner every mathematical operation. A simple and comprehensive system of notation is essential to the progress of every science, but in no branch is a complete system more necessary than in mathematics, and in no branch has there been a greater diversity of systems proposed. Our present system is the result of the labors of many men, living in different ages, speaking different languages, and possessing different habits of thought; from these diverse sources a mathematical language has sprung up, defective in many respects, and yet sufficiently simple and copious for most of the purposes of analysis and investigation. Each department of mathematics has its own notation; in this article will only be considered the notation of arithmetic, or the method of writing numbers.

There are at present in general use only two systems of arithmetical notation, the *common* system and the *Roman*; in addition to these we shall also explain the method of the ancient Greeks.

(1) *The Common System*.—This is sometimes called the *Arabic*, because the figures which it employs were introduced into Europe by the Arabs. The following figures, expressing values regularly increasing by one from nothing to nine, are used in this system: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. These figures, taken separately, are called *digits*. The first one, named *naught*, is also called a *cipher* or *zero*; it stands for no number. The remaining ones are called *significant*

figures. All integral numbers are expressed by writing the proper digits in a line. The digit on the right is said to stand in the *first* place, the one preceding this in the *second* place, the next preceding in the *third* place, and so on. This order of arrangement is called the *scale* of the system. The same digit always indicates the same number of units, but the value of the unit indicated depends on the place it occupies in the scale. If a digit stands in the first place, it expresses simple units or *ones*; if in the second place, it expresses *tens*; if in the third place, it expresses *hundreds*; the value of the unit in any place is always ten times that of the unit in the next lower place. Thus the combination 376 stands for 3 *hundreds*, 7 *tens*, and 6 *ones*, or for the number *three hundred and seventy-six*. If we place a point—which we call the decimal point—on the right of the first place, we may continue the scale downward to any extent; in this case the digit on the right of the point is said to stand in the *first place of decimals*, the next stands in the *second place of decimals*, and so on. The unit of the first place of decimals is *one-tenth*; that of the second place, *one-hundredth*; that of the third place, *one-thousandth*, and so on. Thus the combination .325 stands for 3 *tens*, 2 *hundredths*, and 5 *thousandths*, or for the number *three hundredths*. The scale thus completed is called the decimal scale; it will be noted that this scale is continuous throughout; that is, in proceeding from right to left the unit of each place is ten times that of the preceding place. If we place a cipher in each place, we may write the decimal scale as follows:

Period of billions.	Period of millions.	Period of thousands.	Period of units.	Period of thousandths.	Period of millionths.
etc., etc.	etc., etc.	etc., etc.	etc., etc.	etc., etc.	etc., etc.
hundreds of billions,	hundreds of millions,	hundreds of thousands,	hundreds of thousands,	hundreds of thousands,	hundreds of thousands,
tens of billions,	tens of millions,	tens of thousands,	tens of thousands,	tens of thousands,	tens of thousands,
billions,	millions,	thousands,	units,	thousandths,	millionths,
0 0 0 , 0 0 0 , 0 0 0 , 0 0 0	0 0 0 , 0 0 0 , 0 0 0 , 0 0 0	0 0 0 , 0 0 0 , 0 0 0 , 0 0 0	0 0 0 , 0 0 0 , 0 0 0 , 0 0 0	0 0 0 , 0 0 0 , 0 0 0 , 0 0 0	0 0 0 , 0 0 0 , 0 0 0 , 0 0 0

For convenience of reading, the scale is separated into periods, each of which embraces three places, and is named as shown above. The denominations above billions are trillions, quadrillions, quintillions, etc., deriving their names from the Latin numerals. If a digit is written in the place of any cipher in the blank scale above given, it will express a corresponding number of units of the name indicated; thus the combination 326,812,435,278,812, expresses the number 326 *millions*, 812 *thousands*, 435 *units*, and 278 *thousandths*, 812 *millionths*. It will be observed that the unit of each place is some power of 10: thus the unit of the first place is 10^0 , or 1; that of the second place is 10^1 , or 10; that of the third place is 10^2 , or 100, and so on. In like manner the unit of the first decimal place is 10^{-1} , or $\frac{1}{10}$; that of the second place of decimals is 10^{-2} , or $\frac{1}{100}$; that of the third place is 10^{-3} , or $\frac{1}{1000}$, and so on. It is from this law of relation that we name the scale a *decimal* scale; for like reason we call this system of indicating numbers the *decimal* system. In the system just explained the units corresponding to the different places are in geometrical progression, the *base* or *radix* of which is 10. Similar scales might be constructed having any other number as a *radix*, but such scales are not in common use.

There is an unfortunate ambiguity in the use of the terms billions, trillions, etc. In the French system, which is generally used in the U.S., each of these denominations is 1,000 times the preceding one; but in the English system it is 1,000,000 times, the billion being a million millions.

(2) *The Roman Method.*—In the Roman method of notation seven capital letters are used. These letters and the values they express are shown below:

Letters,	I.	V.	X.	L.	C.	D.	M.
Values,	1,	5,	10,	50,	100,	500,	1000.

Any other number is expressed by a combination of these letters on the general principle that such a combination represents the sum of the values of its constituent letters, these being arranged from left to right in order of value, and the use of the same letter five times or more being

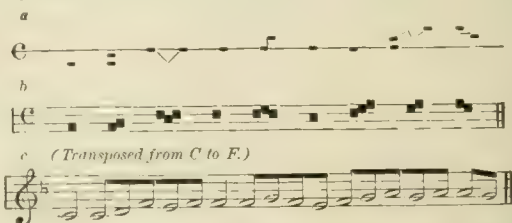
avoided by using letters of greater value; but when, in accordance with the above, the same letter would occur four times, it is customary to employ the sub-principle that whenever a letter precedes one of greater value the value of the two is that of their difference instead of their sum. Thus III. denotes 3; VI., 6; LX., 60; XC., 90; XIV., 14; and MDCCLXXVI., 1776. This system is used only for dates, headings of chapters, and the like.

(3) *The Grecian Method.*—In representing numbers the ancient Greeks used either (1) the initial letter of the word denoting the number—e.g. Π (Pente) 5, Δ (Deka) 10, etc.; or (2) they used letters of their alphabet, to which they added the three obsolete characters ς , φ , and ω . Thus the consecutive numbers from 1 to 9 were represented by the characters α , β , γ , δ , ϵ , ζ , η , and θ —*simple units*; the tens from 1 ten to 9 tens, or the numbers from 10 to 90, were represented by the characters ι , κ , λ , μ , ν , ξ , σ , π , and φ —*tens*; and the hundreds up to nine hundred were represented by the characters ρ , σ , τ , υ , ϕ , χ , ψ , ω , and ω —*hundreds*. Thousands were expressed by a subscript dash; thus the number 3,000 was written γ . The letter μ written below any symbol increased its value ten thousand times; these conventional principles enabled them to write any number up to 1,000,000,000. The following examples show how numbers were expressed in this system:

$\theta \zeta \iota \varsigma \theta$, nine thousand nine hundred and ninety-nine.
 $\delta \tau \pi \beta$, four thousand three hundred and eighty-two.
 $\gamma \alpha$, three thousand and one.

Other devices for expressing numbers were conceived by Archimedes, Apollonius, and others, but the entire system was, like that of the Romans, extremely unwieldy and ill fitted to practical computations. Revised by S. NEWCOMB.

Notation (in music): the mode or system by which musical thoughts are represented in writing, including all the signs, characters, figures, and arbitrary marks necessary to render such thoughts intelligible. The system now in use is mainly a product of the last three or four centuries, and in all civilized nations musical symbols are the same. In ancient times the recording of musical ideas was a subject of perplexity and uncertainty. To convey from one mind to another a clear idea merely of the pitch and the duration of several tones or sounds, though comprising only a very limited series, required of course certain signs or symbols which should possess a fixed meaning. The earliest signs adopted for this purpose seem to have been the letters of the alphabet, which were sometimes placed erect, sometimes inverted, mutilated, commingled, or cast into various fanciful forms, so that by degrees more than 100 of such characters came into use. After this greater simplicity was secured by the use of only a few Roman letters, the lower octave being represented by capitals, the second octave by small letters, and the third by small letters doubled. Besides the letter system another mode of representing musical sounds came into use, the leading feature of which was a single straight line, the various sounds being indicated chiefly by dots, either on the line or more or less distant from it. An illustration of this is given at *a* in the following example, taken from a work by Padre Martini, with its interpretation in black notes at *b* and in modern notes at *c*:



As late as the thirteenth and fourteenth centuries numberless crooked marks, loops, curves, hooks, wavy lines, and other signs, besides the dots, were used with the single straight line, forming a system not easy to be interpreted even by the most skillful of modern musicians. The introduction of several lines with their spaces, and notes of fixed form and duration, was the next important step. The lines were at first only four in number, though we sometimes find the staves belonging to two or three voices (with their proper clefs) so crowded together as to look like one staff of eight or twelve lines. The ancient notes belonging to the four-line staff are described in the article LARGE (*q. v.*). To indicate the pitch of the notes two clefs were used—

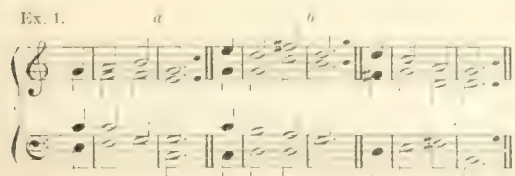
one to mark the place of middle C, and the other that of the F below. These clefs were not permanently fixed, but were placed on such a line as would serve most conveniently to keep the notes within the bounds of the stave and the spaces above and below. The stave now in universal use consists of five lines, and to each stave is prefixed a clef to designate, as from a starting-point, the various degrees of acuteness or gravity of the notes employed. Of these clefs that of F for the bass and that of G for the upper parts are of most frequent use in modern music, the C clef being reserved for certain orchestral parts, and also occasionally used for the tenor and alto in church music. The round-headed form of notes is now exclusively used, the old square breve seldom appearing except in the music of the church. The semibreve is now taken as the standard of unity or the note of longest duration, but the extent of that duration is determined by the will of the composer or performer. The actual speed of a piece of music is indicated by regulative terms or signs at the beginning, or is left to the discretion of the performer; but in all cases the time given to the semibreve determines the time of each minim, crotchet, quaver, etc., because these notes stand to it in the relation of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, etc. Intervals of silence also, corresponding in duration with the several kinds of notes, are indicated by characters called *rests*. To meet the want of notes bearing other ratios to the semibreve, as $\frac{3}{2}$, $\frac{3}{4}$, $\frac{1}{16}$, etc., the simple process of adding a dot to a note was adopted, whereby its duration became one-half longer—a dotted minim, for instance, being $\frac{3}{4}$ of a semibreve, a dotted crotchet $\frac{3}{8}$, etc. The dot is sometimes doubled; in this case the time expressed by the first dot is increased one-half. These dots are equally applicable to the rests. The use of bars was not general till about the middle of the seventeenth century, and to the same period is to be referred the grouping of quavers, semi-quavers, etc., by ties or ligatures connecting their stems. Under the head of notation are also comprised the numerous signs of expression, emphasis, loudness and softness, retardation and acceleration of speed, various kinds of ornament, and all the marks belonging to the province of harmony. See *Grove's Dictionary of Music and Musicians*.

Revised by DUDLEY BUCK.

Note [from O. Fr. *note* < Lat. *no'ta*, mark, sign, note; cf. *nos'cere*, *no'tum*, know, recognize]: in music, the character by which a tone is recorded and represented to the eye. (See NOTATION.) In a less accurate sense, the term "note" is often used for the sound of which it is the representative, as when we say a high note or a low note, meaning a high or low sound. Though not strictly correct, this usage of the word is common even in scientific works and in ordinary converse.

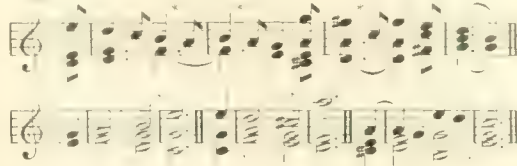
LEADING NOTE.—The leading note is the seventh degree of the major scale, or the semitone next below the octave. In the scale of C the leading note will thus be B; in that of B \flat , it will be A, and so in the other keys. In major keys with sharps the last sharp of the signature is always on the leading note. From a certain natural tendency to resolve itself upward into the octave, the major seventh of the scale is said to lead the ear in that direction, or cause it to expect that the next progression will be to the octave, and hence its name of leading note. In minor scales the seventh in its natural form is not properly a leading note, being a minor seventh above the tonic. It is thus a whole tone below the octave, and does not possess any special upward or leading tendency. This defect, however, is removed by the use of an accidental sharp, which brings the seventh into the same relation to the octave as in the major mode, and makes it equally characteristic. The leading note is considered as the most sensitive interval of the scale, because it creates in the mind of the hearer a peculiar longing or desire for an ascent into the octave above, which it already seems almost to touch. Instances of this are given at *a*, *b*, and *c* in Ex. 1, and these may be compared with the true progression as represented in each case by the black dots:

Ex. 1.



Exceptions to this general rule, however, occur in good compositions when special effects are to be produced, or in flowing melodies where the leading note is not prominent as such, or when by an upward spring the leading note in its resolution passes over the octave and takes the third or fifth above. Some cases of this kind will be seen in Ex. 2 under the asterisks:

Ex. 2.



The leading note, as third in the chord of the seventh on the dominant, is subject also to the rules relating to the resolution of sevenths; but in this case the rule of the leading note as such, and that affecting it as third in the chord of the seventh, are coincident in requiring that the progression should be one semitone upward—i. e. into the tonic.

Revised by DUDLEY BUCK.

Nothnagel, HERMANN, Hofrath: physiologist and neurologist; b. in Alt Lietzgericke, Brandenburg, Sept. 28, 1841; was educated in Berlin; was privat docent in Berlin and Breslau; became Professor of Medicine in Freiberg (Baden) in 1872, in Jena in 1874, in Vienna in 1882. His principal works are *Topische Diagnostik der Gehirnerkrankheiten* (Berlin); *Arzneimittellehre* (seven editions, Berlin); *Beiträge zur Physiologie und Pathologie des Darms* (in *Zeitschrift für klin. Medicin*); *Beurtheilung einzelner Kapitel der Gehirnerkrankheiten* (in Ziemssen's *Pathologie und Therapie*); also a large number of special researches on medical and physiological topics.

J. M. BALDWIN.

Notice [Fr. *notice*, from Lat. *notitia*, knowledge, acquaintance, a being known, deriv. of *noscere*, *notus*, know]: a legal term used with varying significations. At times it is synonymous with knowledge, as when a court is said to take "judicial notice" of matters of general knowledge. (See EVIDENCE.) Again, it designates the act, means, or instrument by which information is conveyed, e. g. notice to quit (see LANDLORD AND TENANT), notice of dishonor (see BILL OF EXCHANGE), notice of acceptance of proposals (see CONTRACT, ASSIGNMENT, GUARANTY), notice in legal proceedings (see PROCEDURE). It is also employed as a technical term to denote information concerning a fact, which "is regarded as equivalent in its legal effect to full knowledge of the fact, and to which the law attributes the same consequences as would be imputed to knowledge." To illustrate: If a person buys and receives property on credit by false representations concerning his financial ability, the vendor upon discovering the fraud may rescind the sale and retake the property from the vendee, or from any purchaser from the vendee having knowledge of the fraud. This right is equally available against a second purchaser, who had notice merely of the fraud and not knowledge.

Actual and Constructive Notice. While technical notice is divided commonly into actual and constructive, both text writers and judges differ in their definitions of these terms. It is agreed that actual notice is properly applied to authentic information concerning a fact which is directly communicated to the party to be charged by notice. It also applies where a person has the means of knowledge to which he dishonestly shuts his eyes. Beyond this all is debatable ground. It is believed, however, that the weight of authority supports the following views: Notice concerning a fact is to be deemed actual when it consists of information that would put a prudent man upon inquiry, which if followed up would result in acquainting him with the fact, provided that the circumstances authorize the finding, without the aid of any legal presumption, that the fact, or some aspect of it, was brought home to the consciousness of the party. The following is an example: A person who was negotiating for the purchase of certain lands with the one who held the record title was told by their prior owner, who was still in possession, that the latter had a claim on them, and that the former had better let them alone or he would get himself into trouble. He nevertheless concluded the purchase without making any inquiries concerning the nature of the claim. Had he inquired he would have learned that the party in possession was a mortgagor of the prem-

ises. It was held to be a question for the jury whether the purchaser had actual notice of the mortgagor's interest. (*Brinkham vs. Jones*, 44 Wis. 498; but see *Lamb vs. Pierce*, 113 Mass. 72.) If in the above case the only information acquired by the purchaser concerning the former owner's interest in the land had been that he was still in possession of it, we should have had at most an example of constructive notice. The law casts upon him who purchases property from one not in possession the duty of inquiring as to the possessor's interest, and if he fails to perform that duty it charges him with notice of all the facts that reasonable inquiry would have discovered. The inference of notice, however, in this case is not one of fact, but results from a presumption of law. That presumption may be rebutted. The purchaser may show that he made due inquiry and yet failed to discover any defect in his vendor's title.

In many cases constructive notice is absolute, or, as is often said, the legal presumption that the party chargeable with notice has acquired information concerning the fact in question is conclusive. He will not be allowed to dispute it. This kind of constructive notice is frequently the creature of statute. Under recording acts (see *RECORD OF CONVEYANCES*) a duly executed and registered deed is absolute notice to subsequent purchasers and incumbrancers not only of its existence, but of all interests in the property thereby conveyed. Constructive notice has a prominent place in the law of negotiable paper. A purchaser of such paper is conclusively taken to have read it, and therefore is never allowed to dispute that he had notice of anything apparent on its face, as, for example, a restrictive indorsement or notarial marks of dishonor for non-acceptance. If he acquires it after maturity he is also charged absolutely with notice of all equities available against his transferor. So a purchaser of real estate is conclusively deemed to have read every instrument which forms a part of his chain of title and to be notified of every interest therein referred to. This doctrine is necessary to the security of titles.

Whenever notice of a fact is established, whether by direct evidence, by an inference of fact, or by an inference of law, its legal consequences to the one chargeable with it are the same as those that would flow from his knowledge of the fact.

What Constitutes Notice.—This is often determined by statute, as in the case of the recording acts, or by an equally positive rule of unwritten law, as in the case of negotiable paper. Where no such rule exists, it is a question of fact in each case whether the evidence shows (1) that the party to be charged with notice received information of a character that subjected him to the duty to inquire further, and (2) that such further inquiry would have resulted in knowledge of the requisite fact. A mere rumor or a vague report, or a general statement by one having no interest in the subject-matter of the transaction, will not impose on one the duty of inquiry. Such information ordinarily furnishes no clew to the truth. "To set on foot an inquiry into the foundations of mere rumors would in most cases be a vain and impracticable pursuit." If the information, though given by a stranger to the transaction, is definite and apparently credible, and especially if it refers to an authentic source of knowledge, it will impose upon the recipient the duty of further inquiry. Acts may constitute notice. One who fences and cultivates a piece of land thereby gives notice that he claims an interest therein. Visible structures may give notice. The purchaser of a house showing fourteen chimney tops and but twelve flues is notified of an easement in two chimneys on the part of the adjoining house. See *Wade on the Law of Notice*; *Pomeroy's Equity Jurisprudence*, ch. ii., § 5. FRANCIS M. BURDICK.

Notidan'idæ [Mod. Lat., named from *Notidanus*, the typical genus; Gr. *νῶτον*, back + *ιδανός*, slightly, comely]: a family of selachians of the order *Squali* or sharks, distinguished from all others by the increased number of branchial apertures. In the form of the body they resemble the typical sharks. The skin is shagreen-like; the head depressed, oval, with the snout protuberant; the eye has no nictitant membrane; the nostrils are inferior and distant from the mouth; the mouth has a crescent-like cleft; the teeth are very unlike in the opposite jaws, those in the upper jaw being broad and armed with several cusps, one of which extends beyond the others, but in the lower jaw are six pectinated teeth on each side forward and several smaller posterior ones; the branchial apertures are six or seven in number; small spiracles are persistent on each side of

the neck; the dorsal fin is single and inserted far backward behind the ventrals; the anal is well developed and behind the dorsal; the pectorals have an anterior edge straight from the base; the ventrals normal. The family is distinguished, in addition to these peculiarities, by a number of others, and is composed of two genera, *Hexanchus* and *Heptanchus*, represented in most warm seas. T. GILL.

Notion: a concept or general idea. The word is used mainly in logic, and is generally made to include the name given to the class of objects to which a concept or idea has reference. Thus "horse," considered as a "concept" or "idea," is the mental state or inner meaning of the thinker, while "notion" includes the name horse by which this "concept" or "idea" is expressed in reference to the object of thought. J. M. B.

No'to: town of Sicily; 16 miles S. W. of Syracuse (see map of Italy, ref. 10-G). It stands on a hill not far from the sea and commands a charming valley. The old town (Neëtum or Netum), built about 450 B. C. on the ruins of one still more ancient, flourished under the Romans and shared in all the vicissitudes of Sicily in the Middle Ages, but was utterly destroyed by earthquake in 1693. The modern town was founded in 1703 4 miles S. E. of the ancient site. It carries on trade in grain, wine, oil, and fruits. Pop. 15,925. E. A. G.

No'tochord, or **Chorda Dorsalis** [*notochord* is from Gr. *νῶτον*, back + *χορδή*, cord; *chor'da dorsa'lis* is Mod. Lat., from Lat. *chor'da*, cord + *dorsu'lis*, pertaining to the back, deriv. of *dor'sum*, back]: a rod of tissue of cartilaginous or softer nature which occurs in Vertebrates, Tunicates, and some other forms between the alimentary tract and the nervous system. In the early stages of the embryo the notochord arises from the dorsal wall of the digestive canal and becomes cut off from it to take its permanent position. In some forms (Amphioxus) it persists throughout life as the sole skeletal structure, and extends from one end of the body to the other. In the ENTEROPNEUSTA (*q. v.*) it occurs only at the anterior end, and in the TUNICATA (*q. v.*) it is developed only in the tail of the larvæ. In the Vertebrates it never quite reaches the anterior end, and in most it usually undergoes more or less complete degeneration. Around it is a sheath of connective tissue, the notochordal sheath, and from thickenings and ossifications in this the bodies of the vertebrae are developed, and with their growth the notochord loses its supportive value and becomes more or less completely obliterated. In adult man the only remnant of it is the so-called "nucleus of the intervertebral disk." To the naturalist, one of the most interesting features connected with the notochord is that it, a skeletal structure, is derived from the alimentary tract, and hence is entodermal in origin. See EMBRYOLOGY. J. S. KINGSLEY.

Notopter'idæ [Mod. Lat., named from *Notopterus*, the typical genus; Gr. *νῶτον*, back + *πτερόν*, fin]: a family of teleocephalous fishes of the sub-order *Physostomi*, distinguished by many peculiar characters. The family is composed of fresh-water fishes, attaining considerable size, and peculiar to the fresh waters of India and Africa.

Nototherni'idæ [Mod. Lat., named from *Notothernia*, the typical genus; Gr. *νότος*, from the south; *νότος*, south + *-θεις*, from]: a family of teleocephalous fishes, of the sub-order *Acanthopteri*, representing in the southern seas to some extent the codfishes of the northern. The species are all inhabitants of the southern seas. The greatest number belong to the typical genus (*Notothernia*), and some of them are abundant on the S. coasts of South America and contiguous islands, as well as Kerguelen's Land, Australia, etc.

Nott, ELIPHALET, D. D., LL. D.: educator; b. at Ashford, Conn., June 25, 1773; graduated at Brown University 1795; was licensed to preach in that year and settled at Cherry Valley, N. Y., uniting the duties of pastor of a Presbyterian church with those of principal of an academy; was pastor of a church at Albany 1798-1804, acquiring celebrity as a pulpit orator, especially by a sermon on the death of Alexander Hamilton; was elected president of Union College, Schenectady, N. Y., 1804, and retained that post until his death Jan. 29, 1866. Dr. Nott acquired a considerable fortune by several inventions in stoves and other apparatus for warming buildings, and gave large sums for the endowment of Union College and the foundation of scholarships for poor students. Under his management Union College became one of the strongest literary institutions in the U. S., and 3,700 students were graduated from it during his presi-

dency. Among his publications were *Counsels to Young Men* (1810) and *Lectures on Temperance* (1847).

Nottingham, or **Nottinghamshire**, or **Notts**: an inland county of England; bounded N. by Yorkshire, E. by Lancashire, S. by Leicestershire, and W. by Derbyshire. Area, 824 sq. miles. The eastern part, the vale of the Trent, is level and low; the rest is hilly, partly consisting of moorland, partly covered with remnants of the famous old Forest of Sherwood, the haunt of Robin Hood. In the south are the wolds, consisting of upland moors and pasture lands, broken at intervals by fertile hollows. The principal industry of the inhabitants is the manufacture of lace and of cotton hosiery, and those branches are developed more extensively and to a higher degree of perfection than in any other part of England. Much of the surface is laid out for gardening purposes. Coal, inferior to that of Newcastle, iron ore, marl, and good building-stone are found. Pop. (1891) 445,539.

Nottingham: capital of the county of Notts, England; on the Leen, near its junction with the Trent; 38 miles S. by E. of Sheffield and 126 miles N. N. W. of London (see map of England, ref. 8-I). It was formerly irregularly built, but its appearance has undergone a great change, owing to the widening of the streets and other improvements. On the summit of a rock rising abruptly from the river stands the castle (1674-83), built on the site of a Norman fortress. It was restored in 1878, and is now an art museum. Close by is St. Mary's church, a cruciform structure in the Perpendicular style with a fine tower, and a handsome market-place, $5\frac{1}{2}$ acres in extent, at one end of which is the Exchange, rebuilt in 1814. Among modern erections are the Guildhall (1888) and the University College, with its splendid range of buildings. The latter is chiefly for science teaching, and accommodates in its wings a free library and a natural history museum. The High School (1868) has a large income from endowments. Among modern churches may be mentioned the Roman Catholic Cathedral of St. Barnabas, designed by Pugin, in the Early English style. There is a public park of 150 acres, and a common, called Bulwell Forest, of 135 acres, besides a picturesque arboretum of 17 acres. The Trent is crossed by an iron and granite bridge (1871), and the Trent Bridge cricket-ground is the scene of the home matches of the county, which for many years has been the *berceau* of first-class cricketers.

Nottingham's manufactures of cotton and silk hosiery and of bobbinet and lace are most important; bicycles, baskets, cigars, and needles are also made, and iron and brass works, malting business, and trade in grain and cattle are extensively carried on.

After having been occupied for some time by the Danes, when it constituted one of their five boroughs, it was restored and repopled by Edward the Elder, who rebuilt the fortress and threw a bridge over the Trent. Parliaments met at Nottingham in 1334, 1337, and 1357. In 1642 Charles I. began the Parliamentary war by setting up his standard here. Nottingham is the seat of a suffragan bishop in the diocese of Lincoln, and a municipal, county, and parliamentary borough, the last returning three members to Parliament. Pop. (1893) 220,551. R. A. ROBERTS.

Nottingham. HENRAGE FINCH, D. C. L., First Earl of: statesman; son of Sir Henrage Finch, recorder of London; b. in Kent, Dec. 23, 1621; educated at Westminster School and at Christ Church, Oxford; studied law and was called to the bar at the Inner Temple 1645; was a member of the Convention Parliament Apr., 1660; made knight, baronet, and solicitor-general by Charles II. June, 1660; was returned to Parliament for the University of Oxford 1661; became Attorney-General May, 1670; Lord Keeper of the Privy Seal, with the title of Baron Finch of Daventry, Nov., 1673; Lord High Chancellor of England Dec. 19, 1675; presided at the trial of Lord Stafford 1680; was created Earl of Nottingham May 12, 1681, and died in London, Dec. 18, 1682. Famed in his own time for powers of oratory, his portrait was given by Dryden under the character of Amri in his *Absalom and Achitophel*.—His son and successor in the earldom, DANIEL FINCH, b. about 1647; educated at Christ Church, Oxford; became a privy counselor and First Commissioner of the Admiralty 1679; was one of the commissioners to treat with William, Prince of Orange, 1688; was Secretary of State under William and Mary 1689-93; attended William to the congress at The Hague 1690; was again Secretary of State under Anne 1702-04; became one

of the lords justices for the administration of affairs 1714; was Lord President of the Council Sept., 1714-Feb., 1715; wrote an answer to Whiston on the Trinity (1721), for which he was thanked by the University of Oxford; succeeded to the earldom of Winchelsea 1729, and died Jan., 1730.

Noumea: capital of NEW CALEDONIA (q. v.).

Noun [from O. Fr. *noun*, *nom* > Fr. *nom*; Ital. *nome*, Span. *nombre* < O. Span. *nomme*; Portug. *nome* < Lat. *no men*, name]: in grammar, a name or appellation of something, whether it be a substance, creature, quality, action, phenomenon, or any other entity, concerning which name a statement may be made in a sentence. A verb is the name of something as truly as is a noun. The word *talk* is the name of an action. In the sentence, *Talk is cheap*, it is a name concerning which a statement is made; so in the sentence, *It is all for talk*, it is a noun by virtue of its function. In the sentence, *They talk*, a word of like form, if not identically the same word, is also the name of an action, but with different function. The adjective is a name of an attribute; so is a noun. In the sentence, *White is a color*, we call *white* a noun by reason of its function, while in *iron chain*, *stone wall*, names which commonly appear as nouns serve in the rôle of adjectives. In the sentence, *There are too many ifs and ands*, the conjunctions *if* and *and* are nouns by virtue of their function. The distinguishing characteristic of a noun therefore is not the fact that it is a name, but its function as furnishing subject-matter for statement in the sentence. From the side of form it is the distinctive mark of the noun as contrasted with the verb that the former has cases, the latter persons. This distinction is developed most finely in the highly inflected languages like Greek and Latin.

Nouns are either concrete, as names for substance, or abstract, as names of attributes, actions, or phenomena. Concrete nouns are either common or proper. A common noun is an appellation which may be shared by all the individuals of a class or applied to the entirety of a material, as *man*, *tree*, or *water*, *wood*. A proper noun is permanently and definitely appropriated to mark an individual person or thing. The name *city* may be applied to any individual of a class, but *Chicago* has been appropriated like a tag or a trade-mark to designate one certain individual. Proper names may generally be traced historically to common names which from persistent connection with individuals have lost their meaning and become purely symbolic instead of representative; thus *Newcastle*, *Neuburg*, *Neuchâtel* were originally common names, *a new castle*, and the name *Smith*, a class name, *smith*. Proper nouns may in their turn become common when extended to a class of individuals sharing the prominent characteristic of the original holder of the name; thus *academy*, *czar* (Cæsar), *palace*, *a Napoleon*, i. e. an autocrat, *a Judas*, i. e. a traitor.

Common nouns may be divided into material nouns, as *water*, *iron*, and class-nouns, and these into individual nouns, as *man*, *house*, and collective nouns, as *people*, *crowd*, *army*. BENT, LEE WHITFORTH.

Novaculite [Lat. *novacula*, razor + suffix *-ite*]: a fine-grained, gritty, homogeneous, siliceous rock, translucent on thin edges and having a conchoidal fracture. It is known to occur at several localities in Europe, in China, and in Georgia and the Carolinas, and it constitutes an important Silurian formation in Arkansas, where it is quarried for the manufacture of whetstones. The variety quarried contains 99.5 per cent. of silica, and is so compact as to absorb but $\frac{1}{2}$ per cent. of water. As an abrasive material it is distinguished by its fineness, and its chief use is for giving the final finish to cutting edges. See the annual report of the Geological Survey of Arkansas for 1891. G. K. GILBERT.

Nova (or **New**) **Goa**: See **GOA**.

Novaković. NOVÁK-OVÍCH, STOJAN; author; b. at Sabac, Servia, Nov. 1 (o. s.), 1842; was educated at Belgrade, where he became professor in 1865, receiving in 1867 the position of national librarian. He was appointed Minister of Education in 1873, and reappointed in 1874, and again in 1880. During his term of office he reorganized the Servian schools. In 1876 he became Professor of Servian Philology and Literary History at the High School of Belgrade; in 1883 he became a senator; in 1884 Minister of the Interior; in 1886 resigned and was appointed minister to Turkey. His greatest work is a history of Servian literature, *Istorija srpske književnosti* (1867; 2d ed. 1871). In 1869 he published an exhaustive Servian bibliography for the period from 1741-

1867, which he continued in the *Glasnik*. Other noteworthy works of his are *Srpska sintaksa* (3d ed. Belgrade, 1874); *Kosovo*, a collection of folk-songs (3d ed. Belgrade, 1876); *Primjeri*, an historical chrestomathy (1877); *Pripovetka o Aleksandru Velikom* (The Serbian Alexandreis, 1878); *Srpska gramatika* (Belgrade, 1879). J. J. KRÁL.

Novalis: pseudonym of FRIEDRICH LEOPOLD, Freiherr von HARDENBERG, a poet. He was born at Wiedersstädt, a family estate situated in the county of Mansfeld, Saxony, May 2, 1772; studied philosophy at Jena, where he was deeply influenced by Fichte and Schiller, and afterward devoted himself to the study of jurisprudence, chemistry, and mathematics at Leipzig and Wittenberg. The sudden death of his betrothed overwhelmed him with grief, which developed into profound melancholy. During this period he wrote the famous *Hymnen an die Nacht* and the *Geistliche Lieder*, the most perfect of his poetical productions. In 1797 he went to the mining-school of Freiberg for the purpose of studying geology. By coming into renewed contact with life, and by a faithful devotion to his studies, he soon overcame the morbid state of his mind. Shortly after his return from Freiberg he joined in Jena the circle of young writers who gathered around the Schlegels and Tieck, and who are generally known as the founders of the romantic school in Germany. More profoundly than any of the other members he conceived the idea of the unity of poetry, philosophy, and religion, and assigned to poetry the gigantic task of solving the final problems of life. To the principles of romanticism as he understood them he tried to give artistic expression in his unfinished romance, *Heinrich von Ofterdingen*, which he wrote in opposition to Goethe's *Wilhelm Meister*. The air of mysticism surrounding this fragment and the deep philosophical thoughts, frequently assuming the tone of oracles, still fascinate the reader, though as a novel the work must be pronounced an utter failure. It was only in the domain of lyric poetry that the vague emotions of Novalis's deeply agitated soul found their adequate and highly musical expression. D. at Weissenfels, Mar. 25, 1801. His writings were collected and published by L. Tieck and F. Schlegel (2 vols., 1802; 3d vol. 1846); an excellent edition of his poems was made by W. Beyschlag (1869), and an English translation of a selection of his works was published in London in 1891. See also A. Schubart, *Novalis Leben* (1887), and I. Bing, *Friedrich von Hardenberg* (1893).

JULIUS GOEBEL.

Novara, nō-vaa'raā: town; in the province of Novara, Italy (see map of Italy, ref. 2-B); about 30 miles W. of Milan, on a rising ground in the midst of the great fertile plain between the Sesia and the Po. The cathedral rivals St. Ambrogio of Milan in antiquity, having been founded A. D. 400. Charitable institutions of all sorts abound, and the provision for general education is liberal. Novara is the largest grain-market in Piedmont, and its manufactures are numerous and extensive. Among these are cotton and linen cloths, starch, candles, sausages, earthenware, hides, etc. Novara is of pre-Roman origin; its inhabitants were noted for their industry in the time of Pliny; and it has played a considerable part in the history of Northern Italy. Early in the twelfth century it was taken and burned by the emperor Henry V. In 1500 Ludovico il Moro was held a prisoner here; in 1513 it was the scene of a battle that ended in the expulsion of the French from Italy; in 1821 the constitutional troops were here defeated by the Austrians; and here again, in 1849, the Austrians triumphed over the Sardinian army. Pop. (1890) 19,577.

Nova Scotia [Lat., New Scotland]: originally Acadia; a province of the Dominion of Canada, consisting of the peninsula of Nova Scotia proper and the island of Cape Breton, which is separated from the mainland by the Gut of Canso. It lies between 43° 25' and 47° N. lat., and 59° 40' and 66° 25' W. lon. Its extreme length is 350 miles, and its breadth varies from 50 to 100. Total area, 20,907 sq. miles. The peninsula is joined to New Brunswick by an isthmus 13 miles wide, across which a ship-railway, joining the waters of the Bay of Fundy and Bay Verte, is (1894) in process of construction. The coast waters of Nova Scotia are the Gulf of St. Lawrence on the N., the Atlantic on the N. E., E., and S., and the Bay of Fundy on the W. (see map of Quebec, New Brunswick, and Nova Scotia).

Physical Features.—The province is intersected by chains of lofty hills, and is indented with deep bays and noble harbors all along its coast. On the southeastern or Atlantic side there are twelve, capable of affording shelter to the

largest ships, while every few miles along the shore are smaller harbors, easy of access, forming an admirable shelter for the hundreds of fishing-vessels which ply their calling for the greater part of the year. The shore is studded with small islands. The interior is covered with a network of lakes which find their outlet in numerous small rivers, most of which are navigable for small vessels for from 5 to 12 miles. The chief rivers are the Shubenacadia, Avon, Annapolis, Lahave, Musquodoboit, and St. Mary's. The surface is generally hilly, but the greatest elevation is only 2,100 feet.

Geology.—The more regular geological formations run, for the most part, parallel to the general trend of the Atlantic coast-line. The region forming the southern half of the peninsula of Nova Scotia lies on the Atlantic in the form of a curved wedge, whose apex is formed by Cape Canso, and its base by the narrow triple belt of Silurian, Triassic sedimentary, and Triassic igneous. This area is essentially Cambrian, broken in several districts by the irruption of vast masses of granite, and in many places well covered with drift from the more northerly formations; it is the location of the extensive series of gold-bearing rocks. The Bay of Fundy is warded off from this region by the narrow triple bulwark already mentioned, consisting of, first, a huge wall of massive Triassic trap about 120 miles long, containing very interesting minerals and forming the range called the North Mountains. Next come the narrow Triassic intervals at the foot of this range, drained by the Cornwallis and Annapolis rivers toward Minas basin, and covered by the waters of St. Mary's Bay toward the Atlantic. Lastly, a Silurian strip, with Devonian patches, lying against the parallel range of the South Mountain, coterminous with the Cambrian area.

The northern half of the peninsula and the contiguous island of Cape Breton, to the eastward, are principally occupied by Carboniferous and Permian strata, through which rises, in the W., the chain of the Cobequid Mountains, a mass of ancient igneous rock 100 miles long. This is flanked on the S. with narrow strips of Silurian, Devonian, Carboniferous, Triassic, and the waters of the Minas basin. Through the Carboniferous and Permian in the E. protrude in irregular patches of greater or lesser extent areas of old igneous, Cambrian, Silurian, Devonian, and, in the highlands of Cape Breton, pre-Cambrian rocks also. Within these regions, from the Silurian to the Carboniferous, are found great deposits of iron, limestone, marble, gypsum, coal, freestone, manganese, copper, etc. The coal-fields are extensive and of great value. There are besides vast deposits of bituminous shale rich in petroleum.

Climate.—The climate of Nova Scotia is remarkably temperate, being greatly affected by the ocean currents which surround it. The extremes of temperature are not so great as farther inland. Along the coast the mercury rarely falls to zero, but occasionally it falls 10° below; in summer it rarely reaches 90°. For Nova Scotia the mean temperature of summer is about 61°, of winter about 23°. The average mean annual temperature is about 42°; the average annual percentage of cloud, 60 per cent.; average precipitation of water (rain and snow) per annum, about 45 inches. Wintry weather lasts generally from December to March. The spring is usually backward, but vegetation is very rapid. From May to November the weather is very pleasant and healthful.

Agricultural Products.—The dike lands around the Bay of Fundy are admirably adapted to the production of hay. The interval lands all over the province are rich and productive. The upland is of varying degrees of fertility. Wheat, oats, rye, barley, buckwheat, and Indian corn, together with almost every variety of vegetables, are produced abundantly. Apples, pears, plums, cherries, and all the small fruits of temperate climates are largely cultivated. Away from the sea grapes ripen in the open air. Increased attention is given to the cultivation of fruit, the Government having established a school of horticulture at Wolfville, and considerable quantities are shipped to the English market. In 1891 the farm products included 165,806 bush. of wheat, 227,530 of barley, 1,559,842 of oats, 5,113,612 bush. of potatoes, 63,391 tons of hay, 1,051,592 bush. apples, 9,004,118 lb. of butter, 589,363 lb. of cheese, and 1,072,234 lb. of wool.

The forests of Nova Scotia are very valuable, although they have been greatly injured by fires. They consist chiefly of white and red pine, oak, tamarack, rock maple, hickory, elm, and walnut.

Divisions and Population.—The province (including Cape Breton) is divided into eighteen counties, with population in 1881 and 1891 as follows:

COUNTIES.	Ref.	Pop. 1881.	Pop. 1891.	COUNTY-TOWNS.	Pop. 1891.
Annapolis	2 A	20,508	19,350	Annapolis	
Antigonish	2 C	18,090	16,114	Antigonish	
Cape Breton	1 D	31,358	34,244	Sydney	2,427
Colechester	2 B	26,120	27,160	Truro	5,102
Cumberland	2 B	37,368	34,529	Amherst	3,781
Digby	2 A	19,881	19,897	Digby	2,000
Guysborough	2 C	17,808	17,195	Guysborough	
Halifax	3 B	67,917	71,358	Halifax	28,556
Hants	2 B	23,359	22,052	Windsor	2,838
Inverness	1 D	25,051	25,759	Port Hood	
King's	2 B	21,169	22,489	Kentville	1,686
Lunenburg	3 B	28,583	31,075	Lunenburg	4,044
Pictou	2 C	35,535	34,541	Pictou	2,998
Queen's	3 B	10,557	10,610	Liverpool	2,465
Richmond	2 D	15,141	14,399	Arsicat	
Shelburne	3 A	14,913	14,956	Shelburne	
Victoria	1 D	12,470	12,432	Baldie	
Yarmouth	3 A	21,284	22,216	Yarmouth	6,089
Totals		440,572	450,396		

* Reference for location of counties, see map of Province of Quebec, etc.

Principal Towns.—The chief towns are Halifax, the capital (pop. 38,556); Dartmouth (6,249); Truro (5,102); Yarmouth (6,089); Lunenburg (4,044); Spring Hill (4,813); Amherst (3,781); New Glasgow (3,776); Pictou (2,998); North Sydney (2,522); Windsor (2,838); and Liverpool (2,465). The eastern half of the province was settled almost wholly by Scotch, the center and west by English, Scotch, Irish, American loyalists, and a few Canadian French. The county of Lunenburg is almost wholly German. The Micmac Indians number 2,129.

Industries.—In addition to farming the chief industries of the province are fishing, lumbering, and mining. The fishery returns for 1891 show that during that year 14,065 vessels and boats, valued at \$1,416,048 and manned by 24,070 men, were engaged in the work. The catch was valued at \$7,011,300; comprising cod, \$2,464,982; mackerel, \$1,399,694; lobster, \$1,100,927; herring, \$621,722; all others, \$1,423,975. The products of the forest included 202,938 cubic feet of white pine timber, 3,082,940 cubic feet of other timber, and 5,195,498 pine and spruce logs. The principal mining industries are coal and gold. In 1893 there were mined 2,229,715 tons of coal, while the production of gold amounted to 18,849 oz.

Prior to the introduction of steel and iron, ship-building was very extensively carried on. A large number of vessels are still built, the number on the returns for 1892 being 2,740, with a tonnage of 425,870. Since 1880 the manufacturing industries have greatly increased. There are two large sugar-refineries and a cotton-factory at Halifax, a cotton-factory at Windsor, and a cotton-duck factory at Yarmouth, smelting-works and rolling-mills at Londonderry, large iron-works at Ferona, steel-works and glass-works at New Glasgow, and numerous smaller establishments, including woolen-mills, tanneries, foundries, shoe-factories, canning-factories, agricultural-implement works, gunpowder and dynamite works. A railway system connected with the great lines of the continent extends throughout the province.

Religion, Education, etc.—According to the census of 1891 there are in the province 122,452 Roman Catholics, 108,520 Presbyterians, 83,122 Baptists, 64,410 members of the Church of England, 54,152 Methodists, 5,882 Lutherans, and 3,112 Congregationalists. The Roman Catholics have two dioceses: the archbishopric of Halifax and the bishopric of Arichat. There is also a bishop of the Church of England, whose diocese extends to Prince Edward Island as well as Nova Scotia. Public schools are supported by a grant from the Government amounting to \$222,000, and by direct taxation of the municipalities. In 1893 there were 2,252 schools with 2,319 teachers and over 100,000 pupils. Each of the eighteen counties has an academy. There is a provincial normal school at Truro. There are also six colleges: Dalhousie College and University, at Halifax, which is non-denominational; King's College and University (Episcopal), at Windsor; Acadia College (Baptist), at Wolfville; St. Francis Xavier (Roman Catholic), at Antigonish; St. Ann's (Roman Catholic), in Digby County; and a Presbyterian Theological College, at Halifax. There is an institution for the blind and an institution for the deaf and dumb at Halifax. The province has an admirable system of public charity.

History and Government.—Nova Scotia was visited by the Cabots in 1497. It was first settled in 1604 by the French under de Monts. At that time Nova Scotia, New Brunswick, and a part of Maine were called Acadia. The settlement of Port Royal was attacked by the English colonists of Virginia under Sir Samuel Argall in 1614. They captured the place, and claimed the territory as belonging to England. For many years Acadia was a battle-field for the French and English. In 1621 James I. granted the whole peninsula to Sir William Alexander. It was then for the first time called Nova Scotia. A small Scotch settlement was formed opposite Port Royal, but it did not prosper. After many years of war Nova Scotia was finally ceded to Great Britain by the Treaty of Utrecht in 1713. In 1749 Halifax was settled by Lord Cornwallis. In 1755 the Acadians were expelled from King's and Annapolis Counties. The struggle now went on for the island of Cape Breton. It was ceded to Great Britain by the Treaty of Paris, 1763. Nova Scotia joined the Dominion of Canada in 1867. The Dominion pays an annual subsidy to the province for purposes of the provincial government. The province also enjoys a royalty on coal, gold, and other minerals. The local legislature consists of an upper house of twenty members, and a house of assembly of thirty-eight. The executive is composed of a lieutenant-governor appointed by the governor-general in council, and eight members, three with portfolios and five without.

AUTHORITIES.—See the histories by Haliburton, Murdoch, and Campbell; *Nova Scotia Archives*, compiled by Aikens; Dawson's *Acadian Geology*; and the public documents of Canada and Nova Scotia.

JOHN FORREST.

Novatian (Lat. *Novat'ianus*): a schismatic Roman bishop of the third century, sometimes called "the first antipope," founder of the rigorous Puritanic sect called Novatians. Perhaps he had been a Stoic philosopher. He was learned and eloquent, but of melancholy temperament; was baptized by sprinkling while on a sick-bed, and not confirmed, but notwithstanding this twofold irregularity soon after became a presbyter. In 251 he was persuaded by Novatus from Carthage to be made bishop in opposition to Cornelius, but was formally excommunicated the same year by the dominant party. He then set out to organize an opposition church, but according to Socrates (*Hist.*, iv., 28) suffered martyrdom in the reign of Valerian (253-260 A. D.). We have a letter of his to Cyprian, in the name of the presbyters and deacons of Rome (*Ep.*, xxxi.). He wrote also *De Cibis Judaicis* (about 250) and *De Trinitate* (about 256), a very valuable treatise. There is an excellent edition of his writings by Edward Welchman (Oxford, 1724), but the best is by John Jackson (London, 1728); those mentioned are translated in the *Ante-Nicene Fathers* (New York, vol. v., pp. 308-311, 611-650). The sect spread E. and W., and continued till after 450 A. D. Revised by S. M. JACKSON.

Novatianism: see NOVATIAN.

Novation [from Lat. *nova'tio*, liter., a making new, deriv. of *nova're*, renew, make new, deriv. of *novus*, new; cf. Eng. *new*]; in Roman law, the substitution of a new obligation (see OBLIGATION) for an old one, the old obligation being thereby extinguished. In the new obligation the parties may be the same as in the old, or there may be a new obligee or creditor, or there may be a new obligor or debtor. In the two latter cases (which come under the head of "delegation") novation was resorted to by the Romans because in principle (as at English common law) obligations were not capable of being transferred to new parties.

English Law.—The fact that novation, like other Roman contracts, was independent of "consideration" in the English sense (see CONSIDERATION) makes the Roman rules of novation largely inapplicable in English law. Novation without change of parties does not seem to be recognized at all; novation with change of parties is recognized in but one class of cases. Where, for example, "A owes B £100 and B owes C £100, and the three meet and it is agreed between them that A shall pay C the £100," it is said that "B's debt is extinguished, and C can recover that sum against A." (Bullen, J., in *Tallock vs. Harris*, 3 T. R. 174.) Such a transaction is strictly a double novation, since the new contract between A and C replaces and extinguishes two previous obligations, viz., that of A to B, and that of B to C. It comes easily within the English rules of consideration, because C's surrender of his claim against B is a sufficient consideration for his contract with A; B's surrender of his claim against A is a sufficient con-

sideration for the release which he receives from C; and A's release from B's claim is a sufficient consideration for his promise to C.

Both in the Roman and the English law the substitution of a new creditor by novation requires the consent of the debtor, and the new creditor sues on the new obligation—facts which in both systems distinguish novation from the cession of an obligation or assignment of a debt. Both at Roman law and at English common law a method was devised for ceding or assigning a claim without the consent of the debtor, and with the effect of enabling the new creditor (the cessionary or assignee) to sue on the old obligation. In both systems the method devised was the same—the assignee was made *procurator* or attorney of the old creditor, and sued in the old creditor's name. (See MANDATE and POWER OF ATTORNEY.) In modern European law, as in English equity and the modern legislation of Great Britain and the U. S., rights of action on contract are regularly assignable, and the assignee sues in his own name.

Modern Codes.—In most of the European and South American codes, and also in the codes of Louisiana, California, and North and South Dakota, the Roman rules of novation are restated with little change; but the importance of the doctrine is far less than in the older Roman law. In modern European law obligations are regarded as capable of transfer not only on the active side (to a new creditor), but also on the passive (to a new debtor); and although in the latter case the assent of the creditor is necessary, it is not assumed that a new obligation has been contracted between him and the new debtor. Novation between the same parties is regarded as possible, but an agreement to change the form or the substance of an obligation or its modalities (e. g. time or place of payment) is not assumed, in case of doubt, to imply the creation of a new obligation.

MUNROE SMITH.

No'va Zem'bla (in Russian, *Novaya Zemlya*, i. e. New Land) : two large islands separated by a very narrow strait, forming an enormous crescent in the Arctic Ocean and separating the Sea of Barents from Kara Sea, N. of North-eastern Russia and North-western Siberia; belonging to Russia. Area, 34,500 sq. miles. They are uninhabited, but are visited during the summer by whalers and hunters of bears and reindeer. The islands are very desolate, and have been explored by Baron Nordenskjöld.

Revised by M. W. HARRINGTON.

Novel [from O. Fr. *nouvelle*, *nouvelle* (> Fr. *nouvelle*) piece of news, liter., femin. of *novel* (whence Eng. *novel*, new, strange) < Lat. *novellus*, dimin. of *novus*, new]: in English, a fictitious prose narrative, which describes real life, past or present, the term romance being applied to narratives of a more or less fantastic character. The distinction is not always closely observed, and no history of the novel can be at all satisfactory without including frequent reference to romance; they are simply two kinds of prose fiction, one the work of realism, the other of idealism.

Early Forms of Fiction.—Fictitious narratives are found in many early and remote literatures. There are Chinese, Japanese, and Egyptian novels, and toward the close of the ancient Greek literature we find prose romances of a somewhat fantastic sort, which were imitated freely at the time of the revival of letters. In Roman literature the *Metamorphoses* or *Golden Ass* of Apuleius is the only survival of a form of story that was extremely common, and the *Satyricon* of Petronius gives us a satirical representation of the corruption of imperial Rome. It was not from these fragments, however, that the modern novel arose, but rather from other sources, one of which was the collections of short tales by unknown authors that appeared in Italy in the fourteenth century. The most important of these was called *Il Novellino*. It contained a number of stories already told a thousand times in prose or verse, familiar in rhymed *fabliaux*, or as historical or biographical anecdotes. They had accumulated from all sources—from the classics, from the East; they were the common property of the world. There were many collections of this sort, but they are all mere inchoate beginnings in comparison with the *Decameron* of Boccaccio (1353), a collection of 100 tales, also gathered from various sources, but told with such charm and grace of style that the book became the model for modern prose. Other Italian novelists followed in Boccaccio's footsteps, and their work spread, in translations, over the rest of Europe. It was the English play, rather than the novel, that was fed from this supply. More important sources of

the modern novel are to be found in Spain, a country which acquired power and influence as Italy lost them.

Spanish Romance.—In Spain it is possible to observe many instances of the never-ending conflict between idealism and realism. Nowhere has the division between these two ways of looking at the world been more sharply drawn. The romancers had the additional charm of looking at a world which had many of the qualities of fairyland. The most celebrated of these, the *AMADIS OF GAUL* (q. v.), forms the link that connects the mediæval romance with the modern novel. While it is a fantastic representation of the glory of chivalry it also contains much of the tendency to analytic reflexion which has become the main characteristic of later fiction, and it led directly to a host of imitators, from which the novel was laboriously developed. The origin of the *Amadis* is very obscure; its sources are to be found in Portugal, Spain, France, and England, and to this innate cosmopolitanism it owed perhaps a good part of its success, for it became popular throughout Europe. It was the work of various hands, and was probably first printed early in the sixteenth century. It was a literary representative of the popular taste, and was widely read in its many translations. In Spain it had many followers. In that country many mediæval forms still survived. The long conflict with the Moors had intensified the zeal for the Church as well as a love of warfare, and both these feelings found full expression in the romances which flourished until they were smiled away from out the world by *Don Quixote*. Their only rival in popular favor was the pastoral novel. The first and most important novel of this sort was Montemayor's *Diana*, which appeared about 1559. It owed much of its form to Sannazaro's *Arcadia* (1502), itself inspired by Boccaccio's *Ameto*. The *Diana* was widely translated and imitated. While it would be hard to devise any form of fiction that should be less like life, in time the pastoral secured a hold on reality by the habit which soon became common of describing real persons and incidents under the disguise of shepherds and shepherdesses and their doings. The novel lay hidden beneath those cumbersome trappings.

Spanish Novels.—The realistic novel had, however, a more definite pedigree in that alongside of these unreal works of fiction there grew up in Spain another and very dissimilar form which was destined to have a great vogue. This was the picaresque novel, a story describing real life. The name is derived from the Spanish *pícaro*, or scamp, who is always the hero of these novels. The first to appear was the *Lazarillo de Tormes*, in 1553. It was written by Hurtado de Mendoza, and at once attained great success abroad as well as at home. It was followed by other stories of the same sort by different authors. The most famous of these was *Guzmán de Alfarache*, by Mateo Aleman. While the extravagant romances gave expression to the most serious ideals of the Spaniards, these new picaresque novels indicated a reaction against their cloying impossibility. By the representation of evil deeds, of petty mischief, of ridiculous misadventure on the part of unmarred heroes of low birth, many being reminiscences of the mediæval tales, these novels became not merely formidable rivals, but severe criticisms of the romances which were already hastening to their end. The death-blow was given them, as was said above, by *Don Quixote* (1605-15).

French Romances.—Both the idealistic and the realistic novels made their way all over Europe, but it was in France, then acquiring the importance which Spain was losing, that their influence was greatest. It was the romance that found here a more congenial home than the picaresque novel, for it better suited the artificial society of the seventeenth century. D'Urfé's *Astrée* was the most famous of the pastoral novels, while there was a host of heroic novels of ponderous size and inflated incidents, such as La Calprenède's *Pharamond* (1647), Gomberville's *Polixandre* (1637), and Mlle. de Scudéry's *Clélie* (1660), with which the series closed. The heroic novels deserve to be mentioned with respect for the good they accomplished in expelling the pastoral stories from any possible authority over writers and readers. Their imposing formality, their fantastic artificiality, also served a good purpose in portraying models of decorum and honor for the civilization of a number of readers.

Realistic Novels in France.—While these were the accepted novels of the century, there ran alongside of them a counter-current of realistic fiction, bearing much analogy to the Spanish picaresque novel, from which it sprang. Barclay's *Euphormio* (1603) is the earliest; it was quickly followed by Sorel's *Francion* (1622), the first French novel

of manners. Sorel's *Berger extravagant* was a caricature of the extravagant pastorals. Scarron's *Roman comique* (1652) and Furetière's *Roman bourgeois* (1666) were realistic novels that really expressed not merely a literary but also a political reaction against accepted ideals. The long romances fell by their own weight, but they are always spoken of with respect; the realistic stories are, however, the ones that are read by posterity, and have had the most influence. Mme. de La Fayette's *Princess de Clèves* (1678), thanks to its brevity as well as to its delicate sentiment, still survives as a study of passion told with rare directness and simplicity. It marked the end of the long romances by showing how unnecessary was the painful accumulation of mere incidents. Le Sage's *Gil Blas* was the successful realistic novel, and its form shows how dependent was this school upon the Spanish picaresque story.

Beginnings of English Fiction.—In England the novel slowly acquired importance. John Lily's *Euphuës* (1579–80) was a didactic book in the form of a story. Sidney's *Arcadia* (1590) was the English representative of the pastoral, but the novels that were read for more than a century were for the most part translations of foreign masterpieces. The heroic romances of Spain and the picaresque novels were both extremely popular. These last inspired crude imitations in T. Nash's *Jack Willon* (1594), and in *The English Rogue* (1665–71). In their time the French heroic romances were also translated and admired, but they had more direct influence on the drama than on fiction.

English Novels.—The most important forerunners of the English novel were Swift's *Gulliver's Travels* (1726)—to speak only of modern times, fantastic voyages had already been written by French satirists—and De Foe's *Robinson Crusoe* (1719), as well as in his other stories now almost wholly overshadowed by that more famous book; but satire is never a lasting inspiration—as Rabelais had shown—and De Foe's masterpiece, though it had many imitators, founded no school. A more fruitful source was the *Spectator*, with its intelligent recognition of the great advance in power of the bourgeoisie, and with Addison's untiring efforts to civilize this class. When they had acquired power, the romances became the reading of the ignorant and of children. Just as the flourishing monarchies of Spain and France had produced an aristocratic romance, dealing with great people who were enveloped in a misty splendor, England, now free, began to portray its own social and political ideals in the modern novel. Citizens became the heroes in the place of grandees deposed, and they preferred reading something near their own experience rather than a mere dilution of fairy tales. It was France, however, with its longer literary training, that produced the first novels of this sort, though distinctly under the influence of English ideas; and Marivaux, who had already brought out a sort of French *Spectator* modeled on Addison's, had the honor if not of inspiring yet of preceding Richardson with his *Marianne* (1731–41), a novel bearing much resemblance to *Pamela* (1740). In both novels there is a heroine of humble birth who rises through a series of probable incidents to a position of comfort and security, of perfect respectability, the new ideal. If Marivaux was the first to do this, it was Richardson who won all the credit for it, and it was his greater seriousness that secured it for him. His influence lasted throughout the eighteenth century, and he was, if possible, more warmly admired on the Continent than in England. His *Pamela*, *Clarissa Harlowe* (1748), and *Sir Charles Grandison* (1753) all indicated the importance of the citizen as contrasted with the noble, and the strong moral influences that were then at work to prepare the citizen for his duties. In all his novels Richardson preached virtue, prosily it seems to us, but eloquently it seemed to many of his contemporaries. Fielding, however, agreed with modern readers, and was moved by his weariness of Richardson's inartistic praise of virtue to describing people as he saw them and not as moralists might wish them to be. His *Joseph Andrews* (1740) is almost a caricature of *Pamela*. It is easy to see in it, as elsewhere in Fielding's work, reminiscences of the Spanish picaresque novels; yet what in those books is meager, disjointed, and void of atmosphere, becomes in Fielding's stories a vast and animated picture of life. The influence of Cervantes is more important. Especially is this true of *Tom Jones* (1749), his greatest work. In the novels of Smollett we also distinguish the Spanish influence, as well as that of Le Sage.

In Sterne's *Tristram Shandy* (1759–67) there appeared a new spirit, a combination of humor and pathos, delicate

psychological study, and total disregard of incident. Sterne had read many French books and had learned the value of suggestion as a literary instrument, and both this book and his *Sentimental Journey* (1768) express the new cosmopolitanism of the last half of the eighteenth century. It is possible to see the influence of Cervantes in his humor; his sympathy with eccentric persons and with animals is a sign of a growing interest in objects hitherto ignored or derided, and this part of his work foretold, though dimly, the great change that was impending. He was also preparing for it by his iconoclastic denunciation of pedantry. In short, he was a disturbing writer. In Goldsmith's *Vicar of Wakefield* (1766), on the other hand, we find the graceful optimism, the exquisite form, of the best work of the century, and an apparent unconsciousness of the necessity and certainty of change.

Beginning of Modern Romantic Movement. The change in England had begun with a return, already perceptible in other arts, to an interest in the Middle Ages. Horace Walpole's *Castle of Otranto* (1765) introduced the gloomy cloisters, the knight-at-arms, the wind whistling about battlements, all the paraphernalia of romance. A number of novels followed in the same direction, for instance, Mrs. Radcliffe's *Mysteries of Udolpho* (1794).

Rousseau.—In France, meanwhile, Rousseau's *Nouvelle Héloïse* (1761) had opened a larger study of the world. The book was filled with a new love of nature; it dealt with novel social problems, breathing the spirit of democracy; its main characters had an infinite capacity for suffering; it contained most ardent descriptions of the familiar passion of love, and the whole impression made by the story was most noteworthy. We find in it many reminiscences of Richardson's *Clarissa Harlowe*, a strange ancestor for this new movement, and among its descendants is to be counted Goethe's *Werther* (1774). It was on the Continent that its influence was greatest. In England there was a reaction from the revolutionary spirit. In its place we find amusing pictures of life by Miss Burney and tales by Miss Jane Austen, and unimpeachable morality taught by Miss Edgeworth.

Scott.—It was Scott who gave the English novel worldwide importance. He expressed most vividly the patriotic and mediæval revival of his time; he brought back the past and he threw a new light on the present. He vivified history, he taught the love of nature, and delighted generations with his abundant invention. He made over not only the art of novel-writing, but that of writing history. In France we see his influence in Dumas and Victor Hugo, and in Germany the historical novel still survives, though without proving a dangerous rival to Scott's fame. While Scott inspired many followers, the new problems of the nineteenth century called many writers away to their discussion. Dickens studied social abuses and often hid direct practical teaching under a mask of raillery. Thackeray drew pictures of the new polite society, and his acute observations and gentle ridicule were mislabeled cynicism. Bulwer combined romanticism and the study of the present with more popularity than success.

George Sand.—In France George Sand employed the novel as a means of asserting the rights of women, just as in England Miss Brontë's *Jane Eyre* touched the subject. Balzac made a profound study, half romantic and half real, of the motley society he saw about him. A complete view of society brought into fiction, notably in the work of George Sand, a new class, the country people, whose virtues she set in sharp contrast with the vices of those who dwelt in cities. Auerbach did the same service for Germany in his *Village Tales*.

American Novelists.—J. F. Cooper in the U. S., inspired by Scott, had drawn romantic pictures of the red Indian. Hawthorne, with far more literary art and a subtler imagination, described New England life in the past and in the present, and also Italy in *The Marble Faun*. All his pages were lit by the last and, in the estimation of many, the most beautiful rays of romanticism, now approaching its end. Mrs. H. B. Stowe's *Uncle Tom's Cabin*, with its vivid drawing of the wrongs of slavery, is perhaps more noteworthy as a campaign document than as a work of art.

Realistic Movement.—Everywhere we find the novel something more than a mere piece of literature. It was continually employed, and not always consciously, to express the writer's emotions and interests, sometimes narrow or special in its aim. Again, as in George Eliot's hand, we find life criticised in its relation to the principles of mo-

rality. It is easy to observe the gradual change in the methods of novel-writing. The great wave of romanticism gradually spent its force after enriching the world with new sympathies and a larger vision. It was succeeded by a tendency toward realism. In England the two had long been combined, as in Scott, without antagonism. Balzac in France alternated between the two, but the movement toward an exacter study of life may be observed in him as well as in his contemporaries. Zola, the most important of living French novelists, has advocated realism with tireless energy, but he has not been able to escape the influences under which he was born, and although he has continually struggled to be a faithful disciple as well as preacher of realism, his work often contradicts his theories. When he is furthest from the literary theory which he detests, he is only too prone to substitute the study of repulsive details for an exact study of life, and it is in the representation of a great picture rather than in the faithful study of incidents that he is greatest. The movement toward realism, which owes much to the scientific advance of the present days, has also been greatly aided by the example of the eminent Russian novelists Turgeneff and Tolstói. The former aided the movement for the abolition of serfdom by his *Stories of a Sportsman*, which were followed by longer novels written with the utmost art. Tolstói seemed to abandon all the current theories of composition and to portray life unshaped, but crowded with event as we see it, never modeling itself into a rounded whole. In France Flaubert and de Maupassant rigidly confined themselves to the portrayal of exact truth, and the movement holds sway over the later novelists of the U. S., Italy, Spain, and Scandinavia. That this is but a temporary movement is obvious, for every art that grows changes, and already among the younger writers there is an effort to give greater sway to imagination.

THOMAS SERGEANT PERRY.

Novel'lo, VINCENT: musician; b. in London, England, Sept. 6, 1781; was of Italian descent; became organist of the Portuguese chapel at an early age; was one of the members of the Royal Society of Musicians and a founder of the Philharmonic Society; was a voluminous editor of old musical classics and composer of numerous pieces of considerable merit. D. at Nice, France, Aug. 9, 1861.—His daughter, CLARA ANASTASIA, born in London, June 15, 1818, a distinguished soprano singer and prima donna, married Count Gigliucci, an Italian nobleman, in 1843, and retired from the stage in 1860.—Another daughter is a distinguished Shakspearean scholar. See CLARKE, MARY COWDEN.

November [from Lat. *Novem ber*, *Novem bris* (sc. *mensis*, month), originally the ninth month of the Roman year, deriv. of *novem*, nine]: the eleventh month of the year, containing thirty days.

Nov'gorod: government of European Russia, bounded W. by the government of St. Petersburg, and comprising an area of 47,336 sq. miles. The ground is low, the surface mostly undulating, the soil not very rich, and the climate cold. Lakes and navigable rivers are numerous, and connected with each other by canals. Rye, barley, and oats are grown. Large forests and meadows are found, and timber and hay are the chief articles of export. Pop. (1890) 1,254,900.

Novgorod, called also **Novgorod Velikii** (the great): capital of the government of Novgorod, European Russia; on the Volkhov, near its issue from Lake Ilmen; 110 miles by rail S. E. of St. Petersburg (see map of Russia, ref. 6-D). It is an old town, and was in the fifteenth century the largest and most important town of Northern Europe. It was in 862 made the capital of the Russian monarchy, founded in that year by Rurik, on the thousandth anniversary of which event a magnificent monument was erected in the city, which otherwise is rather poorly built. It is now entirely dependent for its trade on St. Petersburg and Archangel'sk. Pop. (1890) 20,599.

Novikov', NIKOLAI IVANOVICH: writer; b. on his father's estate in the government of Moscow, Russia, Apr. 27, 1744. Although he was educated for the army, his literary tastes were so noticeable that the Empress Catherine II. had him transferred to the civil service, from which he retired in 1768. He was one of the earliest of Russian journalists. His first paper was a satirical one called *Truten* (The Drone, 1769-70). In 1772 he founded *Zhivopisets* (The Painter), which had a great success, and in 1777 he started a monthly review called *Utrenny Svel* (The Morning Light), and con-

tinued it for years under various names. He also leased for a decade and gave new life to the *Moskovskiya Vedomosti* (Moscow Gazette), previously a mere official sheet of the university. He reproached his fellow countrymen with their mania for everything foreign, and strove in every way to bring the best national things into honor, not only writing *An Attempt at a Dictionary of Russian Writers*, but publishing nineteen volumes of his *Drevnaia Rossiskaia Vv-tiofeka* (Old Russian Library), a collection of documents of historical value. He had become a Freemason, and in course of time devoted himself chiefly to philanthropic work, while his ideas showed an increasing tendency toward mysticism. His fame and influence grew apace, so that the Masons were for a time the fashion of the day, but he had numerous enemies, while the empress, who had originally supported him, became more and more suspicious. The French Revolution brought about a sharp reaction against everything that savored of liberalism. Severe measures were taken against the Masons, and Novikov was thrown into prison, from which he was not released until the accession of the Emperor Paul. D. July 31, 1818. See works on him by Longinov (1867), Neselenov (1875), and others. A. C. COOLIDGE.

No'vi Li'gure: town; in the province of Alessandria, Italy; on the northern slopes of the Apennines, at the head of a wide and fruitful plain (see map of Italy, ref. 3-C). It was formerly strongly fortified, having four gates with drawbridges. Novi contains a public library, museum, academies of literature and art, a valuable private picture-gallery, and silk-factories. It is said to have been destroyed by Attila; in 999 it is spoken of as *Corte Nova* or *Castro Novo*, and from that time till 1447, when it gave itself to Genoa, it maintained a semi-independence. This town gave its name to the battle of Aug. 15, 1799, between the French and Russians, in which the French general, Joubert, lost his life. Pop. about 10,000.

Nov'ius: a Latin writer of *fabulae Atellanæ* of about 100 B. C. Some forty-three titles of his plays are known, and the fragments (117 verses) are given by Ribbeck, *Frag. Comicorum Rom.*, pp. 254-272 (Leipzig, 1873). M. W.

Novorossisk: town of the Black Sea district, Russia; 30 miles S. E. of Anapa (see map of Russia, ref. 10-E). It is the port for Yekaterinodar, and terminus of a railway opened in 1888; also the port for the Stanitzka Iiskaia or petroleum district. Coal and ores of metals are found in the neighborhood. Pop. (1880) 2,000; (1890) 10,000. M. W. H.

Novo Tcherkask: town of Russia (founded in 1806); on the Don (see map of Russia, ref. 10-E). It is the capital of the province of the Don Cossacks; is finely built, has a large cathedral, and is the see of an archbishop. Its manufactures are extensive, and it carries on an active trade in cattle, grain, and wine. Pop. (1890) 38,476. E. A. G.

Novum Organum [Lat., liter., new instrument (or method)]: the name given by Francis Bacon to his great work treating of the proper mode of studying nature in order to extend the dominion of man over the inanimate world. Bacon's great aim was to recall the minds of men from what he deemed the vain and useless speculations of the ancient philosophers to the pursuit of the practical and useful. In order to present the different points of his subject in a manner at once comprehensive and striking, he has given them in the form of aphorisms. In the second aphorism of his first book he tells us that as the naked hand is often unable to perform its proper work without the aid of an instrument, so the human intellect, left to itself, is comparatively inefficient, and needs the help of instruments no less than the hand. To supply this need he composed his great work (published in 1620), comprising the ripe and rich results of a life of study. "In our judgment," says Macaulay, "Bacon's greatest performance is the first book of the *Novum Organum*. All the peculiarities of his extraordinary mind are found there in the highest perfection. Many of the aphorisms, but particularly those in which he gives examples of the influence of the *idola*, show a nicety of observation that has never been surpassed. Every part of the book blazes with wit, but with wit which is employed only to illustrate and decorate truth. No book ever made so great a revolution in the mode of thinking, overthrew so many prejudices, introduced so many new opinions. Yet no book was ever written in a less contentious spirit. . . . What we most admire is the vast capacity of that intellect which without effort takes in at once all the domains of science—all the past, the present, and the future, all the

errors of 2,000 years, all the encouraging signs of the passing times, all the bright hopes of the coming age." *Essay on Lord Bacon*, second part, where will be found many eloquent and admirable passages upon the philosophy of Bacon, though the remarks of the critic on the ancient philosophers, particularly Plato, are to be received with great allowance.

Nowell, INCREASE: colonist; b. in England about 1590; was chosen as assistant governor of Massachusetts Colony 1629, previous to its actual foundation; emigrated with Winthrop in 1630; was ruling elder of Wilson's church 1630-32; one of the founders of the church in Charlestown 1632; commissioner for military affairs on the occasion of the first Pequot war 1634, and secretary of the colony 1636-49. D. at Boston, Nov. 1, 1655.—His son SAMUEL, b. at Charlestown, Mass., Nov. 12, 1634; graduated at Harvard College 1653; became chaplain in Philip's war, and assistant treasurer 1680-86, and afterward treasurer of Harvard University. He was a staunch supporter of the old charter, and went to England in its behalf in 1688. He did not succeed, however, in accomplishing anything for his purpose, as he died in September, soon after his arrival in London.

Noyes, HENRY DRURY, A. M., M. D.: ophthalmologist; b. in New York city, Mar. 24, 1832; graduated M. D. from the New York College of Physicians and Surgeons in 1855; was elected Professor of Ophthalmology and Otolaryngology in Bellevue Hospital Medical College in 1864, a chair he still holds; was attending surgeon to Charity Hospital, New York, 1865-75; has been surgeon to New York Eye and Ear Infirmary since 1869, and is a member of many scientific societies. He is the author of *A Treatise on Diseases of the Eye* (New York, 1881); a *Text-book on Diseases of the Eye* (New York, 1890; 2d ed. 1894), and of numerous monographs published in medical journals. S. T. ARMSTRONG.

Noyes, JOHN HUMPHREY: religious leader; b. at Brattleboro, Vt., Sept. 6, 1811; graduated at Dartmouth College in 1830; studied law, but subsequently studied divinity at Andover and at New Haven, Conn., and was licensed to preach; founded in 1838 a community of Perfectionists near Putney, Vt.; removed in 1847 to Lenox, Madison co., N. Y., where he established the ONEIDA COMMUNITY (*q. v.*). Subsequently he established another branch at Wallingford, Conn. He was the author of various works sustaining his peculiar views. D. at Niagara Falls, N. Y., Apr. 13, 1886.

Nu (or **Nun**): an Egyptian deity, representing the primeval celestial ocean on which Ra, the sun-god, sails and whence he proceeded. He was called "the oldest of the gods," and was regarded as the father of Ra and of the gods in general, being the author of creation and the source of all things. The corresponding female principle was Nu-t or Nun-t (= Nile-water), and together they appear to have signified the male and female personification of the waters of the Nile inundations. C. R. G.

Nubia: a large region in Northeastern Africa, forming a part of the Egyptian possessions, but mostly under Mahdist control since 1882. It has never been a political entity, but it may be roughly described as bounded N. by Egypt, E. by the Red Sea, S. by Abyssinia, Senaar, and Kordofan, and W. by the Libyan Desert and the waste S. of it. Area about 350,000 sq. miles. Lying N. of the region of tropical rains, the country is excessively dry, and not unhealthful; agriculture and stock-raising, the main occupations of the people, are confined to the province of Taka, a few oases, and to a narrow fringe along the Nile. The most arid and desolate part of this region is the Nubian waste, in the northern part of Nubia, which would be impassable were it not for a few oases and wells. These verdant spots, scattered throughout the north, have made a number of important caravan routes practicable, and for centuries a large trade was carried on along these routes, until it was destroyed, for the most part, by the Mahdist revolt. The most productive region is the province of Taka, in the extreme south, which is well watered by streams from the Abyssinian highlands. The people are a mixture of Semitic, Hamitic, and Negro elements, speaking dialects of the Nuba language as well as Arabic, and fanatically Mohammedan in their religious faith; they number probably less than 1,000,000. C. C. ADAMS.

Nuble, nyoo'blā: an interior province of Chili; between Concepcion and the Argentine frontier; crossed by lat. 37° S. Area, 3,556 sq. miles. It lies partly on the steep slope of the Andes and partly in the plain called the Valley of Chili; the soil of the latter is very fertile, and this is one of the chief wheat-growing provinces. The mountain lands

yield excellent timber. Capital and largest city, Chillan. Pop. (1891) estimated, 157,349. HERBERT H. SMITH.

Nubti: a Hyksos King of Egypt, whose reign fell 400 years before the close of the reign of Ramses II., as is shown by a granite stele erected by the latter at Tanis. (See *Records of the Past*, ser. i., vol. v., p. 33 ff.; *Ägyptische Zeitschrift*, 1878, p. 89-106; 1879, p. 138-143; Birch, *Egypt*, p. 76; Wiedemann, *Ägypt. Geschichte*, p. 295.) This tablet was found by Mariette, copied, and reburied. Recent excavators have not succeeded in finding it again. If the Exodus of the Hebrews occurred under Meneptah, the successor of Ramses II., the record of this tablet, taken in connection with the biblical statement that the sojourn of Israel in Egypt lasted 430 years, would show that Joseph lived in the time of one of the early Hyksos kings. This "era of 400 years" is the only example of the kind in Egyptian history, and it appears to have been used in only one other instance, the reign of Bocchoris, the sole king of the twenty-fourth dynasty, who is said by George Syncellus, quoting Manetho, to have lived 990 years after Nubti. CHARLES R. GILLET.

Nucleobranchia'ta: a name applied by de Blainville to the group of molluses previously called by Lamarck HETEROPODA (*q. v.*).

Nucle'olus and **Nucleus**: See HISTOLOGY (*The Cells*).

Nucleus (of the earth): See GEOLOGY.

Nudibranchia'ta [Mod. Lat., liter., naked-gilled ones; Lat. *nudus*, naked + *branchia*, from Gr. *βράγχια*, gills]: a group of Opisthobranchiate molluscs in which the gills, when present, project freely into the water. A shell is always lacking in the adult, on which account these forms are commonly known as naked molluscs. See GASTEROPODA.

Nueva España (New Spain): See MEXICO.

Nuevo Leon, nōōs, vā-lōōn, or **New Leon**: state of Mexico; bounded N. E. and E. by Tamaulipas, S. W. by San Luis Potosí, and W. and N. by Coahuila; separated from the frontier of Texas only by a narrow portion of Tamaulipas. Area, 25,980 sq. miles. It is traversed from N. W. to S. E. by the eastern Sierra Madre; from one-third to one-fourth of the territory S. W. of the Sierra is included in the Mexican plateau, which here has an average elevation of about 6,000 feet; the northern and northeastern portions are in the tierra caliente, low rolling lands or plains falling toward the Rio Grande and varied with a few isolated mountains. The climate of the plateau and the slopes of the Sierra is mild and agreeable; some parts of the lowlands, however, are hot and unhealthful. Rains in good years are abundant, but they are very irregular, and droughts sometimes last for several years; these are especially felt on the plateau, where there is a lack of running water and springs. Much of the population is gathered along the northeastern slope of the Sierra, a well-watered, fertile, and very beautiful district. The principal occupation is agriculture; the most important crops are maize on the higher lands and sugar-cane on the lower ones. The mines are rather unimportant, though rich silver deposits were worked during the colonial period. Nuevo Leon was settled during the last years of the sixteenth century. Pop. (1893) estimated, 271,987. HERBERT H. SMITH.

Nuisance [from O. Fr. *noissance*, *nuissance* < Lat. *nocentia*, transgression, guilt, deriv. of *nocē're*, hurt, harm]: a rather indefinite legal term which may be said, however, to denote those acts or omissions which unlawfully disturb a person or the public in the enjoyment of property or the exercise of common rights. In the early English law nuisance (*nocumentum*) had in some respects a broader, and in others a narrower, signification than it bears at present. On the one hand, it was confined to annoyances to the enjoyment of a freehold; while now the possessor of any interest in land, and in some cases of movables, may complain of a nuisance. On the other hand, it was applied to any form of such annoyance. Bracton opens his discussion of the topic with this statement: "And it is to be known that of nuisances, one is tortious and hurtful, and another hurtful *damnum* and not tortious (*injuriousum*)." (3 *11* 1 *bus Anglia*, chs. xliii.-xlvi.) Now the term is limited to harm which is actionable, which produces legal injury as well as damage.

In some instances the same act may be treated by the injured party as a nuisance or as some other kind of tort. One who wrongfully floods his neighbor's land, or erects a building with eaves projecting over the adjoining premises, or allows a tree to grow so near his line that the branches

overhang another's property, thereby commits both a trespass and a nuisance. The same act or omission produces two wrongs. One is the interference with the possession, the other is the incommodity, the discomfort, the annoyance to the possessor. Again, a person who maintains an insecure structure which endangers his neighbor's property commits a nuisance, and is also chargeable with actionable negligence if injury ensues.

An act or omission which would constitute a nuisance at common law may be legalized, and thus cease to be actionable. It is not to be understood, however, that every statute which authorizes a person to do a particular thing or to carry on a particular business will protect him from liability where the thing is so done or the business so carried on as to constitute a common-law nuisance. As a rule it will relieve him from any public prosecution, but it will not bar a private action, unless it shows a clear intent on the part of the legislature to authorize the affair even though a nuisance should result. This is well illustrated by two decisions of the House of Lords. In one (*Metropolitan Asylum District vs. Hill*, 6 Appeal Cases 193; cf. *Morton vs. Mayor, etc., of New York*, 140 N. Y. 207) it was held that the statute in question empowered the district to build a smallpox hospital only in case this could be done without creating a nuisance. Its hospital turned out to be a nuisance to Hill, and the statute in no way affected his rights. In the other (*London Ry. Co. vs. Truman*, 11 Appeal Cases 45) it was held that the company received authority by statute to build its road and maintain a cattle-yard whether a nuisance was created or not. Hence the property-owners who suffered extreme discomfort by reason of the noises and odors of the cattle-yard were without redress. In the U. S. legislative power is limited by constitutional provisions, and a statute undertaking to legalize a nuisance may be unconstitutional as an attempt to authorize the taking of property without compensation. *Baltimore Ry. Co. vs. Fifth Baptist Church*, 108 U. S. 317.

Public Nuisance.—An act or omission which endangers the lives, safety, health, property, or comfort of the public, or by which the public are obstructed in the enjoyment of any common right, is a public nuisance. The obstruction of highways, disorderly houses, indecent performances in public, exhibiting or selling obscene articles, selling diseased food, the public exposure of persons having contagious diseases, the pollution of water used by the public, the manufacture, storage, or display of dangerous explosives to the peril of the public, the exercise of offensive trades in thickly settled neighborhoods or adjoining public thoroughfares are examples. There is considerable authority for the statement that a purpresture or encroachment upon public property does not amount to a nuisance unless it subjects the public to some degree of inconvenience. The tendency of modern decisions, however, is to treat every unlegalized purpresture as a nuisance *per se*. Persons responsible for a public nuisance may be proceeded against, at common law and under modern statutes, by indictment for a misdemeanor. Upon conviction the court may subject them to fine and imprisonment, and, if the nuisance still continues, may order its abatement. It may be abated also without indictment in a suit by the proper officer in behalf of the crown or people, but a mob has no right to act for the public in abating it. Nor does abatement extend to the destruction of property which does not of itself constitute the nuisance, but is merely accessory to it. *Brightman vs. Inhabitants of Bristol*, 65 Maine 426.

Whether a public nuisance will sustain a private action, either for damages or abatement, depends upon the harm it inflicts upon the individual complaining. If it is a disturbance of all persons alike in the enjoyment of common rights, the injury of any individual is said "to be merged in the common nuisance and injury to all citizens, and the right is to be vindicated and the wrong punished by a public prosecution, and not by a multiplicity of separate actions in favor of private persons." Where the public nuisance, however, produces particular damage to an individual beyond that which he suffers in common with his fellows, he may bring a private action. Accordingly, one whose residence is rendered unfit for comfortable or respectable occupation by an adjoining house of prostitution can maintain an action against those responsible for the nuisance. *Crawford vs. Tyrell*, 128 N. Y. 341.

Private Nuisance.—This "affects only one person or a determinate number of persons, and is the ground of civil proceedings only." It is no defense to an action for a nuisance

that it benefits more persons than it harms. A street-railway may improve greatly its passenger service by substituting steam motors for horses; but unless the change is authorized by legislation, and in the U. S. compensation is made to abutting land-owners for the interference with their easements of access, of light, and of air, the benefit conferred on its many patrons will be no answer to a suit by one whose premises are injured and made uncomfortable by the noise, the vibrations, the cinders, the smoke, and the dust resulting from the new appliances. (*Hassner vs. Brooklyn City Ry.*, 114 N. Y. 443.) Nor can the defendant relieve himself from liability by showing that he has exercised the utmost care to save the plaintiff from harm. The essence of the wrong we are now considering is the unlawful incommodity to the plaintiff, not the negligence nor the bad motive of the defendant. A man "may not, under color of enjoying his own, set up a nuisance which deprives another of the enjoyment of his property." (See *Hauck vs. Tide Water Pipe Line Co.*, 153 Penn. 366.) It is no justification for a nuisance that the defendant has maintained it for many years without complaint; nor that he was careful to establish it in a suitable place, distant from habitations; nor that the plaintiff bought and took possession of his property with knowledge of the nuisance. If it were, a person might prevent the growth of a town, or the proper development of a locality, by establishing a useful but offensive business, such as burning lime, smelting copper, manufacturing gas, or slaughtering animals. Any place where an operation is carried on, so that it does actionable injury to another, is not, in the meaning of the law, a suitable place. *St. Helens Smelting Co. vs. Tipping*, 11 House of Lords Cases 642.

However, the place where an alleged nuisance is maintained is often a circumstance of importance in determining whether the plaintiff has sustained actionable injury. A man who chooses to reside in a city must endure the noises and discomforts which are incident to the locality. He has no right to complain if his neighbor blasts rock, or erects an iron building to his temporary annoyance. (*Booth vs. Railway*, 140 N. Y. 267.) So a man having an estate under which there are veins of valuable minerals "must take the gift with the consequences and concomitants of the mineral wealth in which he is a participator." Were persons so circumstanced allowed to stand on their extreme rights, the business of the whole country would be seriously hampered.

The courts have found it impossible to define the amount or the exact character of the annoyance or inconvenience which will constitute a nuisance. It is settled, however, that the state of things complained of need not be actually injurious to health. If it seriously interferes with the rational enjoyment or reasonable comfort of the plaintiff's premises it is enough. On the other hand, where damage to property is complained of, it must be "such as can be shown by a plain witness to a plain jurymen." It must be substantial and actual, not contingent or remote or sentimental. In a leading English case Lord Justice James illustrated this doctrine in the following manner: "It would have been wrong, as it seems to me, for this court in the reign of Henry VI. to have interfered with the further use of sea-coal in London because it had been ascertained to their satisfaction that by the reign of Queen Victoria both white and red roses would have ceased to bloom in the Temple Gardens. If some picturesque haven opens its arms to invite the commerce of the world, it is not for this court to forbid the embrace, although the fruit of it should be the sights and sounds and smells of a common seaport and ship-building town, which would drive the drayds and their masters from their ancient solitudes." (*Salvin vs. North Brancepeth Coal Co.*, Law Reports, 9 Chancery Appeals 705.) When the nuisance is alleged to consist in defendant's use of his property to the inconvenience and discomfort of the plaintiff, the latter must show that the noises, the odors, the sights, or other annoyances complained of rendered his premises uncomfortable to ordinary persons. If one's right to use his property were to depend upon the effect of the use upon a person of peculiar temperament or disposition, or upon one suffering from disease, the standard for measuring it would be so uncertain and fluctuating as to paralyze industrial enterprises. *Rogers vs. Elliott*, 146 Mass. 349.

Parties Liable.—The person who creates a nuisance is answerable therefor, and the owner and occupant of land upon which it exists is also liable, as a rule, where he has the legal right and is under a legal duty to keep the premises in proper condition. Where a municipal corporation unlawfully authorizes an individual to commit a nuisance it is

liable for all resulting damages. *Cohen vs. Mayor, etc., of New York*, 113 N. Y. 532.

Remedies.—These are abatement, damages, and injunction. The victim of a nuisance may abate it, without instituting a legal proceeding; but where he thus takes the law into his own hands, even in defense of person or property, he acts at his peril. He must be prepared to show that the thing abated was a nuisance, and that he did no unnecessary damage in abating it. (*People vs. Board of Health*, 140 N. Y. 1.) In an action for damages the plaintiff may recover nominal, actual, or exemplary damages, according to the facts. (See DAMAGES, MEASURE OF.) "The most efficient and flexible remedy is that of injunction. Under this form the court can prevent that from being done which if done would cause a nuisance; it can command the destruction of buildings or the cessation of works; and its orders may be either absolute or conditional upon the fulfillment by either or both of the parties of such undertakings as appear just in the particular case." See INJUNCTION; also Pollock's *Law of Torts*, and Wood's *Law of Nuisances*.

FRANCIS M. BURDICK.

Nukha: a walled town of Asiatic Russia, government of Trans-Caucasia; at the foot of the Caucasian Alps (see map of Russia, ref. 12-G). The inhabitants, consisting mostly of Persians, Tartars, and Armenians, with very few Russians, are engaged in breeding silkworms. The vicinity is one garden of mulberry-trees. Pop. (1892) 25,894.

Nullification [from Lat. *nullificatio*, contempt, liter., making void, deriv. of *nullificare*, despise, liter., make void or as nothing; *nullus*, none + *facere*, make. For meaning cf. Eng. *null*]; the act of making null, void, or invalid. The word has acquired a special meaning in the political history of the U. S., as signifying what has been claimed to be the right of one or more of the States in the American Union to declare a law passed by the national Congress unconstitutional, and to refuse to be bound by such an act. This claim, of course, implies the right of each individual State to interpret the Federal Constitution for itself, and thus to impose a check upon the law-making power of the general Government. According to this doctrine, a State which nullified a law of Congress was entitled to all its former privileges, though refusing obedience to the law in question. If, in case of such nullification, the President should attempt to enforce the authority of Congress, the enforcement would be an unconstitutional act, and the State would have the right to retire from the Union.

History of the Doctrine.—Soon after the adoption of the Constitution numerous questions arose involving the relations of the Federal Government to the individual States. During the administration of President John Adams there was so much opposition in some parts of the country to the alien and sedition laws that the people in several of the States boldly took the ground that the U. S. Government had no constitutional right to pass and enforce a law that was manifestly antagonistic to the interests of any individual State. This opinion took the most formal and prominent expression in the Kentucky resolutions of 1798 and the Virginia resolutions of 1799. In the Kentucky resolutions, which were written by Thomas Jefferson, it was held that the Government was a compact between States, and that in this compact the Government "was not made the exclusive or final judge of the extent of the powers delegated to itself, and that, as in all other cases of compact among powers having no common judge, each party has an equal right to judge for itself, as well of infractions, as of the mode and measure of redress." Though the people who adopted these resolutions never went further than the expression of a political opinion, the resolutions are entitled to the distinction of having definitely formulated the doctrine of nullification. At the HARTFORD CONVENTION (*q. v.*) also free expression was given to opinions of a similar nature in regard to the attitude of Congress toward the New England States. The most striking example illustrative of the doctrine was shown by some of the Southern States nearly twenty years later. The occasion was the passage of the tariff law of 1828, and the attitude of Congress toward the Territories in the Northwest. The people of South Carolina deemed the action of Congress oppressive to the Southern States, and accordingly advanced again the theory that the law might be made void by State action. The question was discussed in one of the most memorable debates in the history of Congress by Senator Hayne, of South Carolina, on the one side, and by Daniel Webster, of Massachusetts, on the other. In Web-

ster's celebrated reply to Hayne, delivered Jan. 26, 1830, the views in opposition to the right of nullification were put with such cogency and eloquence that the people of the North, especially of the Whig party, were convinced that the doctrine could not be maintained on any constitutional grounds. The people in the South, however, were by no means convinced. Accordingly, in Nov., 1832, soon after Gen. Jackson's second election to the presidency, a convention was summoned to meet at the capital of South Carolina to consider the question still at issue. The convention drew up and unanimously passed an "ordinance of nullification," which embodied the views on State sovereignty held by Calhoun. (See CALHOUN, JOHN C.) The tariff law just enacted was pronounced "null and void, and no law, nor binding on this State, its officers, or citizens." The ordinance also declared that no appeal to the Supreme Court of the U. S. should be permitted; that any appeal from the decision of a court of the State upholding this ordinance should be treated as contempt; that all officers and jurors were required to obey the ordinance; that all legislative acts to enforce its provisions should be obeyed; and that any measures of force adopted by the general Government for the purpose of levying duties on the foreign commerce of South Carolina would justify the State in regarding itself no longer a member of the Union. Fortunately for the country at the time of this action Gen. Jackson was President. His vast popularity in the South, as well as in the North, gave to his authority great advantages, and he did not hesitate to act with characteristic decision and promptness. He ordered the collector of customs to make use of the revenue cutters and any other vessels that might be available for the purpose of seizing all cargoes liable to pay duties. On the meeting of Congress in Dec., 1832, the President's annual message declared that it was his intention to treat all armed resistance as treason against the U. S. This remarkable paper, written by Edward Livingston, the Secretary of State, not only set forth the constitutional objections to nullification with great power, but it also showed clearly that the Government would be desperately in earnest in the enforcement of its authority. This utterance and the special message addressed to Congress in Jan., 1833, very generally commended themselves to all except the special advocates of nullification. The so-called Clay compromise of 1833 propitiated South Carolina so that the ordinance of nullification was abandoned.

It would not be correct to suppose that the spirit of nullification has been confined to South Carolina, or indeed to the Southern States. In 1820 Ohio passed resolutions approving the Kentucky and Virginia resolutions of 1798-99. Alabama in 1828 entered a formal protest against the validity of the tariff of that year, and in 1831 prohibited the establishment of a U. S. bank in that State. In the same year the Legislature of Maine (Mar. 28) passed a resolution declaring that the U. S. Government in fixing the boundary by treaty with Great Britain between Maine and Canada had exceeded its constitutional powers, and had encroached upon the rights of the State of Maine. The Legislature asserted that the Government of the U. S. had violated the Constitution of the U. S., and "impaired the sovereign rights and powers of the State of Maine," and that "the State of Maine is not bound under the Constitution to submit to the decision which is, or shall be, made under that convention." It further resolved that no decision of any umpire provided by the treaty would have any force "unless the State adopt and sanction the decision." A still more striking case, involving also the question of boundary-line, occurred in Wisconsin. By the Ordinance of 1787 organizing the Northwest Territory the line between Ohio, Indiana, and Illinois, and the territory on the N. was determined as "an east and west line drawn through the southern bend or extreme of Lake Michigan." When the three Southern States, however, were organized their northern line was fixed so as to include a very considerable strip of land N. of the boundary designated by the Ordinance. Michigan at a later period claimed all the territory to which she was originally entitled, and the so-called Toledo war might have become serious had not Congress satisfied the claim by granting to the new State the upper peninsula as a compensation; but the claim of Wisconsin could not be so easily disposed of. According to the line established by the Ordinance, Chicago, Rockford, Galena, and other important towns of Northern Illinois, besides 8,500 sq. miles of the best of farming land, would belong to Wisconsin. From 1838 to 1846 the inhabitants of the territory in dispute

strongly desired to be a part of Wisconsin instead of Illinois, chiefly, no doubt, on account of the State debt of Illinois incurred for internal improvements. The claim of the people rested on the fact that the Ordinance was a compact which could only be annulled "by the consent of all parties," and therefore was superior to the Constitution and the acts of Congress in its binding force. In 1843 an address to Congress was prepared, in which the people declared that if their request was not granted, the people of Wisconsin, "relying on their own resources, and looking to Him who aids the injured for protection, would seek in themselves for that measure of redress which their own right arm can bring them." This belligerent tone, however, was ineffectual. A majority of the people were too indifferent to the subject to venture upon active hostilities, and finally the Supreme Court of the U. S., in *Strader vs. Graham* (3 H. 589), declared that the Ordinance of 1787 "was superseded by the adoption of the Constitution of the U. S.," and that the six articles forming the compact of the Ordinance "are not superior and paramount to the Constitution." Thus the claim fell to the ground.

In the same State a conflict of authority grew out of the arrest and detention of a fugitive slave in 1854. The U. S. deputy marshal had seized a fugitive slave by the name of Glover under authority of the Fugitive Slave Law. A local judge issued a writ of *habeas corpus*, but as this was not respected by the U. S. authorities, Glover was rescued by a mob incited and led on by an editor named Booth. Booth was arrested for aiding in the escape of a fugitive slave, and at once made application to A. D. Smith, a justice of the Supreme Court of Wisconsin, for a writ of *habeas corpus*, on the ground that he was detained under an unconstitutional act of Congress. The justice, after prolonged arguments, discharged Booth, holding the Fugitive Slave Law unconstitutional. In the decision it was held that "the State will never consent that a slave-owner, his agent, or an officer of the U. S., armed with process to arrest a fugitive slave from service, is clothed with entire immunity from State authority." Booth was then arrested, convicted, and sentenced by U. S. authority. The State Supreme Court issued a writ of *habeas corpus*; but the action was overruled by the Supreme Court of the U. S., and Booth was remanded to serve out his term. This very interesting instance of conflict of authority will be found fully discussed in 1 Wis. Reports 1-218; 11 Wis. 517; 21 Howard 506-526; and in Hare's *Am. Constitutional Law*, 1202.

The several instances given are enough to show that there was throughout the country a more or less prevalent belief that a State had the supreme constitutional right of ultimate decision in case of an alleged infraction of the Constitution by the Government of the U. S. The attempt of the several Southern States in 1861 to secede was founded upon the assumed right of nullification, and it was not till the close of a terrible war that the question was authoritatively and finally settled.

Authorities.—Hampden, *The Genuine Book of Nullification* (Charleston, 1831) contains a large list of references to cases where the authority of the general Government has been either defied or disputed. The question of constitutional right, however, will be found most satisfactorily treated in the *Debates in Congress*, especially in the *Speeches* of Webster, Calhoun, and Hayne. See also Greeley, *American Conflict*; Stephen, *War between the States*; Lincoln, *Speeches and Messages*; Nicolay and Hay, *Life of Lincoln*; *Histories of the Civil War*, by Davis, Draper, Pollard, and others; also Thwaites, *Boundaries of Wisconsin*; Sanford, *State Sovereignty in Wisconsin*. C. K. ADAMS.

Numan'tia: an ancient city of Spain; the capital of the Celtiberian Arevaci; situated on the Douro, near the present Soria in Old Castile. It became very celebrated on account of the heroic valor with which it defended its independence against the Romans. Of its population, 8,000 men were capable of bearing arms, and with this force it fought successfully against Quintus Fulvius Nobilior in 153 B. C., Quintus Cæcilius Metellus in 143, Quintus Pompeius in 141, Marcus Popilius Lanas in 139, and Cneius Hostilius Mancinus in 137; but in 134 Publius Cornelius Scipio the Younger received the command. With an army of 60,000 men he laid siege to Numantia, and inclosed it completely. His propositions of surrender were rejected, and the siege continued for fifteen months. When Scipio entered the city he found no one to oppose him. Those whom plague and famine and the arrows of the besiegers had spared had

fallen upon their own swords. He felt that he himself had been utterly defeated, and in his fury he leveled the vacant houses with the ground.

Nu'ma Pompi'lius: in the mythical history of Rome, the successor of Romulus. His reign, which is said to have lasted from 715 to 672 B. C., was regarded by the Romans as a sort of golden age of peace and prosperity. All the ecclesiastical institutions which formed the basis of the religious ceremonial of the Romans were ascribed to him, and he is also said to have improved the social and political institutions of Rome.

Number [from O. Fr. *nombre* < Lat. *nu'merus*, number]: abstractly considered, the measure of the relation between quantities of the same kind; in this sense it is identical with the term *ratio* or *quotient*. Technically considered, it is a single thing, or a collection of things of the same kind; it is in this sense that the term is generally employed in mathematics. By an extension of meaning always permissible in the use of mathematical terms, the term *number* is made to include 0, ∞ , and also all *surds*; we shall use the term in this extended signification in the following article. For methods of writing numbers, see **NOTATION**.

Classes of Numbers.—Numbers are divided into classes in many different ways, according to their different properties. The names of some of these classes are given below, with a brief statement of their peculiar properties.

(1) **Odd and Even Numbers.**—The series of integers, 0, 1, 2, 3, 4, etc., called the series of *natural numbers*, is subdivided into two series—the series of *odd numbers*, 1, 3, 5, 7, etc., none of which is exactly divisible by 2, and the series of *even numbers*, 0, 2, 4, 6, etc., each of which is exactly divisible by 2. The following are some of the properties of these two classes of numbers: 1, the sum or the difference of any two even numbers, or of any two odd numbers, is always an even number; 2, the sum of any number of even numbers, or the sum of an even number of odd numbers, is an even number, but the sum of an odd number of odd numbers is an odd number; 3, the product of any number of even numbers is an even number, and the product of any number of odd numbers is an odd number; 4, all the integral powers of even numbers are even numbers, and all the integral powers of odd numbers are odd numbers, and consequently the difference between any power of an odd number and the number itself is an even number.

(2) **Prime and Composite Numbers.**—A *prime* number is one that can not be exactly divided by any other number except 1; all numbers that are not prime are said to be *composite*—that is, composed of two or more factors; thus 2, 3, 5, 7, etc., are prime numbers; 4, 6, 9, etc., are composite numbers. See **PRIME NUMBERS**.

(3) **Figurate Numbers.**—Figurate numbers are those which can be derived from the general form

$$\frac{n(n+1)(n+2) \dots (n+m)}{1 \cdot 2 \cdot 3 \dots (m+1)}$$

by making particular suppositions on the arbitrary integers m and n . If we assume m equal to any whole number, and then make $n = 1, 2, 3$, etc., we shall have one series of figurate numbers; by giving to m every value from 0 up, we obtain in succession an infinite number of figurate series. See **FIGURATE NUMBERS**.

(3) **Polygonal and Pyramidal Numbers.**—These numbers are so named because they express the different numbers of equal spherical balls that can be symmetrically arranged so as to form certain polygonal and pyramidal figures. The polygonal numbers are formed by taking the successive sums of the terms of an arithmetical progression whose first term is 1; if the common difference is 1, we have triangular numbers; if the common difference is 2, we have square numbers; if the common difference is 3, we have pentagonal numbers; and, in general, if the common difference is $m-2$, we have m -gonal numbers. Thus,

- { *Arithmetical series*, 1, 2, 3, 4, 5, 6, 7, etc.;
- { *Triangular numbers*, 1, 3, 6, 10, 15, 21, 28, etc.
- { *Arithmetical series*, 1, 3, 5, 7, 9, 11, etc.;
- { *Square numbers*, 1, 4, 9, 16, 25, 36, etc.
- { *Arithmetical series*, 1, 4, 7, 10, 13, 16, etc.;
- { *Pentagonal numbers*, 1, 5, 12, 22, 35, 51, etc.

Pyramidal numbers are derived from polygonal numbers according to the same law. Thus,

- { *Square numbers*, 1, 4, 9, 16, 25, etc.;
- { *Square pyramids*, 1, 5, 14, 30, 55, etc.

Here each number of the second line is formed by adding the corresponding number of the first line. The last line of numbers gives the number of equal spherical balls that can be piled in different pyramids having square bases. It is a general principle that any whole number is equal to the sum of 1, 2, or 3 triangular numbers, or to the sum of 1, 2, 3, or 4 square numbers, or to the sum of 1, 2, 3, 4, or 5 pentagonal numbers, etc. Thus the number 23 is equal to $21 + 1 + 1$, or to $9 + 9 + 4 + 1$, or to $22 + 1$, etc.

(4) *Redundant, Defective, and Perfect Numbers.*—If the sum of all the divisors of a number (except itself) is greater than the number, it is said to be *redundant*; thus 12 is a redundant number, because $1 + 2 + 3 + 4 + 6 = 12$. If this sum is less than the number, it is said to be *defective*; thus 10 is a defective number, because $1 + 2 + 5 < 10$. If this sum is just equal to the number, it is said to be *perfect*; thus 6 is a perfect number, because $1 + 2 + 3 = 6$. If $(2^n - 1)$ is a prime number, then is $2^{n-1}(2^n - 1)$ a perfect number; thus $2^1 - 1$, or 1, or 127, is prime, and $2^6(2^7 - 1)$, or 8128, is a perfect number.

(5) *Amicable Numbers.*—Two numbers are said to be amicable when each is equal to the sum of all the divisors of the other. Thus 284 and 220 are amicable numbers, as are 17296 and 18416, and also 9363583 and 9437056.

(6) *Bernoulli's Numbers.*—These are the coefficients of the different powers of x in the series obtained by developing the expression $x(e^x - 1)^{-1}$. These numbers are used in the higher branches of applied mathematics, and for this reason they have been computed and tabulated. The general forms of Bernoulli's numbers may be found in the larger French books on the calculus. For a complete discussion of the theory of numbers the reader is referred to Gauss's *Disquisitiones Arithmetice*, Dirichlet's *Zahlentheorie*, or to Legendre's *Essai sur la Théorie des Nombres*.

Revised by S. NEWCOMB.

Numbers, Book of: the fourth book of the Pentateuch, so called because it contains an account of the second census of the Hebrews, made at Sinai in the second month of the second year of the Exodus (ch. i.); it also contains (ch. xxvi.) an account of a third census, thirty-eight years later. Its contents treat largely of the history of the tribes in the journey through the wilderness, and in it are also portions of the Mosaic Law. See HEXATEUCH and PENTATEUCH.

Numerals, or Figures [*numerals* is from Lat. *numeralis*, pertaining to numbers, deriv. of *numerus*, number]; the characters by means of which numbers are expressed. See NOTATION.

Numerator: See FRACTIONS.

Numid'ia: that part of the northern coast of Africa which extended between Mauritania in the W. and *Africa Propria*, the ancient territory of Carthage, in the E., corresponding nearly to the modern Algeria. It was inhabited by the same race of people as Mauritania, the Moors, the ancestors of the modern Berbers, and it was divided between many different tribes. By the help of the Romans, as a reward for his support in the wars against Carthage, Massinissa succeeded in uniting the tribes and establishing an empire, several of whose rulers became famous in Roman history, as for instance Jugurtha and Juba. In 46 B. C. Numidia was made a Roman province, and the Romans formed several colonies here, of which Hippo Regius was the most noticeable.

Numid'idæ [Mod. Lat., named from *Nu'mida*, the typical genus, from Lat. *Nu'mida*, a Numidian]: a family of gallinaceous birds typified by the well-known GUINEA-POWLS (*g. v.*). The general form is familiar to all, and in this respect all the species of the family agree, the body being squat, with the head small and the neck comparatively long, but not as much so as in the turkeys; the head is always more or less wattled and naked; the bill moderate; the nostrils large, oval, and partly covered by a membrane; the tarsi moderately long; the hind-toe a little elevated; the tail depressed or bent downward. The family is sustained, according to Prof. Huxley, by a number of osteological characters. It differs from all others by the absence in its representatives "of any backward process of the second metacarpal, and in the obtuseness and somewhat outward inclination of the costal processes. The acromial process of the scapula is also singularly recurved." In most other respects, however, it agrees essentially with the *Meleagridæ* and *Phasianidæ*, having the same kind of sternum, skull, etc., but slightly modified. The family is peculiar to Africa. The

species are chiefly found in the woodlands, and especially along the margins of rivers, and congregate in flocks of 200 and 300 individuals, scattering along in search of food, which consists of insects as well as small grains. The eggs are numerous and are laid in a rude nest, generally concealed in the bush. The dozen or so species are contained in three genera: (1) *Numida*, including the common guinea-fowl (*Numida meleagris*); (2) *Agelastes*, with one species; and (3) *Phasidus*, also with one species. These nearly average in size the domestic species.

Revised by F. A. LUCAS.

Numismatics [from Lat. *numis'ma*, coin (by analogy of *num'mus*, coin), from Gr. *νόμισμα*, something sanctioned by usage, especially a coin, deriv. of *νομίζω*, own as a custom, deriv. of *νόμος*, custom, law]: the study of coins and, with these, of medals; though properly only of those struck in a die, excluding those cast. (See MEDAL and MEDALLION.) It has been usual to divide coins for purposes of study (omitting minor details) into three grand classes: (1) *Ancient*, from their earliest existence in the seventh century B. C. to the deposition of Romulus Augustulus (A. D. 476); (2) *Medieval*, from this period to the beginning of the sixteenth century; (3) *Modern*, from about 1500 to the present time.

The *ancient* coins are classed under (1) Greek, (2) Roman, (3) Græco-Oriental, or Byzantine, under each of which it is customary (following the arbitrary arrangement proposed by Eckhel of Vienna) to take the countries in their order from W. to E., the cities of each country being placed alphabetically. Of the three, the Greek are unquestionably the most important. Heads and full-length representatives of divinities and legendary persons are found on these; sometimes, too, celebrated games—e. g. those of Olympia—are commemorated, as in the chariot-race types of Syracuse; or well-known myths, as that of the Labyrinth, on coins of Cnossus in Crete. Maritime states are often denoted by dolphins and other fish; rivers, like the Achelous, by bulls with human heads. The materials of the coins are gold, silver, bronze, electrum, an alloy (sometimes natural) of silver with gold, or potin or billon, bronze or copper washed with silver. It is supposed that the metal was first formed in roundish lumps and then struck cold, but no ancient die is known to exist in any museum; the materials, however, for coining, the hammer, the anvil, and the tongs, may be seen on a denarius of the Roman family Carisia. Inscriptions on Greek coins are generally in the genitive, on Roman and Oriental in the nominative, the word *νόμισμα* (coin) being in the first case understood. The finest period of Greek art lasts from 460 to 390 B. C., and is nearly coincident with the best period of sculpture; and, as a rule, the colonial coins of Italy and Sicily rival those of Greece proper in beauty, and are even more varied and rich. In one instance, that of Athens, the coins remain to the last rude and ugly, perhaps owing to their great commercial importance, the peoples of the Mediterranean objecting to any change of type. In weight, Greek coins are generally very accurate, but different countries and towns preferred the different standards of the Phœnician, Aginææ, or Attic talent. Thirteen multiples or submultiples of the Athenian drachma (67.5 troy grains) are known; and of these, 100 went to the *mina*, and 60 *minæ* to the talent. The two-drachma piece (didrachm) and the four-drachma piece (tetradrachm) are the most usual sizes, the gold generally following the standard of the silver. Bronze coins are usually submultiples of the *obolos*, itself one-sixth of the drachma.

Greek coins are found in Europe in Spain, Gaul, Britain, Italy, Sicily, Thrace, Macedonia, Thessalia, Attica, Bœotia, and the Peloponnesus; and in Asia in Ionia, Phrygia, Lydia, Caria, Cilicia, Phœnicia, and Egypt. In Italy we find magnificent specimens of the colonial coinage at Heraclea, Metapontum, Neapolis, Pandosia, Tarentum, Terina, Thurium, and Rhegium; of very early types at Caulonia, Croton, Pastum, Populonia, and Sybaris; of the ancient mode of writing, from right to left, on some of the earliest; and of the use of the digamma at Heraclea. The finest coins of Sicily are in like manner colonial, with some resemblance to those of Italy, the earliest ascending in date to B. C. 490 or 480. At Agrigentum the name of the people is written *boustrophedon*—i. e. from right to left and from left to right, as an ox plows. The Syracusan decadrachms represent the largest of ancient Greek coins. Connected with Sicily are some very fine coins bearing Phœnician inscriptions, sometimes attributed to Carthage; indeed, there is no doubt the best specimens were struck for that great city in Sicily at Panormus and other places, and by Greek artists. The beautiful coins of Philistis commemorate a lady not men-

tioned in history, but believed to be the wife of Hiero II., as her name is found carved on a seat in the theater at Syracuse.

In Greece proper we find very early and beautiful specimens of Greek art at Abdera, Eneus, and Thasos, and in various towns of Macedonia and its neighborhood, as Acanthus, Amphipolis, Chalcidice, Lète, and Neapolis. The types in many cases refer to old and well-known myths, as the Gorgon's head at Neapolis. Two remarkable coins exist of Geta, King of the Edoni, both of which were found in the Tigris, and therefore may have been carried back to Persia after the defeat of Xerxes. Of Philip and Alexander the Great coins abound in gold and silver, but are less frequent in bronze, the former being of good art and the latter confirming the extent of his conquests; while those of Lysimachus, King of Thrace, are noteworthy for the portrait they exhibit of Alexander himself, with the symbols of the Young Ammon. Thessaly exhibits some good specimens in the money of Larissa, with some resemblance in fabric to those of Sicily; and Epirus offers the beautiful series from Ambracia, with the noble head of its king, Pyrrhus, treated as the Jupiter of Dodona. The coins of Pyrrhus were probably struck at Tarentum or Syracuse. Athens naturally affords the largest series of Greek coins; some specimens are as early as 500 B. C. Those of the adjacent island of Ægina are very interesting from their antiquity, and from the tradition that Pheidon, King of Argos, first struck coins here in the eighth century B. C. In the Peloponnesus the series of the money of Corinth claims especial attention from its great extent and long-preserved excellence. At Elis we find the digamma on early types of the time of Xerxes, and a magnificent series of the finest period, with the head of Juno and her name, *HPA*, inscribed on a bandeau over her forehead. With these may be ranged scarcely less noble specimens from Trazene, Arcadia (with the head of Zeus Ætophoros), and Stymphalus—the latter possibly Cretan. Sparta naturally records her famous ruler, Læurgus, though on a late copper coin. Mantinea and Heræa have good archaic types.

Asia Minor offers us coins partly Greek and partly Græco-Oriental; there is a magnificent head of Mithridates VI. of Pontus; in Mysia we have a unique series of *electrum* coins, called *staters* of Cyzicus, with other splendid trophies of Greek art, in the money of Cyzicus, Phocæa, and Pergamus. The tetradrachms of the last place are called, from their peculiar type, *cistophori*. Ilium in Troas naturally records its local traditions, placing Hector (*ΕΚΤΟΡ*) on its money, and Æneas carrying Anchises and leading Ascanius. Lydia comes next, with its rude and archaic gold coins, probably, the earliest specimens of Greek numismatic art, though those of Ægina could not have been much later; then comes Ionia, with its great series of Smyrna and Ephesus, and the noble coins of Clazomenæ. Magnesia records its river by the type of a bull butting within the pattern, hence called "Maander." Early coins of Phocæa exhibit the seal, whence its name; and Chios, Samos, Calymna, and Cos early produced many curious specimens. The coins of Rhodes have an importance of their own, and comprise very fine specimens, with the head of Apollo, probably the same type as was afterward known as the Colossus of Rhodes. On the opposite coast Lycia and Pamphylia afford a remarkable series, the elder ones inscribed in the local character and languages, and Side in the latter province having some especially fine tetradrachms, with the pomegranate fruit (*ΣΙΔΩ*) as their type. In Pisidia we have curious locally inscribed coins at Selge, resembling those of Aspendus in Pamphylia. Phrygia offers several coins of interest of the imperial times with local myths, such as that of Deucalion and *N&E*, and Cilicia some remarkable coins inscribed with Phœnician characters and struck by the Persian rulers of that district. These are called "satrap" coins. There are also some interesting types at Tarsus, bearing legends similarly written. These, and the types prevailing along the coast of Syria, at Sidon, Tyre, Aradus, and Byblus, together with the early money of the Bactrian series, might perhaps best be termed Græco-Oriental. The native coins of Carthage and of Judæa must be called Oriental; they do not exhibit anything worthy of remark, except, perhaps, the earliest "shekels" of Judæa, which were probably struck soon after the return of the Jews from Babylon.

Roman numismatics begins about 230 or 240 B. C. with a massive copper coinage, termed technically *as grave*, having the *as* for its largest size, and the *uncia* (or ounce) for its unit. At first the *as* actually weighed 1 lb., and hence was

called *as libralis*, the ounce being its twelfth part; but it was soon and rapidly reduced. The leading types of the Roman *as* are the *Janus bifrons* and the prow of a galley. Other and similar coins were struck in the neighboring towns of Etruria and in Umbria and Apulia. About 170 B. C. gold, silver, and copper coins were issued by various Roman families, who were permitted by the state to strike coins—often, too, beyond the bounds of Italy; and with Julius Cæsar began the imperial series, which lasted till 476 A. D. The main characteristic of Roman art is individuality as opposed to idealism; faithful portraiture, often exceedingly good, as in the cases of Nero, the Antonines, the two Faustinas, etc., with a remarkable permanence of religious types on the reverses. Many historical events are recorded on them, as the crowning of Ptolemy Epiphanes by Lepidus, the introduction of elephants into Rome by Metellus, the construction of the port of Ostia and of the Colosseum by Nero and Vespasian respectively, and the overthrow of Judæa by Titus.

It is probable that all the finest Roman coins were executed by Greek artists, and their chief value for study is the illustration they afford of contemporary sculpture, and the influence they have exercised over mediæval and modern art. After Julius Cæsar the senate reserved to itself the striking of the copper money, which for a long time is always marked with S. C. (*senatus consultu*). Names for Roman coins are scarce, but we know that the earlier gold and silver coins were termed, respectively, the *aureus* and the *denarius*, the latter of which names was preserved through the Middle Ages as the *denier* of France. Besides the regular coins, the Romans had also what are termed *medallions* (see MEDALLION), and *contorniates*, which were probably tickets of admission to the theaters or games. Christian types, as the *labarum* or standard bearing the cross, are found from Constantine downward, and on one are seen the celebrated words, "*Hoc signo victor eris*." With the imperial Roman it is usual to class the *imperial Greek* coins, struck in the Greek cities by nearly every emperor, and in some cases, as at Antioch and Alexandria, forming a series unrivaled in number and duration.

The Greek coinage of the Byzantine emperors down to the capture of the city by the Turks in 1453 is generally supposed to begin with Anastasius in A. D. 491. The inscriptions on it are at first in Latin, thence continuously in Greek, its varying orthography showing the gradual change of the language. The Byzantine coinage is mostly in gold, and its chief interest is that it was the principal coinage of Middle and Eastern Europe till the introduction of the florins and ducats of the Italian republics; and, further, because the money of the Vandals in Africa, of the Ostrogoths in Spain and of Nicæa, Thessalonica, and Trebizonde, was framed on Byzantine models.

The early mediæval types are a barbaric imitation of the Roman, their art being progressively worse as they were removed farther and farther from Italy, which always retained some traces of her earlier civilization. The earliest mediæval coins are those of the Lombard and Merovingian kings and of the dukes of Benevento, and in Britain the small silver pieces called *sceatas*. In France and in England the *denier* and the *penny-sterling* (i. e. Easterling) were the common and the most important coins. Coins were (except in England, where the right of striking coins was always much restricted) issued by princes and ecclesiastics, as well as by kings, and somewhat later by free cities and corporations. Mediæval coins are not relatively so important to us as the seals of the same epoch, of which many originals and many impressions exist. The coins are nearly always inferior in beauty to those seals, and still more decidedly inferior to the cast medallions of Italy. (See MEDAL and MEDALLION.) It is only in very modern times that the same care and pains have been spent upon die-sinking for coins that are given to the other arts.

Besides the various series above enumerated there exists a vast number of coins struck by different Oriental rulers from the beginning of the empire of the khalifs to the present day. These coins are not very important in the history of art, but very valuable in determining the dates of dynasties; as a rule, with the exception of the Chinese, they are written in the characters of the Mohammedan conquerors, or in some modification of the Devanâgari (or Sanskrit) alphabetic system.

Revised by RUSSELL STURGIS.

Nummulate: See FORAMINIFERA.

Nun: See NU.

Nunataks: See GLACIERS.

Nuncio: See LEGATES AND LEGATION.

Núñez, *noón yóth*, RAFAEL: statesman; b. at Cartagena, New Granada, Sept. 28, 1825. He studied in his native city; was elected to congress in 1851, and thereafter took a prominent part in politics; was secretary of the treasury 1855-57 and 1861-62; and edited *El Porvenir* and other journals. From 1863 to 1865 he lived in New York, where he conducted a Spanish newspaper; later he was in Europe until 1874, acting as consul of Colombia at Havre and Liverpool. Returning to his native country, he was the candidate of the liberal party for the presidency in 1875, but was defeated; was governor of the state of Bolívar, senator, and secretary of the treasury for a short time in 1878; and was elected president in 1879. His term of two years (1880-82) was very prosperous. He was again elected for the term beginning Apr., 1884; in 1885 a rebellion was put down, and in 1886 a new constitution was adopted, by which the federal system was abolished, and the presidential term was extended to six years. Under this constitution Dr. Núñez became president in 1886, and again in 1891. D. in Bogota, Sept. 18, 1894. HERBERT H. SMITH.

Núñez de Arce, *-dā-nar thā*, GASPÁR: dramatist and poet; b. at Valladolid, Spain, Aug. 4, 1834. His studies were pursued at Toledo, and even before they were completed he was given the freedom of the city for a successful drama. Soon after he went to Madrid, where he began to write for various periodicals, and also, both alone and in association with the poet Antonio Hurtado, to produce plays. From his own pen we have the comedies *¿Quién es el autor?* (1859); *La Cuanta del Zapatero* (1859); *Como se empezó un marido* (1860); *Ni tan buena tan poca* (1865); and the dramas *Doctores de la honra*; *Quién debe, paga*; *Justicia procedural*; and *El Haz de Leña*. The last of these, produced in 1882, and devoted to the story of Don Carlos, is one of the best recent Spanish plays. With Hurtado he wrote *El Laurel de la Zubia* (1865); *Herir en la sombra* (1866); *La Jota aragonesa* (1866); *Una página de oro, ó el Salto de Cartagena en 1815* (1873). It is, however, quite as much by his poetry as by his plays that Núñez de Arce has obtained his commanding place in Spanish letters. On the whole, he is the best exponent in Spain of the doubts and pessimistic inclinations of the nineteenth century; but at the same time he has often shown remarkable patriotic passion in denouncing the political evils of his country. Through the wretched revolutions of the last half of the century, his voice has again and again been raised against the cruelty and selfishness of self-styled patriots, and more than once his words have echoed throughout Spain. He has given the title *Gritos del Combate* (5th ed. 1885) to the collection of these passionate poems. Besides this volume, he has published several longer poems that have had remarkable popularity: *Última lamentación de Lord Byron* (23d ed. 1884); *Marija* (9th ed. 1886); *La Pesca* (15th ed. 1886); *La Selva Oscura* (15th ed. 1886); *El Vértigo* (25th ed. 1886); *La Visión de Fray Martín* (15th ed. 1886); *Un Idilio y una Elegía* (18th ed. 1886). In 1860 Núñez de Arce went as correspondent of the Madrid journal *Iberia* to the war between Spain and Morocco; and this is described in his *Recuerdos de la Guerra de África*. He early began to take part in politics, always on the liberal-monarchical side, and in 1865 he was first elected to the Cortes. In 1882 he was Minister of Colonial Affairs. He was elected to the Spanish Academy in 1876. He has published his four chief dramas under the title *Obras dramáticas* (Madrid, 1879); various tales and articles as *Miscelánea literaria* (Barcelona, 1886). A. R. MARSH.

Núñez Vela, *-vā lāñ*, BLASCO: first Viceroy of Peru; b. at Avila, Spain, about 1490. He held various civil and military offices, and was appointed Viceroy of Peru in 1543, with special directions to enforce the new laws for the abolishment of Indian slavery. He reached Lima in May, 1544. He had already shown his good intentions by refusing the forced services of Indian porters during his journey, and laying an embargo on a cargo of silver, on the ground that it was the product of slave labor; but he lacked discretion to introduce so great a reform against the violent opposition of the colonists. A revolt quickly broke out, headed by Gonzalo Pizarro. Vela made matters worse by imprisoning his predecessor, the governor Vaca de Castro, and in Sept., 1544, he killed the factor, Carbajal, after accusing him of conspiring with Pizarro. He was finally deposed and arrested by the Audiencia, and put on board a ship, to be sent to Spain. The captain of the ship allowed

him to land at Tumbez, where he began to organize an army; but Pizarro pursued him, and he fled through Quito to Popayan. Thence, re-enforced by Benalcázar, he returned to Quito, but was defeated and killed by Pizarro at the battle of Ñaquito, Jan. 18, 1546. HERBERT H. SMITH.

Nu'niak: an island in Bering Sea, belonging to the U. S.; in lat. 60° N., lon. 166° W.; off Cape Vancouver and separated from the mainland by Etolin Straits, about 40 miles wide. It is an irregular quadrilateral, about 50 miles long by 30 broad, and contains about 1,200 sq. miles. It is unexplored, but is known to be lightly wooded in sheltered places and to contain many high hills. It is lowest in the northern part, and has no harbors. It is inhabited by Innuits, very degraded and filthy, and noted for the beauty of their ivory carvings and of their skin canoes. Their chief articles of trade are fox-skins, oil, and ivory. M. W. H.

Nunnery: See MONASTERY.

Nur-ed-din Mahmud, or **Malek-al-Adel** (just before): Sultan of Syria; b. at Damascus in 1117; son of Zenghi, Emir of Bassorah, who had conquered Northern Syria. After Zenghi died (1146), his elder son, Seif-ed-din, succeeded to the northern half of his dominions, while Nur-ed-din took possession of the rest. In 1147 he defeated Count Joscelin de Courtney and captured Edessa, the bulwark of the Christian kingdom of Jerusalem. For its recapture Louis VII. of France and Conrad III. of Germany undertook the second crusade. Nur-ed-din defeated Louis, took Antioch, Tripolis, and Damascus (1154), which he made his capital, overthrew Baldwin III., King of Jerusalem, near the Jordan (1155), and gradually mastered nearly all Syria and Palestine. The civil dissensions of the Mussulmans in Egypt led him to interfere in that country, which was subdued and pacified by his generals, the Kurds Schir-Kou and Salah-ed-din. D. at Damascus in 1174. Nur-ed-din was a man of noble character, revered by the Mussulmans and admired by the Christians. His victories were due not only to his diplomacy and military skill, but to his firm persuasion that he was chosen by God as the soldier of Islam. E. A. GROSVENOR.

Nu'renberg (Germ. *Nürnberg*): town of Bavaria; on the Little Pegnitz, here crossed by seven bridges, and on three railway lines; 95 miles N. by W. of Munich (see map of German Empire, ref. 6-E). Of all German cities it is the most interesting and characteristic with respect to its architecture. The houses face the street with their gables, and balconies profusely ornamented with carvings in stone or wood overhanging the sidewalks. It is very rich in splendid mediæval monuments which show that its ancient boast of being the commercial, industrial, and literary center of Germany was not vainglorious. Of its many remarkable buildings, the most striking is the Church of St. Sebald, a Gothic structure ornamented with paintings by Albert Dürer, and containing the famous tomb of St. Sebald executed in bronze by Peter Vischer, who, with his five sons, worked on it for nearly thirteen years. The town-hall, the largest building of its kind in Germany, with subterranean dungeons and torture-chambers, the castle, and the Church of St. Lawrence are also interesting edifices. The Albrecht Dürer Platz contains a statue of the great artist, erected in 1840. The principal manufactures of Nurenberg are carvings in wood, bone, and metals, children's toys and dolls, lead-pencils, chemicals and ultramarine, looking-glasses, watches, carriages, and machinery. Its trade is very extensive.

Nuremberg was once the wealthiest and most important of the free imperial cities of Germany. Among the earliest of German cities to accept Protestantism, it gave hearty support to the followers of Luther, and was the seat of important diets during the Reformation. It gave its name to the religious peace of 1532, which granted temporary liberty of worship to Protestants in order to secure united action against the Turkish invaders. Although it suffered greatly during the Thirty Years' war, and gradually declined until in 1806 it lost its independence and was annexed to Bavaria, it is still a great and rich town. Its fortifications, consisting of a double wall and a moat, were demolished during the occupation by the Prussians in 1866, and have been transformed into promenades. Pop. (1890) 142,590, of whom about 25,000 are Roman Catholics.

Nursery: in horticulture, an establishment for the rearing of plants; in the U. S., however, there is a tendency to restrict the term to those areas devoted to the growing of woody plants alone, like trees and shrubs, while the propa-

gation of herbaceous plants is referred to floriculture. The peculiarity of nurseries in the U. S. as distinguished from those of other countries is the enormous quantity of fruit-tree plants which are propagated, a circumstance which arises from the fact that fruit-growing is the chief horticultural pursuit of the republic. In 1890 the nurseries of the U. S. occupied 172,806 acres of land, and represented an invested capital of \$52,425,669.51. They employed 45,657 men, 2,279 women, and 14,200 animals. There was a total of 3,386,856,778 plants growing for sale, of which 518,016,612 were fruit-trees and 685,603,396 were grape-vines and small fruits. The greatest number belonging to a single species were 240,570,666 apple-trees, grown upon 20,232½ acres. Evergreen trees were represented by 822,038,324 plants, and deciduous ornamental and forest trees by 1,297,408,257. The most important nursery region of the U. S., considering both extent and variety of the industry, is Western New York, particularly the counties of Ontario, Monroe, Wayne, and Niagara.

The nursery interest may be divided into two categories with respect to the use and economy of the land—the growing of fruit-trees and plants, and the growing of ornamentals. The market value of fruit stocks is measured by their age and size combined, and it is therefore essential that they be grown upon unworked land in order that the greatest possible growth may be obtained in a given time. It is almost a universal practice to grow only one crop of fruit-trees upon the land. Nursery lands are therefore largely rented for a term of four or five years, after which farm crops are raised upon the soil. A high system of fertilizing would undoubtedly restore the soil to a condition to allow of successful nursery business, but in practice it is found to be cheaper to plant upon land which has never been used for nursery purposes. Ornamental stocks are valued according to their size alone, and these can therefore be satisfactorily grown upon land already used for nursery crops.

Fruit-trees are grown from seeds, and the seedlings are budded or grafted (see GRAFTING) with whatever varieties of the same, or in some cases allied, species the nurseryman may desire. Ordinarily, the growing of seedlings is a separate business from the propagating and growing of named varieties. The seedlings of plums, pears, quinces, and generally of cherries, are mostly grown in France, where labor and seeds are cheap and the climate is adapted to the work. These seedlings are exported to the U. S. at the end of the first season's growth and are planted in nursery rows. The following summer (that is, the second season from the seed) these seedlings are budded to the various named varieties. These buds do not grow until the following spring, at least not in the North; so that when the bud, which is to make the body and top of the tree, begins to grow, the root is two years old. The trees are ready for sale when the bud or top is two or three years old. Apples are now mostly grown upon seedlings raised in the rich soil of the Western States. These seedlings are dug and shipped in the fall of the first year. The purchaser may root-graft these stocks the same winter and plant them in the spring, or he may set them in nursery rows and bud them the following July or August. Peaches are budded in late August or September (in the North) of the first year, and the trees are ready for sale at the close of the following year. That is, peach-trees are sold when the top is one year old and the root two years old. Ornamental trees and shrubs are multiplied in a great variety of ways. Some are budded or grafted, and many are increased directly by seeds, cuttings, or layers. (See CUTTINGS.) Grapes are almost wholly grown from cuttings of the mature wood (see GRAPE), as are also currants and gooseberries. Raspberries and blackberries are multiplied both by means of cuttings of the roots and by suckers which spring from near the base of the plant; but the blackcap raspberries are usually propagated by bending over the growing shoots or canes and allowing the tip to root in the soil, after the manner of a layer. (See LAYERING.) For detailed accounts of nursery practice, consult Barry's *Fruit Garden*, Fuller's *Propagation of Plants*, and Bailey's *Nursery Book*. L. H. BAILEY.

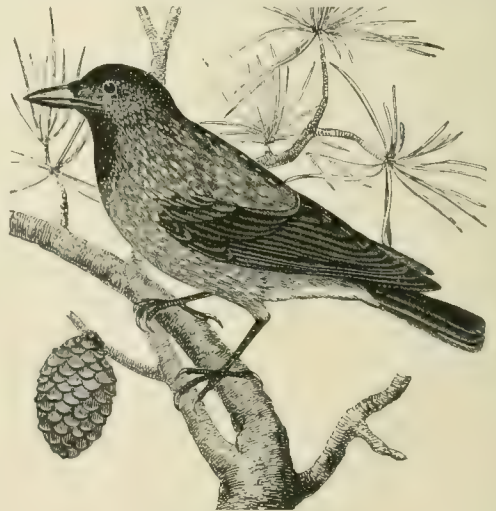
Nurse-shark: a large shark (*Somniosus microcephalus*) found in Arctic or cold northern waters. It is of a robust form and attains a length of from 12 to 20 feet, but has very small teeth and is sluggish in its motions. This name is also applied to a smaller and more slender shark (*Ginglymostoma cirratum*), occurring in the Caribbean Sea and adjacent waters. F. A. L.

Nusairieh, Ansyreeh, Ansaries, or Ansonians: a Muslim sect. They inhabit the lower Ansyrean mountain range between Lebanon and Antioch, in Syria, and also are numerous in towns and villages along the coast. They sprang from the Shiites, with whose heresies they united many Christian, Jewish, and pagan ideas. Their prophet Nusair taught that God had appeared several times in human form, as in Abraham, Moses, Jesus, Mohammed, and Ali, and will once more manifest himself in El Mahdi or the Messiah. They regard Christ as a prophet, revere the Virgin Mary, observe Christmas, adore the sun and moon, accept the Koran, which they claim was revealed to a Mohammed of their sect and not to the Arabian prophet, maintain the divinity of Ali, who they say was incarnated seven times, practice polygamy, indulge in wine, and believe in the transmigration of souls. In their belief, whoever is apostate or unfaithful to his religion will after death be transformed into a Jew, Mussulman, Christian, or animal. They endeavor to keep their creed secret, and many of their doctrines are unknown. Their neighbors give them a bad reputation, but, though ignorant and superstitious, they are kindly and hospitable. E. A. GROSVENOR.

Nut: an Egyptian deity, wife of Seb (or Qeb) and mother of Osiris, Isis, Nephthys, and Set-Typhon. She was the personification of the heavens, and is represented as a woman standing like a quadruped upon her hands and feet, while her body symbolized the heavens in which the stars appear. Similarly she is represented by the figure of a cow. Nut is to be distinguished from Nu-t. See Nu. C. R. G.

Nutation: See PRECESSION OF THE EQUINOXES.

Nutracker: a bird of the crow family, so called from the readiness with which it cracks the nuts that form a part of its food. Its scientific name is *Nucifraga caryocatactes*, and it is nearly related to the jays. It is a little over a foot in length; the thick, soft plumage is dark brown, with white or whitish spots on the head and neck; the wings and tail are black, the latter with a white band. The nutcrackers frequent the pine forests of Northern Asia and Europe, feeding on grubs, the seeds of the pine, etc. They associate



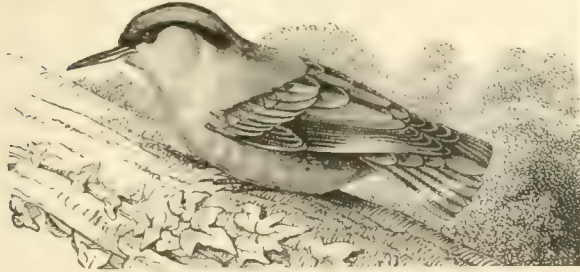
The European nutcracker.

in flocks and are active and noisy, except during the breeding season. Although the birds are very common, the eggs were for a long time unknown, owing to the fact that the birds nest early in the spring while the snow is still on the ground, and at this time are shy and quiet. The American nutcracker, better known as Clarke's crow (*Picicorvus columbianus*) is an inhabitant of the pine woods of the western parts of the U. S. It is of a gray color, wings black with a white mark on the secondaries, tail white, except central feathers, which are black. F. A. LUCAS.

Nutgalls: See GALL INSECTS, GALLOTANNIC ACID, and GALLS.

Nuthatch: any one of a number of small birds belonging to the family *Sittidae*, and, with a few exceptions, to the genus *Sitta*. They have round, pointed beaks, long wings, short, rather square tails. They are active climbers, and may be seen scrambling about trees, often head downward,

in search of insects and their eggs. They get their popular name from a habit of placing a seed, or small nut, in some convenient crevice, and hacking, or *hatching*, out the contents with blows of the beak. The greater number of species are found in Europe, Asia, and North America, but a few peculiar genera, which may possibly not rightfully belong to the group, are found in New Zealand, Australia, and



The common European nuthatch.

Madagascar. The common European species is *Sitta europæa*; the common nuthatch of Eastern North America is *S. carolinensis*, a bird 6 inches in length, bluish ash above, dull white below; wings blackish, tail, except central two feathers, brown, and nape black. It nests in holes, which it hews out for itself, and lays a number of white eggs speckled with reddish and purplish colors. F. A. LUCAS.

Nutmeg: See MYRISTICA.

Nutria Fur: See COYOTE.

Nutrition [from Lat. *nutri* *re*, nourish, whence Eng. *nourish*]: the process by which appropriate material is taken into living organisms and utilized to maintain their existence, promote their development, and facilitate the performance of their functions. This definition covers vegetable as well as animal nutrition. The discussion of the former will be found in the articles on botanical subjects; in this only animal nutrition will be considered. Animal nutrition includes the absorption of gases and of water, and the preparation, appropriation, and assimilation of solid food. The absorption of gases and water takes place, in very simple organisms, through their general surface; in higher organisms the absorption of gases (and perhaps to a very limited extent of water) takes place through lungs or gills by the function of respiration; the absorption of liquids takes place chiefly in the stomach, and of semi-liquids and solids in the intestines. The function of respiration accomplishes an exchange of gases, by which those needed by animal tissues in active life are received into the blood, and those excreted by them are conveyed out of the body. This is as really a part of the process of nutrition as that which consists in appropriating nourishment taken into the stomach, and its details may be found in the article on RESPIRATION.

Briefly stated, nutrition is the result of appropriating food, and food is anything which, when appropriated by the tissues—or, more properly, the cells—of the body, contributes to their life, growth, or functional activity. The simplest forms of animal and vegetable life (*amœbæ*, bacteria) are nourished by direct absorption of suitable material from the surrounding media, in this respect, as in many others, resembling the individual cells of higher organisms. For the latter, the first step in the process of taking food (after any form of preparation) is called by physiologists “prehension” (laying hold of); the second (applicable to solid or semi-solid food) is usually “mastication” (chewing); the third is usually “deglutition” (swallowing). Some animals, like birds, perform the act of mastication in the stomach (gizzard); others, like fishes, do not masticate at all; others, like cattle, masticate their food after it has been once swallowed and then regurgitated—what is called “rumination.” In the highest animal organism, man, the three processes named above are followed by DIGESTION (*q. v.*), and this by absorption through the walls of the stomach of liquids and the products of gastric digestion, which then enter the blood-vessels and lymph-channels and are conveyed in the blood and lymph to the remotest parts of the body. The undigested food passes into the intestinal canal, where it is further elaborated (for the details of which process see DIGESTION), the prepared portion being taken up by blood and lymph vessels of the wall of the intestines and conveyed into the circulation, while the residue is carried on and finally expelled by the process of defeca-

tion. After nutritive material enters the circulation, it is carried to various parts of the body and comes in contact with individual cells, which then (in health) take up and appropriate to their nourishment what they need. A necessary complement to the process of appropriation is that of excretion, which consists in the casting off by each cell of effete matter, the product of its own vital activities, which is conveyed by the blood-vessels to the various points of exit from the body—the lungs, the skin, the kidneys, and the bowels.

A correct understanding of the process of nutrition involves, as a fundamental conception, the fact that the most complex being is a community of individual cells, each living by itself, growing, developing, reproducing its like, decaying, and dying in due time, and from the beginning to the end of its existence maintaining its individuality. The life and health of a man depend upon the life, health, and harmonious action of the cells of which his body is composed, and the state of nutrition of a man corresponds to the state of nutrition of his cells. When a man grows fat it is because the cells which make up his adipose (fat) tissue are in a state of high nutrition; when he grows thin, it is because they are under-nourished. When a man grows muscular, it is because his muscle-cells are well nourished; and when these are impoverished, his muscles will be weak and small. All the steps in nutrition previous to the appropriation of food by each cell are but preliminary to that final act in which each cell—like an *amœba* in a drop of water—takes from its surrounding medium that which is suited to its needs. By means of a process of which nothing is certainly known the material that each cell appropriates undergoes changes which make it like that which already occupies the cell, and fit it to take the place of that which, having served its purpose, is undergoing further changes that render it unsuited to the use of the cell, and is about to be cast out into the same current which has brought the needed supply of nutrient material. This is the real process of nutrition. CHARLES W. DULLES.

Nut'tall, THOMAS: botanist and ornithologist; b. in Yorkshire, England, in 1786; was brought up a printer; went to the U. S. in youth; devoted much time to botanical and ornithological studies; traveled in nearly every State of the Union; explored the Great Lakes, the upper courses of the Missouri and Arkansas rivers; crossed to Oregon, the Sandwich islands, and California. He published, among other works, *The Genera of North American Plants* (2 vols., 1818); *A Journal of Travels into the Arkansas Territory* (1821); *A Manual of the Ornithology of the United States and Canada* (1832-34); and *The North American Sylva* (3 vols., 1842-49), being a continuation of F. A. Michaux's work on the same subject. Nuttall was curator and lecturer at the botanic garden of Harvard College at Cambridge 1822-28; returned to England about 1841 on inheriting an estate. D. at St. Helens, Lancashire, Sept. 10, 1859.

Nux Vom'ica [Mod. Lat.; Lat. *nux*, nut + *vo'mere*, vomit]: an important drug consisting of the seeds or beans of a small tree (*Strychnos nux vomica*) of the natural order *Loganiaceæ*, growing in the coast districts of India. The leaves are roundish-oblong, stalked, smooth, and with terminal corymbs. The fruit is a globular berry, about as large as a small orange, with a brittle shell and several seeds lodged in a white gelatinous pulp. The seeds are gray, disk-shaped, a little less than an inch in diameter, and about a sixth of an inch in thickness. They have a very bitter taste and are exceedingly poisonous, both these qualities depending on the presence of the alkaloids strychnine and brucine. Of these, strychnine is the more powerful and important. It is a white powder, almost wholly insoluble in water, odorless, but of an intensely bitter taste. It is highly poisonous, producing in poisonous dose, within half an hour after taking, violent tetanic spasms, the body during the paroxysms being arched backward, with every muscle convulsed and stiff. The mind is unaffected. Death occurs within an hour or two or earlier from a spasmodic prolonged spasm of the muscles of respiration, so that the patient can not breathe. The physiological antidotes are bromides and chloral, and drugs producing motor paralysis, such as Calabar bean, hemlock, tobacco, nitrite of amyl, the anæsthetic ethers, etc., are useful in mitigating the severity of the spasms. Medicinally, strychnine and preparations of *nux vomica* seeds are used in small repeated doses in cases of nervous debility and paralysis of various kinds, to help in restoring proper functional activity in the affected muscles or organs. Revised by H. A. HARE.

Ny'ack: village; Rockland co., N. Y. (for location of county, see map of New York, ref. 8-J); on the west bank of the Hudson river, and on the Erie, the N. Y., Ont. and W., and the W. Shore railways: 28 miles N. of New York city, with which it has daily steamboat communication, and opposite Tarrytown, with which it is connected by a ferry. It contains Rockland College (non-sectarian, opened in 1874), Nyack Seminary (Protestant Episcopal), Nyack Library Association (founded 1879), public, high, and union schools, several private schools, electric lights, 2 daily and 3 weekly newspapers, a private bank, and manufactories of shoes, pianos, pipe-organs, steam-yachts, boilers, engines, and paper boxes. Pop. (1880) 3,881; (1890) 4,111; (1894) estimated with South Nyack and Upper Nyack, 9,000.

EDITOR OF "JOURNAL."

Nyan'za: a word for lakes in Eastern Equatorial Africa, and especially applied to two great lakes, the *Victoria Nyanza*, or *Ukerewe*, and the *Mutan*, or *Albert Nyanza*. Nyassa is another form of the same word. See ALBERT NYANZA, NYASSA, and VICTORIA NYANZA.

Nyas'sa: one of the large lakes of inner Africa; about 340 miles long and from 15 to 34 miles wide; 700 feet deep in the south and shallower toward its northern end; area about 14,220 sq. miles. Its waters run to the Zambesi through the Shire river. The shores for the most part are steep, particularly on the west and northeast coasts, and in general the lake gives the impression of a deep cleft in the highland filled with water. Many small rivers flow into the lake on the west coast, but the water receipts of the east coast are small. German and English steamers ply on the lake, whose coasts are divided between those nations. The lake offers (1894) the best route to Central Africa from the Indian Ocean. Many thousands of natives live around its shores.

C. C. ADAMS.

Nyāya Philosophy: the youngest of the six systems of Brahmanical philosophy (MĪMĀṂSĀ, VEDĀNTA, SĀṆKHYA, YOGA, NYĀYA, and VĀJESHIKA, *q. v.*), founded probably some time after the Christian era, and by a man named Gotama, or, as he is often nicknamed, Aksha-pāda, literally, "Having his eyes on his feet." The system bears the Sanskrit name *nyāya*, that is logic, because its importance is chiefly due to its extraordinarily thorough and acute exposition of formal logic, an exposition which has held its own, even until to-day, in India, and which serves as the basis of all philosophical studies, and whose terminology has made its way into the younger treatises of all the other systems. The importance attached to the Nyāya system is evident from the fact that Gotama, in the opening sentence of his manual, the *Nyāya-sūtras*, in enumerating the sixteen fundamental logical conceptions, declares that upon the right understanding of their nature depends the attainment of the supreme welfare, that is, the liberation of the soul from the round of existence. The Nyāya philosophy, however, aims not merely to develop a system of logic, but rather also a complete philosophical system; and is, in this aspect, a continuation and supplement of the Vājeshika system, and requires, accordingly, for its proper understanding, some knowledge of the VĀJESHIKA (*q. v.*). The metaphysical bases of both systems are the same; both regard the world as a conglomerate of eternal, causeless, and unchangeable atoms; and both agree in their psychology, holding, namely, that the souls are eternal and endless, that they possess certain qualities, and that they can apprehend only by means of the atomistic organ of thought that belongs to them.

The Indic philosophies in general separate strictly two kinds of causes, the material cause (*upādāna-kāraṇa*) and the instrumental cause (*nimitta-kāraṇa*). The material cause of a thing is the matter from which it proceeds and of which it consists. As instrumental cause of a thing is regarded not only the occasion of its coming into being, but also the means by which it is produced. While the material cause of a certain object is always the same, the instrumental causes thereof need by no means be so. Instead of the usual term *upādāna-kāraṇa*, the Nyāya employs—with evident reference to the sixth category of the Vājeshika system—the term *samarāyī-kāraṇa*, inherent cause; and assumes, moreover, a third kind of cause—which we should denominate the formal cause—namely, the *a-samarāyī-kāraṇa*, or non-inherent cause. Thus, to use the stock-example, the threads are the inherent cause of the cloth; the connection of the threads, the non-inherent cause; the loom and tools of the weaver, his personal skill, his activity, and the weaver himself are the instrumental causes. Or, again, the cloth is

the inherent cause of its qualities, while the qualities of the threads are the non-inherent cause of the qualities of the cloth.

The Nyāya recognizes four sources of true knowledge, to wit: 1, Perception (*pratyakṣa*); 2, inference (*anumāna*); 3, analogy (*upamāna*); and 4, trustworthy testimony (*śabda*). Of these, the second palpably outranks the rest. Inference is of three sorts: *a*, From cause to effect (*pūrvavat*), as when from the gathering of the clouds you conclude that it is going to rain; *b*, from effect to cause (*śeshavat*), as when from the swelling of the streams you conclude that it has rained; *c*, from the particular to the general (*sāmānyato dṛṣṭa*), answering to our induction, as when, at the sight of a blossoming mango-tree, you infer that the mangos in general are in bloom; or when, from the consideration of the single senses, you arrive at the general idea of the instrument of perception.

The syllogism of the Nyāya has five members, and may be illustrated by the stock-example:

1. Proposition (*pratijñā*): This mountain has fire,
2. Reason (*dātū*): because it has smoke.
3. Example (*dehātūta*): Whatever smokes has fire, as a kitchen hearth.
4. Application (*upanaya*): This mountain smokes.
5. Conclusion (*nigamana*): Therefore it has fire.

All this, compared with the Aristotelian syllogism, seems needlessly prolix, since 4 and 5 are only repetitions of 2 and 1; but Gotama was not aiming at the utmost brevity, but rather to teach how to present the syllogism in the best and clearest manner to another—that is, the five-membered syllogism is merely the tripartite logical one modified by rhetorical considerations. The conception that underlies the Nyāya syllogism is called invariable concomitance or pervasion (*vyāpti*). Instead of proceeding with one of the "universal affirmatives" of Occidental logic, as "Every smoke presupposes the existence of a fire," the Nyāya proceeds with the invariable concomitance, *e. g.*, of smoke by fire. The observed characteristic (*liṅga*), *e. g.*, smoke, is the invariably concomitated (*vyāpya*); the inferable bearer of the characteristic (*liṅgin*), *e. g.*, fire, is the invariable concomitant (*vyāpaka*). Although strange in form, this is logically correct. Smoke is invariably accompanied by fire, albeit the converse is not true. The definitions of *vyāpti* and the doctrine of its application are important not only in the Nyāya system, but also in the other philosophic writings of the Hindus.

Such are some of the salient features of the Nyāya. The system goes on to discuss other logical topics, fallacies, and various faults of controversy, often with complicated detail and hair-splitting subtlety. For an outline of these matters, see Garbe's translation of *Aniruddha's Commentary on the Sāṅkhya-sūtras* (Calcutta, 1892), pages 233-237.

One important point, which concerns both the Vājeshika as well as the Nyāya system, still demands our notice. The fundamental works (*sūtras*) of both schools are without any mention of God; and since, moreover, they declare the souls and likewise the substance of the external world to be eternal and uncreated, and since, in agreement with the general Indic view, they hold the fate of the individual to be the product of his good and evil deeds in former existences, there is, accordingly, little room to doubt that the original character of both systems was atheistic. This may be due to the influence of the Sāṅkhya system. (See SĀṆKHYA.) Indeed, the Nyāya and Vājeshika doctrines, although presenting many striking contrasts to the Sāṅkhya, show various peculiarities which seem to rest upon some of the fundamental conceptions of the Sāṅkhya: such are their pessimistic coloring; their rejection of bliss in heaven as transitory and as leading to new misery; their teaching that even good works are a hindrance to the attainment of salvation; the view that salvation involves the cessation of joy no less than of sorrow—in short, a condition of absolute unconsciousness. Here, too, belongs the fondness for the numerical groupings of the categories and the like.

In later times, both Nyāya and Vājeshika go over to theism; but they do not go so far as to hold the personal God to be the creator of matter. Their theology is worked out in the *Kusumāñjali* (written by a Nyāya teacher named Udayanāchārya about 1300 A. D.) and in various works which treat of both systems together. According to these, God is a definite eternal soul, as are all other individual eternal souls; but with this difference, that he is free from the qualities which condition the migration of the other souls (merit, sin, aversion, joy, sorrow), and that he alone possesses the qualities by which he is fitted to govern the universe, to wit, omnipotence and omniscience.

Next to the Vedānta, the Nyāya has produced the greatest number of text-books. Fitzedward Hall's *Index to the bibliography of the Indian philosophical systems* enumerates 202. The *Nyāya-sūtras* were edited with the commentary of Viṣvanātha Bhattachārya by Nīmāi Chandragromani (Calcutta, 1828), and with that of Vātsyāyana by Jayanarayana Tarkapañchānana (*Bibliotheca Indica*, Calcutta, 1865). These *sūtras*, except the last and hardest (the fifth) book, were translated into English, with extracts from Viṣvanātha's commentary, by J. R. Ballantyne (Allahabad, 1850-54). The *Kusumāñjali*, with commentary, was edited and translated by E. B. Cowell (*Bibl. Ind.*, Calcutta, 1864). Among the modern works that mingle Nyāya and Vaiśeṣika doctrines are especially useful the *Bhāṣāparicheda* of Viṣvanātha, edited and translated by E. Röer (*Bibl. Ind.*, Calcutta, 1850), and the *Tarkasaṃgraha* of Annabhaṭṭa, edited, translated, and annotated by J. R. Ballantyne, under the title, *Lectures on the Nyāya Philosophy, embracing the text of the T. S.* (Allahabad, 1849; 2d. ed. 1852). Of the last three works various other editions exist.

Among European works on Nyāya-Vaiśeṣika, most important are H. T. Colebrooke's treatise in the *Transactions of the Royal Asiatic Society*, i., 92-118, 1824, reprinted with valuable notes by Cowell in Colebrooke's *Miscellaneous Essays*, 2d. ed., i., 280-318 (London, 1873), and three articles by Max Müller, *Beiträge zur Kenntniss der indischen Philosophie*, in volumes vi. and vii. of the *Zeitschrift der deutschen morgenländischen Gesellschaft*.

RICHARD GARBE. Translated by C. R. LANMAN.

Nyblom, nŭ'blŏm, KARL RUPERT, Ph. D.: poet and critic; b. in Sweden, in 1832; graduated at Upsala in 1857; was in 1860 appointed assistant professor in the university, and in 1867 Professor of Æsthetics, Literature, and Art History. In 1879 he was elected a member of the Swedish Academy, which institution had already in 1853 awarded him its prize for the poem *Arion*. Nyblom has been very productive both as æsthetic author and as poet. Among his æsthetic works may be mentioned *Konststudier i Paris* (Art Studies in Paris, 1864), and others collected under the title *Æstetiska Studier* (Æsthetic Studies, 1873). As a poet he has published *Dikter* (Poems, 1860); *Bilder från Italien* (Pictures from Italy, by Carlino, 1864; 2d. ed. 1883, entitled *Et tår i Södern*); *Nya Dikter* (New Poems, 1865); *Vers och Prosa* (by Carlino, 1870); *Valda Dikter* (Selected Poems, 1876). Besides these original productions he has translated Thomas Moore's *Irish Melodies* (Irländska Melodier, 1858); Shakespeare's *Sonnets*; *American Humorists* (Amerikanska Humorister, 1874). From 1865-68 he edited *Svensk Literatur-tidskrift* (Magazine of Swedish Literature).—His wife, a native of Denmark, has shown considerable talent as a novelist.

P. GROTH.

Nybm, nŭ'bŏm, JOHAN: poet and publicist; b. in Sweden in 1815; studied at Upsala, but never completed a course. Since 1860 he has resided at Vesterås, at the beginning earning his living as a newspaper writer. His earlier poems are remarkable for their splendor of expression, warmth of feeling, and vivid imagination, but his later efforts have to a large extent fallen below the standard of his earlier work. Among his poems may be noted *Byron i Grekland* (Byron in Greece, 1838); *Sista Natten i Alhambra* (Last Night in the Alhambra); *Dannemora och Österby* (1847). His complete poems (*Samlade Dikter*) appeared 1844-48; 4th ed. 1880.

P. GROTH.

Nyctalopia: See BLINDNESS.

Nye, EDGAR WILSON: humorist; b. at Shirley, Me., Aug. 25, 1850. He went to Wyoming when a young man, studied law, and was admitted to the bar. He afterward gained reputation as a humorous writer and lecturer under the pseudonym *Bill Nye*, and removed to New York. Among his works are *Bill Nye and the Boomerang* (1881); *The Forty Lenses* (1883); *Bated Hay*; *Remarks* (1886). D. Feb. 22, 1896.

Nyerup, nŭ'e-rŭop, RASMUS: scholar; b. on the island of Fünen, Denmark, in 1759. After passing the philological and theological examinations he entered the Royal Library and began his literary activity, which continued until his death. His chief merit is the interest he aroused in Scandinavian folk literature and archaeology. The Museum of Northern Antiquities in Copenhagen is a result of his earnest efforts. His religious and political views were far in advance of his time. D. June 28, 1829. He published *Bidrag til den danske Digtekunsts Historie* (with Rahbek, 6 vols., 1800); *Historisk-statistisk Skildring af Tilstanden i Danmark og Norge i ældre og nyere Tider* (4 vols., 1803-06); *Udvalgte danske Viser fra Middelalderen* (with Abrahamson and Rahbek, 5 vols., 1812-14); *Almindelig Morskabslæsning i Danmark og Norge igjennem Aarhundreder* (1816); *Dansknorsk Literaturlexikon* (with J. E. Kraft, 1818); *Peder Laales Ord-sprog* (1828), etc.

D. K. DODGE.

Nylander, nŭ'lan-dŭet, WILLIAM: lichenologist; b. in Uleaborg, Finland, in 1823. He was Professor of Botany for many years in the University of Helsingfors, and was afterward a resident of Paris. Author of many books and papers on the structure and classification of the lichens, among them *Synopsis Methodica Lichenum* (1858-59); *Lichenes Scandinaviae* (1861); *Synopsis Lichenum Novæ Caledoniæ* (1868); *Recognitio Monographica Ramulinarum* (1870); *Lichenes Novæ Zelandiæ* (1888); *Lichenes Insularum Guineensium* (1889).

CHARLES E. BESSEY.

Nylghau: See NILGHAU.

Nymph: See ENTOMOLOGY.

Nymphs [from Lat. *nym'pha* = Gr. *νύμφη*, nymph]: maiden divinities, inferior in rank to the other gods. They were neither mortal nor immortal, but lived to a great age; they ate ambrosia, and associated with the gods even in Olympus. They enjoyed the sweets of love with Hermes and the Sileni, and from the union sprang high trees which in the end had to die, and with them died also the Nymphs. They were very numerous, inhabiting mountains and valleys (*Ōreads*, *Napææ*), springs, rivers, fountains, lakes (*Næads*, *Oceanids*, *Krænææ*, *Limnæads*), forests and trees (*Hamadryads*, *Dryads*), groves and grottoes (*Alseids*, etc.), seas (*Nereids*), etc. They were beneficent genii of their dwelling-places, where they hunted, danced, sang, wove, and aided mankind in manifold ways. Goats, lambs, fruit, and oil were offered to them, but no wine. In art they are represented as charming maidens.

J. R. S. STERRETT.

Nymphs, Grotto of the: See CAPRI.

Nym'wegen, or **Nijmwegen** (Fr. *Nimègue*; Germ. *Nimwegen*): town of the Netherlands, province of Gelderland; on the Waal; 73 miles by rail E. of Rotterdam (see map of Holland and Belgium, ref. 6-H). It is important on account of its commanding position on the Rhine and Waal, and has extensive manufactures of beer, brandy, eau de cologne, tobacco, and cigars. Treaties of peace were concluded here between Holland and France (Aug. 11, 1678), between Holland and Spain (Sept. 17, 1678), and between France and Germany (Feb. 5, 1679). Pop. (1892) 34,128.



: the fifteenth letter of the English alphabet.

Form.—The form is derived through the Latin *O* from the early Greek and Phœnician *Ō*, the sixteenth letter of the Phœnician alphabet as adopted by the Greeks.

Name.—The Semitic name *ayin*, meaning "eye," had reference to the shape of the letter, and this name, on account of its meaning, gave the letter its place in the alphabetical series with *pē*, "mouth," *goph*, "head," *resh*, "head" (side-view), *shin*, tooth, i. e. in a group of letters whose shapes suggested resemblances to the head or its parts. The sound denoted by the Semitic letter was a guttural breathing not existing in the Greek language. The Greeks therefore applied the sign to denote a vowel-sound, as they did also in the case of *aleph* (*a*), *hē* (*e*), and *yōd* (*i*). They used it at first for all the various sounds of *o*: the short, the open-long (later *ω*), and the close-long (later *ου*). The alphabet of Miletus developed early (not later than 800 B. C.) a differentiated form, *Ω*, which was applied to express the long (open) *o*. This symbol was adopted into use at Athens toward the end of the fifth century, and by the middle of the following century in all Greek alphabets. The early Greek (Attic) name for *o* was *ōδ* (cf. *ελ*, the older name for epsilon, and *δ* that for upslon); the later, post-classical name, *omicron*, *ὀ μικρόν* (little *o*), to distinguish from *omega*, *ὀ μέγα* (big *o*). In Latin the practice of calling the letter by its long sound was revived, and this name, *ō*, has been continued into English.

Sound.—The simple letter *o* is used in English to denote two principal groups of *o*-sounds: (1) The close *o*, vulgarly called "long *o*": (*a*) In stressed monosyllables, before a voiced consonant or finally, this *o* appears as long and is accompanied by a vanish-sound or glide like *u*, i. e. it is a diphthong; thus *node*, *rode*, *old*, *go*, *no*, *so*. The same sound is denoted variously also, e. g. by *ew* in *shew*, *sew*, by *eau* in *beau*, by *ou* in *dough*, *though*, by *ow* in *throw*, *crow*, by *oa* in *moan*. (*b*) In stressed monosyllables before a voiceless consonant the sound is half-long, as in *note*, *ghost*, *post*. (*c*) In words of more than one syllable the vanish-sound nearly or quite disappears, even under the accent, as in *notary*, *October*, *social*. (*d*) In unaccented open syllables the close *o* appears as a short slack ("wide") vowel, as in *obey*, *poetic*.

(2) The open *o*, vulgarly called "short *o*." In phonetics it is the low-back-round vowel. It appears in two forms: (*a*) Slack ("wide"), as in *not*, *pot*, *mob*, *fog*, *odd*, *box*. The vowel in *soft*, *often*, *frost*, *broth*, *strong*, etc., i. e. before *f*, *s*, *þ*, *n*, is generally the same with slightly increased quantity. The same sound is denoted by *a* in *wasp*, *swan*, *wad*, *quality*, *yacht*, etc., by *ou* in *hough*, *ow* in *knowledge*. (*b*) Tense ("narrow"), in the position before *r*, as in *corn*, *lord*, *or*, *abhor*. The same sound is denoted by *a* in *all*, *water*, *law*, etc.; by *ou* in *cough*, *trough*. There is also a recent tendency in England to use the sound in *door*, *floor*, *four*, *oar*, *board*, *glory*, etc., where more generally the sound classified above as 1 (*a*) is used.

O stands also for the following *u*-sounds: (1) The high-back-narrow-round of *do*, *prove*, *shoe*, *two*, *who*, *lose*, etc. The same sound is denoted by *oo* in *spoon*, *too*, by *ou* in *youth*, *through*, by *u* in *rude*, *truth*, by *ew* in *Jew*, *crew*, by *ui* in *fruit*, *suice*. (2) The high-back-wide-round of *wolf*, *woman*, *bosom*. This sound is denoted also by *oo* in *book*, *wood*, by *u* in *bull*, *full*, *push*, by *ou* in *should*, *could*. (3) The unrounded vowel of *son*, *ton*, *dove*, *love*, *month*, *oven*, *mother*, *does*. This sound is denoted also by *u* in *up*, *but*, by *ou* in *tough*, *rough*, *double*, *southern*, *cousin*, *touch*, by *oo* in *blood*, *flood*.

Source.—(1) Of the close *o* as in *no* the chief sources are: (*a*) O. Eng. *ā*: Germ. *ei*, *ē* < Teutonic *ai* < Indo-Europ. *ai*, *oi*; *home* < O. Eng. *hām*: Germ. *heim*: Goth. *haim*s, cf. Gr. *κοῖμος*; *goat* < O. Eng. *gāt*: Germ. *geiss*, cf. Lat. *hædus*; *one* in *alone*, *only* < O. Eng. *ān*: Germ. *ein*: Goth. *ains*: cf. Gr. *οἶνος*, Lat. *ūnus*; *dough* < O. Eng. *dāg*: Germ. *teig*, cf. Gr. *τοῖχος*; *bone* < O. Eng. *bān*: Germ. *bein*; *oak* < O.

Eng. *āc*: Germ. *eiche*: *lode* (*loadstone*) < O. Eng. *lād*, cf. Germ. *leiten*: Goth. *laidjan*; *dole* < O. Eng. *dāl* (*dæl*): Germ. *theil*: Goth. *dails*; *toe* < O. Eng. *tā*: Germ. *zehe*; *mole* < O. Eng. *māl*: Goth. *mail*; *whole* < O. Eng. *hāl*: Germ. *heil*. (*b*) O. Eng. short *o*, which later suffered lengthening in open syllables and before *ld*, *mb*; as *hole* < *hol*; *stolen* < *stolen*; *knoll* < *cnoll*; *bolt* < *bolt*; *gold* < *gold*; *mould* < *molde*; *foal* < *fola*; *shoal* < *scolu*: *sworn* < *sworen*; *shorn* < *scoren*; *hoard* < *hord*; *board* < *bord*; *over* < *ofer*; *cove* < *cofa*; *clove* < *clofe*; *smoke* < *smocian*; *folk* < *folc*; *throat* < *protu*; *float* < *flotian*; *rose* < *rose*; *comb* < *comb*. (*c*) O. Eng. long *ō* preserved (i. e. not changed to *ū*, as in *nōn* > *noon*) before *w*; as *flow* < *flōwan*; *blow* < *blōwan*; *grow* < *grōwan*; *stow* < *stōwian*; *glow* < *glōwian*; *row* < *rōwan*; *low* < *hlōwan*. (*d*) O. Eng. *ea* (*a*) before *l* + consonant < Teutonic *a*; as *old* < O. Eng. *eald*: Germ. *alt*, cf. Lat. *alo*; *cold* < O. Eng. *ceald*: Germ. *kalt*: Goth. *kalds*; *hold* < O. Eng. *healdan*: Germ. *halten*: Goth. *haldan*; *bold* < O. Eng. *beald*: Germ. *bald*: Goth. *balps*.

(2) Of the open *o* the chief sources are: (*a*) M. Eng. short open *o*. This was derived either from O. Eng. *o*, as in *moth* < *moððe*, *lost* < *gelosed*, *broth* < *broð*, *god* < *goð*, *horn* < *horn*, *corn* < *corn*, or from O. Eng. *ō*, *ā* before nasal < Teutonic *a*, as in *long* < *long*: Germ. *lang*; *song* < *song*: Germ. *sang*; *soft* < *sōfte*: Germ. *sanft*; *brought* < *brōhte*: Goth. *brāhta* (**branhhta*); *thought* < *ðōhte*: Goth. *pāhta* (**panhta*). (*b*) M. Eng. *a* < O. Eng. *a* (*ea*) < Teutonic *a*, as in *salt* < *sealt*: Germ. *salz*, *warm* < *wearm*: Germ. *warm*. (*c*) M. Eng. *au* < O. Eng. *a* + guttural (*or w*) < Teutonic *a*; as in *draw* < *dragan*; *cause* < O. Fr. *cause*; *sauc* < O. Fr. *sauc*. (*d*) M. Eng. *o* < O. Fr. *o*; *cord* < O. Fr. *corde*; *order* < O. Fr. *ordre*.

(3) *O* in its value as *ū* (*oo*) is generally derived from O. Eng. *ō*. This may represent Teutonic *ō*, as in *stool* < O. Eng. *stōl*: Goth. *stōls*; *food* < O. Eng. *fōda*: Goth. *fōdeins*; *mood* < *mōd*: Goth. *mōps*. Or it may represent Teutonic *an*, as in *goose* < O. Eng. *gōs*: Germ. *gans*; *tooth* < O. Eng. *tōð*: Germ. *zahn*. In certain words *o* (pronounced *ū*) may come from an O. Eng. *ā* preceded by *w*; as *who* < *hwā*, *two* < *twā*, *swoop* < *swāpan*, *swoon* < *swānian*.

(4) *O* in its value as *ū* is chiefly derived: (*a*) From M. Eng. *ō*, O. Eng. *ō*, which was shortened in closed syllables after having changed to *ū*; thus in *hoof* < *hōf*, *roof* < *hrōf*, *book* < *bōc*, *good* < *gōd*. Before nasals this O. Eng. *ō* may represent Teutonic *ān*, as in *soon* < *sōna*: O. H. Germ. *sān*; *spoon* < *spōn*: O. H. Germ. *spān*. (*b*) From M. Eng. *u*, after *w* or before *l*, as in *wolf* < M. Eng. *wulf*, O. Eng. *wulf*: Goth. *wulfs*; *wool* < *wulle*; *pull* < *pullian*.

(5) *O* in its value as unrounded *ū* is chiefly derived: (*a*) From O. Eng. *u*, as in *son* < O. Eng. *sunne*, *love* < O. Eng. *lufian*; *tongue* < *tunge*; *won* < *gewunnen*; *some* < *sum*. (*b*) From O. Eng. *o* < Teutonic *o*, as in *honey* < O. Eng. *honeg*: Germ. *honig*; *oven* < O. Eng. *ofen*: Germ. *ofen*. (*c*) From O. Eng. *ō*, as in *mother* < *mōder*, *brother* < *brōðor*, *glove* < *glōf*, *flood* < *flōd*, *blood* < *blōd*, *done* < *gedōn*.

Symbolism.—*O* = oxygen (in chemistry); Ohio; Old, as in O. T., Old Testament, O. Eng., Old English; *Ō* = 11 (in mediæval Roman notation); O. F. = Odd Fellows; O. K. = all correct; O. S. = Old Style (calendar previous to 1752).

BENJ. IDE WHEELER.

Oa'hu: one of the Hawaiian islands. (See HAWAII-NEI.) The second in area and the most populous. Honolulu, the capital, is on this island.

Oak [O. Eng. *ōc*: O. H. Germ. *eih* > Mod. Germ. *eiche*; this name for the tree (*aik-*) is apparently restricted to the Teutonic, and probably replaced an Indo-Europ. name, of which Lat. *quercus*, and Germ. *föhre* are representatives]: any one of a genus (*Quercus*) of trees of the family *Cupuliferæ*, related closely to the chestnuts and beeches, and somewhat distantly to the hazels, hornbeams, alders, and birches, with which they agree in their amentaceous staminate flowers, small perianth, three-celled ovary, and exalbuminous seeds, but from which they are separated by the production of the familiar "acorn" fruit. (Figs. 1, 2, 3.) The ovary contains two ovules in each cell; but after fertilization one of these

grows rapidly at the expense of the rest, so that at maturity there is but one cell, and this usually contains but one seed. The little root of the embryo is directed to the point of the

is notable for its large acorns and fringed cups. It occurs E. of the Rocky Mountains. The chestnut-oak (*Q. prinus*, Fig. 2, c) occurs in the northeastern parts of the U. S. Live-oak (*Q. virginiana*, Fig. 2, d) occurs from Virginia to Texas and Mexico near the coast. It is evergreen, and attains a height of from 15 to 18 meters (50 to 60 feet). Its wood is very heavy, hard, and tough, and in the days of wooden ships was held in high repute for ship-building. The California live-oak (*Q. agrifolia*, Fig. 3, a) is a large spreading,



FIG. 1—The oak of Europe (*Q. robur*), with flowers and fruit.

acorn. The cup of the acorn is an involucre, which grows up around the fruit after fertilization.

There are about 300 species of oaks, nearly all of which grow naturally in the north temperate zone. They are most abundant in North America, Europe, and Asia. They

are absent from Australia, Africa (except the extreme northern portion), South America (except Colombia), and Madagascar. In the U. S. there are about forty-five species, besides half a dozen or more pretty well marked varieties.

The white oak (*Q. alba*, Fig. 2, a) is one of the most valuable trees of the Eastern U. S. Its tough, hard wood is used in the manufacture of wagons, the frames of railway-cars, heavy machinery, and implements in which great strength is required. It is also much used in making fine furniture, and for the inside woodwork of houses. Bur-oak (*Q. macrocarpa*, Fig. 2, b)

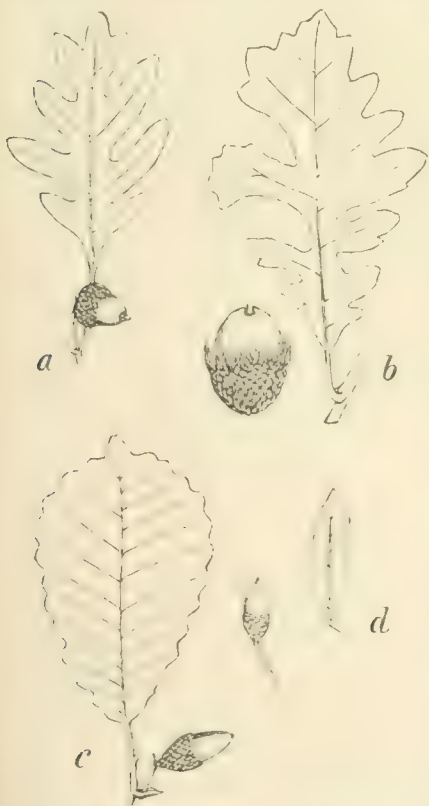


FIG. 2—a, white oak; b, bur oak; c, chestnut oak; d, live oak (one-fourth natural size).



FIG. 3—a, California live-oak; b, red oak; c, laurel oak; d, cork-oak (one-fourth natural size).

evergreen tree of the coast region of California. The red oak (*Q. rubra*, Fig. 3, b) is a fine tree ranging from the great plains eastward. Laurel oak (*Q. imbricaria*, Fig. 3, c) is a close-topped tree with pretty foliage. Its range is nearly the same as that of the red oak. The cork-oak (*Q. suber*, Fig. 3, d) of the Mediterranean region is of great importance for the commercial cork which it produces.

The oak of England—"British oak"—is *Q. robur* (Fig. 1), a fine tree with foliage resembling that of the white oak. It grows also throughout Europe and Western Asia.

Many oaks attain a great age. Trees from 400 to 500 years old are of common occurrence in the great forests of the U. S. In Europe some trees are supposed to be more than 1,000 years old.

CHARLES E. BESSEY.

Oak-apple and Oak-galls: See GALL INSECTS and GALLS.

Oak Harbor: village; Ottawa co., O. (for location, see map of Ohio, ref. 2-E); on the Portage river, and the Lake Shore and Mich. S. and the Wheeling and Lake Erie railways; 23 miles E. of Toledo. It is principally engaged in lumber manufacturing, and has a State bank with capital of \$25,000, and two weekly newspapers. Pop. (1880) 987; (1890) 1,681.

Oakland: city; capital of Alameda co., Cal. (for location, see map of California, ref. 7-B); on San Francisco Bay, and the Southern Pacific Railroad; opposite and 7 miles E. of San Francisco. An estuary of the bay separates the city from Alameda, and steam-ferries connect the cities of Oakland and San Francisco. Its location on the bay and at the western terminus of the railway system gives the city a large commercial importance. It is in an agricultural and fruit-raising region; is lighted by gas and electricity; has electric street-railways, paid fire department, and efficient police, water, and sewerage services; and contains many costly residences of San Francisco business men. The census of 1890 showed that 103 manufacturing establishments (representing 44 industries) reported. These had a combined capital of \$4,015,014, employed 2,944 persons, paid \$1,794,317 for wages and \$3,246,222 for materials, and had products valued at \$5,672,888. The manufactories include flour

and planing mills, marble and iron works, tanneries, smelting and refining works, fruit-preserving works, potteries, a cotton-mill, a large jute-factory, and carriage, windmill, and other factories. In 1890-91 there were 10,183 children enrolled in public schools, and 2,132 in private and parochial schools; 15 public-school buildings, and public-school property valued at \$1,002,970. There were 2 colleges, the Pacific Theological Seminary (Congregational), 7 private academies and secondary schools, a private normal and training school, a business college, and 8 libraries of all kinds, containing over 34,000 volumes. In 1894 there were 4 state banks, 2 national banks, a savings-bank, and 4 daily, 10 weekly, and 7 monthly periodicals. Pop. (1880) 34,555; (1890) 48,682. EDITOR OF "ENQUIRER."

Oak-lungs: See LUNGWORT.

Oan'nes: the man-fish god of the Babylonians, resembling Dagon of the Philistines. He is said to have issued from the Persian Gulf, and to have founded the civilization of Lower Chaldaea. As represented by art, a man's head was under that of the fish, and a woman's feet were joined to its tail.

Oases, ô-a'sêez [sing. oasis = Lat. = Gr. *oasis*. Cf. Coptic *ouahe*, dwelling-place, oasis, deriv. of *ouih*, dwell]: fertile areas in deserts. Like many geographical terms, oasis originally had only a local application, being the name of certain parts of the SAHARA (*q. v.*). The cause of barrenness of deserts generally being their dryness (see DESERTS), any local supply of moisture may induce fertility amid arid surroundings. Oases are therefore usually found in depressed districts, where a more or less subterranean supply of water is gathered from the occasional rainfall on the surrounding more elevated regions. The Saharan oases, El-Kharga, El-Siwah, etc., are of this kind. Wells are frequently dug in order to increase the supply of water for irrigation; and by using better methods than those of the Arabs the French have improved the condition of various Algerian oases. In Persia and Central Asia many settlements or oases on the margins of the interior deserts are located at points where streams escape from deep valleys in the inclosing barren mountains; here the water may frequently be led over the plain before disappearing in the central arid area, as at Kashgar, Yarkand, and Khotan. In other cases the oasis is near the termination of the stream, where its dwindling waters are easily led about in irrigating canals, as at Merv. Many settlements in the western arid region of the U. S. and in the drier parts of South America are similarly located. Although the term oasis is often used in a figurative or poetical sense to indicate a place of great attractions, the actual oases of deserts can not be so described. Their water-supply is often scanty and impure; they are generally excessively dusty; their products are narrowly limited in variety, and often fall short in quantity. W. M. DAVIS.

Oat, or Oats [O. Eng. *ātan*, a name not found outside English, and of doubtful etymology; it displaces a Teutonic word represented by Germ. *hafer* or *haber* < O. H. Germ. *habaro*: Dutch *haver*; cf. *haversack*]: the common name for the seeds and plants of the numerous species of a genus of grasses, *Avena*, generally characterized by having the spikelets in loose panicles, the glumes as long as the florets, the paleæ firm and almost cartilaginous, and the outer one of each floret provided with an awn, which is twisted at the base, but this generally disappears in cultivation. The cultivated oat (*Avena sativa*) is an annual, though the genus contains several perennial species. It is supposed to have developed from *Avena fatua* found growing wild in Europe, where it is considered a weed. It is also wild in California, where it is sometimes cut when green and cured for hay. The oat is decidedly a northern plant and thrives best in a cool, moist soil, reaching the highest state of development in the higher latitudes, and rapidly degenerating when grown in a hot country. Some varieties when threshed part with the hull, and are called hull-less oats; *Avena nuda* is one of these varieties. There is a great difference in the varieties regarding the awn; in some it is entirely wanting, while in others it is long and bent; and as it is hygroscopic, considerable motion is produced when it is changed from a dry to a moist atmosphere. *Avena sterilis* is one of the so-called animated oats.

Oats are produced as one of the chief cereals in nearly all countries where they can be grown; they furnish the most common grain food for horses, and are much used also as food for men. There are more than 150 varieties in the U. S.; in 1893 the acreage was 27,273,033, the product was

638,854,850 bush., and value \$187,576,092. The most productive States were: Iowa, 95,448,231 bush.; Illinois, 83,842,178; Wisconsin, 46,680,266; Minnesota, 41,562,196; Indiana, 32,092,170; Pennsylvania, 30,601,098; and New York, 30,208,728. The oats grown in the Southern States are inferior, and are mostly of the red or dun varieties. In most of the States the legal bushel is 32 lb. Most varieties are cultivated for the grain, although a few are useful for fodder. The oat is a rapid grower, and requires an abundance of available plant-food for perfect development.

The following analyses are the average of many analyses made at experiment stations in the U. S. They are both given in per cent.:

FERTILIZER ANALYSIS.

SUBSTANCE.	Nitrogen.	Phosphoric acid.	Potash.
Grain.....	1.60	0.77	0.55
Straw.....	0.65	0.22	1.22

FODDER ANALYSIS.

SUBSTANCE.	Water.	Ash.	Protein.	Crude fiber.	N.-free extract.	Fat.
Grain.....	11.0	3.0	11.8	9.5	59.7	5.0
Straw.....	9.2	5.1	4.0	37.0	42.4	2.3

The oat has comparatively few insect enemies, but is subject to about the same fungus diseases as wheat, rust being quite prevalent, particularly if the weather is hot and moist. It is also subject to loose smut in a way similar to wheat, the smut, however, being more destructive to oats than to wheat. Early varieties and early-sown grain are the least likely to be attacked by fungus diseases. G. C. WATSON.

Oates, Titus, alias AMBROSE: a notorious informer; b. in London, England, about 1620; educated at Merchant Taylors' School and at Cambridge; took orders in the Church of England; officiated in several parishes; became a chaplain in the navy; was dismissed from that post on a charge of disgraceful conduct; professed conversion to Roman Catholicism; became a Jesuit; resided some months in the colleges at Valladolid and St.-Omer; was expelled from both institutions for alleged misconduct; returned to England in 1678, and gave information to the authorities of the existence of a "Popish plot" for the extirpation of Protestantism in England, accusing several of the Roman Catholic nobility and gentry of participation in the pretended conspiracy. The admitted zeal for Roman Catholicism displayed by James, Duke of York, the suspected inclination of King Charles II. to the same faith, and the unexpected corroboration of a part of Oates's testimony by the discovery of some incriminating papers in the possession of one of the accused gave color to the charges, and the murder of Sir Edmundbury Godfrey, the magistrate before whom the testimony was taken, produced conviction in the popular mind. Oates thereupon developed his original testimony into a circumstantial account of the intended burning of London and the shipping in the Thames, a massacre of Protestants, and a landing of a French army in Ireland, adding that the pope had intrusted the government of England to the Jesuits, that the chief officers of state had already been parceled out among the great Roman Catholic lords, that the king was to be assassinated, and that the queen was privy to the plot. The king was incredulous from the first, and refused to countenance the attacks upon his wife; but among the people the excitement was intense, many believing that the Roman Catholics intended to repeat in England the massacre of St. Bartholomew. The houses of Roman Catholics were searched, and extraordinary precautions taken against the supposed danger. Oates was lodged in Whitehall, received a large pension, and had guards assigned him. The accused Roman Catholics were put on trial Nov., 1678; several were convicted and executed; and fresh victims were added from time to time for two years. After the execution of Lord Stafford, Dec., 1680, there was a revulsion of public sentiment; the bad character of Oates was exposed; the Duke of York obtained a verdict of £100,000 against him for defamation (1685), and he was imprisoned as a debtor. On the accession of James II. severer measures were taken; Oates was convicted of perjury, sentenced to stand in the pillory five times a year in as many different towns during his life, to be whipped from Aldgate to Newgate, and thence to Tyburn, and to be imprisoned for life. Public sentiment being now fiercely against him, he was mobbed and nearly killed at the first

pillory, and received 1,700 lashes at the whipping. After the accession of William and Mary, Parliament declared the conviction of Oates illegal. He was pardoned, received a pension of £300 per annum, and survived in obscurity seventeen years longer, dying in London, July 23, 1705. Oates's career is described at some length in Macaulay's *History of England*. See also the accounts in Langard's and Burnet's works. Revised by F. M. COLBY.

Oath [M. Eng. *othe*; O. Eng. *ād*; Germ. *eid*; Icel. *edra*; Goth. *afþs*; Teuton. *afþas*; O. Ir. *oath*, *oath*; akin to Gr. *tras*, defined as *ὅρκος* by Hesychius; cf. *ἱρκλος*, firm]: in law, a solemn asseveration or promise under sanction of the maker's religion, in the presence of one legally authorized to administer it. If administered without authority, it has no legal effect as an oath (see PERJURY), although the transaction may subject the parties to punishment under statutes against unlawful oaths. (Stephen's *Digest of the Criminal Law*, §§ 83-85.) In certain contingencies a person has authority to administer an oath to himself. (*Wilson vs. De Coula*, 22 Chancery Division 841.) The object of an oath is so to affect the conscience of the maker as to guaranty his future conduct or present veracity. The means employed in most legal systems is an invocation to a superior power to attest the maker's good faith or veracity, or an imprecation of divine vengeance upon him for false swearing, or both. Primitive oaths contain often no express appeal to a deity. For example, two men grasp an animal, which is chopped in two, as emblematic of what will befall the one who is false to his vow; or the swearer calls on a fierce beast to punish him if he lies. In other cases, however, the primitive oath-taker calls upon a river, like the Ganges, or upon the sun, or other great natural object which he worships, to destroy him if he swears falsely.

The most important legal oaths in modern times are those required of officials and those required of witnesses. Official oaths are usually promissory, as the following examples will show. The British sovereign upon coronation solemnly promises and swears to govern the people of Great Britain and dominions thereto belonging according to the statutes in Parliament agreed on and the laws and customs of the same; to cause law and justice in mercy to be executed in all his judgments; to maintain the laws of God and the Protestant reformed religion established by law; and to secure unto the bishops and clergy of the nation all such rights and privileges as by law shall appertain unto them. The oath required of the President of the U. S. is that he will faithfully execute the office, and will, to the best of his ability, preserve, protect, and defend the Constitution of the U. S. (Art. 2, § 1, cl. 8.) An English judge takes an oath to "do right to all manner of people, after the laws and usages of this realm, without fear or favor, affection or ill-will"; and similar promises are made by judges in the U. S. upon taking office. A juror's oath is promissory, binding him to try the issue joined in the particular case, and give a true verdict according to the evidence. At times test oaths are required of officers. Of this kind was the oath prescribed by § 1756 of the U. S. Revised Statutes (repealed by ch. 46, Laws of 1884), often called the iron-clad oath, to the effect that the affiant had never voluntarily borne arms against the U. S. since he had been a citizen thereof, nor voluntarily given aid, countenance, counsel, or encouragement to persons engaged in armed hostility thereto. Such official oaths are declaratory. The ordinary witness oath is promissory in form, the witness swearing that the evidence he shall give shall be the truth, the whole truth, and nothing but the truth. An affidavit is in the form of a declaratory oath.

In the absence of express statutory directions the oath is administered in that form which the one taking it considers most binding on his conscience. According to the ordinary common-law form, the affiant holds the New Testament in his bare right hand, assents to the promise to tell the truth addressed to him by the proper officer, and kisses the book. Jews are sworn on the Pentateuch, the closing language of the oath being, "So help you Jehovah"; Mohammedans on the Koran, and Parsees on their sacred books. A part of the ceremony of swearing a Hindu consists in his touching the foot of a Brahmin, or, if a Brahmin is sworn, in his touching another Brahmin's hand. In some parts of India the native takes his oath on water from the Ganges. Chinese oath-takers break a saucer or behead a fowl as an essential part of the ceremony, thereby imprecating punishment upon them for false swearing.

As the religious sanction is an essential element of the oath, it can not properly be taken by an atheist. Under the U. S. Constitution and the constitutions of several States any religious test as a qualification to any office or public trust is forbidden, and officers are allowed to substitute an affirmation for an oath. (See U. S. Constitution, Art. 6, cl. 3, and U. S. R. S., § 1.) In nearly one-half of the U. S. atheists are no longer incompetent as witnesses, but are permitted to give their evidence under the sanction of a solemn affirmation. (Stimson's *American Statute Law*, §§ 45, 46, 47.) Persons having conscientious scruples against taking an oath are generally allowed to affirm. The Oaths Act of 1889 (51 and 52 Vict., c. 46) permits every person who objects to be sworn, either because he has no religious belief or because the taking of an oath is contrary to his religious belief, "to make a solemn affirmation instead of taking the oath, in all places and for all purposes." This legislation was induced largely by the punishment inflicted upon Charles Bradlaugh for sitting and voting in Parliament, in July, 1880, without taking an oath. *Clarke vs. Bradlaugh*, 7 Queen's Bench Division 38.

The employment of oaths, even in legal proceedings, has been criticised as irreligious, and also as useless. Pothier declared: "In the exercise of my profession for more than forty years . . . I have not more than twice known a party restrained by the sanctity of the oath from persisting in what he had before asserted." (1 Pothier, *On Evidence*, § 831.) It has been said in reply: "Even the good might be too negligent and the bad would frequently have no concern at all about their words if it were not for the solemnity of this religious act." The tendency of modern legislation is to substitute declarations for unnecessary oaths (see Promissory Oaths Act, 31 and 32 Vict., c. 72), and to treat a solemn affirmation as affording a guaranty of the good faith and veracity of the maker equally trustworthy with that furnished by the oath.

Reference to Oath.—This in Scotch law is the last resource of a party who despairs of any other evidence. It is allowable in civil actions only, and by it the party who refers places the cause on the sole issue of his antagonist's oath. Whatever the antagonist swears to is indisputably true for that cause, though in another proceeding, as a prosecution for perjury, it may be proved to be false. Bell's *Principles of the Law of Scotland*, §§ 2263 to 2269; E. B. Tylor's *Ordeals and Oaths*, 34 *Macmillan's Mag.* 1; J. E. Tylor *On Oaths* (London, 1835); Junkin *On the Oath* (New York, 1845); Ford *On Oaths* (London, 1890). F. M. BURDICK.

Oaxaca, or **Oajaca**, ō-ā-haa'kaā: a state of Mexico; bounded S. by the Pacific and bordering on Guerrero, Puebla, Vera Cruz, and Chiapas; the eastern portion is included in the Isthmus of Tehuantepec. Area, 28,778 sq. miles. With the exception of a narrow coast belt it is mountainous throughout, the principal range being the Sierra Madre del Sur, which crosses it from E. to W., with peaks nearly 12,000 feet in height. Many of the intervening valleys are below 3,000 feet. The soil nearly everywhere is fertile and well watered; the climate, except in the coast belt, is delightful and very salubrious. Almost the only prominent industry is agriculture; the principal crops are maize (for home consumption) on the highlands, and sugar, cotton, and indigo in the warm valleys; coffee-planting has also risen in importance. The cochineal insect is indigenous, but comparatively small quantities are now exported. The mountain forests have abundance of valuable timber. The mineral deposits are said to be extensive and very rich; but few mining improvements have been introduced, and the present annual yield of gold and silver does not exceed \$2,000,000. The state has many interesting antiquities. (See MEXICAN ANTIQUITIES.) Pop. (1893) estimated, 815,460, of whom seven-eighths are civilized Indians, principally Zapotecs and Mixtecs. HERBERT H. SMITH.

Oaxaca: capital and principal city of the Mexican state of the same name; situated near the center of the state, in a beautiful valley at the foot of the Sierra Madre del Sur, 3,900 feet above the sea (see map of Mexico, ref. 8-II). The valley was granted in fief to Hernando Cortés (whence his title of Marqués del Valle), and the town was officially founded in 1532. Owing to its isolation it has had little share in the progress of modern Mexico. It is the seat of a bishopric and has a theological seminary, a good public library, cathedral, etc. Pop. (1889) 28,500. H. H. S.

Ob, or **Obi**, o'bē: a river of Western Siberia. It rises in the Altai Mountains within the Chinese dominions, and

flows in a northern and northwestern direction, with a tortuous course of 2,600 miles, into the Gulf of Obi, an inlet of the Arctic Ocean on the shore of Siberia. It receives many affluents, of which the principal is the Irtysh (1,500 miles long), coming in from the left, 200 miles below Tobolsk. It is navigable from Tomsk to its mouth, and forms the commercial highway between China and European Russia. From May 15 to Sept. 15 steamers and lighters ply between Tomsk and Tiumen on the Tobol, near the frontier of Russia.

Revised by M. W. HARRINGTON.

Obadi'ah [from Heb. *ʿObadyāh*, liter., worshiper of Jehovah]: one of the minor Hebrew prophets, of whom nothing is known, except what can be inferred from his book, the briefest book of the Old Testament. This is a monograph on the Day of Jehovah, and especially on the relations of Edom to that day. Punishment has just been inflicted on Edom (verses 1-6) for an offense committed against Jacob (7-14), and the impending day of Jehovah will complete the overthrow of Edom and the triumph of Jacob (15-21). The book has strong affiliations with Joel and with Jer. xlix. 7-22. Different scholars assign it to all places among the prophets, from the earliest to the latest; but the way in which it mentions Judah, Joseph, Ephraim, Samaria, seems to indicate a date before the overthrow of the northern kingdom. Its position among the books of the minor prophets indicates that it belongs to the earlier group of them, and it fits well the historical situation in the reign of Amaziah, King of Judah, 2 Kings xiv. 7-8, 10; 2 Chron. xxv. 11-12, 19. According to this view the similar sentences in Jer. xlix. are quoted from Obadiah.

W. J. BEECHER.

Oban'do. JOSÉ MARIA: general and politician; b. in New Granada about 1797. Nothing is known of his birthplace and parentage; it is said that he was stolen when a child and was adopted by a family of Popayan, whose name he took. In 1822 he joined the republican army, and later he became prominent as a leader of the liberals in the disturbances which ended in the dissolution of the first republic of Colombia. The republic of New Granada having been formed, Obando was vice-president and acting president in the provisional government Nov. 23, 1831, to Mar. 10, 1832. Under Santander he was Secretary of War 1832-37, and in the latter year he was an unsuccessful candidate for the presidency. Marquez was elected and Obando led a revolt against him which lasted until 1841, but he was eventually defeated and banished for several years. Subsequently he was prominent in congress, was president of Cartagena 1850, and was elected president of New Granada for the term beginning in 1853. In 1854, owing to a conflict with congress, he assumed dictatorial powers, and was deposed. In the civil war of 1860 he supported the federalists, commanding a force in Cauca, where he was killed at the battle of Cruz Verde, June 29, 1861. H. H. SMITH.

Obeld', El: the capital of Kordofan, in the Sudan, Africa. It derives its importance primarily from the fact that it lies in a depression of a vast semi-arid plain and its wells never lack water (see map of Africa, ref. 4-F). When the Mahdist revolt occurred (1882), the town had about 100,000 inhabitants. It was a great supply center for Darfur and other parts of the Sudan, and sent large quantities of ostrich feathers and Kordofan gum to the Nile. The houses were mud huts with the exception of the Egyptian Government buildings, which were of sun-dried brick. Insurrections, epidemics, and the ruin of commerce in the Mahdist domain greatly injured the town. C. C. ADAMS.

Ob'elisk [from Lat. *obeliscus* = Gr. *ὀβελίσκος*, dimin. of *ὀβελός*, spit, pointed pillar]: the name given by the Greeks to the quadrilateral, tapering monolithic monuments erected by the Egyptians in front of their temple pylons as votive offerings to the gods and as memorials of the victorious might conferred by the deities upon the Pharaohs. They are usually composed of Syenite granite, and were cut from the rock with great skill. There is now near Syene, in Upper Egypt, a partially finished obelisk which measures 10½ feet square at the base and 92 feet in length, 72 feet of it being completed. These great masses were finished on three sides before being finally detached from the bed-rock by the use of drills and wet wedges. They were made slightly convex, to obviate the concave effect produced by sides that were exactly flat. The usual method of inscription was with a single column of hieroglyphs down the center of each side; three lines to the side ordinarily indicate a later usurpation. They were placed in pairs, for

architectural effect, before the great pylons of the temples, and were devoted to the glorification of the Pharaoh in bombastic and laudatory phrase. With the exception of a small obelisk found in the necropolis of Memphis by Lepsius, the oldest one known is that now standing at Heliopolis (the city whose hieroglyphic name was written with the sign of the obelisk), erected by Usertasen I., the second king of the twelfth dynasty. Its companion fell in the twelfth century. It is of Syenite granite, 66 feet high, but is now partially buried at the base and has its deeply cut hieroglyphs obliterated on two sides by bees' nests. Till a comparatively recent date its top was covered by a metal sheathing. Cleopatra's Needles was the name given to a pair of obelisks removed from Heliopolis to Alexandria in Roman times, one of which is now on the Thames Embankment in London, and the other in Central Park, New York, the latter having been presented by the Khedive Isma'il. They were originally erected by Thothmes III. It was one of the great feats of Queen HATASU (q. v.) to have completed and erected one of the largest obelisks, 109 feet high, in the short space of several months. (See Edwards's *Fel-lahs, Pharaohs, and Explorers*, p. 268 ff.) At Luxor one obelisk is still *in situ* at the E. of the temple pylon; the western and smaller one now stands in the Place de la Concorde at Paris, being 75 feet high, and weighing 212 tons. This pair was erected by the great Ramses. At Karnak, at about the center of the temple as it now exists, stood two obelisks which indicated the entrance to the temple at the time of Thothmes I. Both were erect in 1738, when Pockocke visited the place, but one has since been destroyed. The other stands 76 feet high. At Philæ in the portion of the Temple of Isis built by Nectanebo, were two sandstone obelisks, the western one being still *in situ*, while its mate is in England. These monoliths had on their bases Greek inscriptions which gave assistance in the original decipherment of the hieroglyphic character. Two others in granite in the same temple have been destroyed. Moldenke gives a list of 50 obelisks, erect and prostrate or in fragments, 20 of which are in Egypt, 2 in Constantinople, 12 in Rome, 7 in other parts of Italy, 2 in France, 5 in England, 2 in Germany, and 1 in New York. The list, however, includes copies and uninscribed stones. See *Cleopatra's Needle* (in the By-paths of Bible Knowledge Series); Gorringer, *Egyptian Obelisks* (New York, 1882); Moldenke, *The New York Obelisk* (New York, 1891); Maspero, *Egyptian Archaeology* (London, 1887); Ebers, *Cicerone durch das alte und neue Aegypten* (Stuttgart, 1886), etc. CHARLES R. GILLET.

Ober-Ammergau, o'-ber-aa'-mer-gow: a village of Bavaria, with a population of 1,200; beautifully situated on the Ammer, 46 miles S. W. of Munich; celebrated for the performance of a mystery representing the passion and death of Christ, which takes place here every ten years (see map of German Empire, ref. 7-F). The custom originated in 1634, when the population made a vow to this effect if the village escaped from further invasion of the plague, which prevailed in the vicinity and had begun to ravage their community. The performance requires nearly 600 actors, many of whom are children, chosen among the inhabitants themselves, lasts from 8 A. M. to 5 P. M., with an intermission of an hour and a half, is repeated on Sunday, Monday, and Friday generally, from May to September, and attracts very large audiences, as it is the only place in which mysteries are still performed in true mediæval style. See W. T. Stead's *The Passion Play in 1890* (London, 1890), which gives the text of the play in German and English.

Revised by S. M. JACKSON.

Oberge, EILHARD, von: mediæval German poet who appears in documents from the years 1189-1207 as a vassal of Henry the Lion. With the latter he probably visited England, where he may have learned about the legend of Tristan and Isolde, which he for the first time introduced into German literature by his epic poem *Tristan und Isolde*. Of this poem only a few fragments are extant, from which, however, we may gather that Oberge's account of the legend in many respects differed from the later version of Gottfried von Strassburg. See Franz Lichtenstein, *Eilhard von Oberge* (1878); W. Golther, *Tristan und Isolde* (1887).

JULIUS GOEBEL.

Oberhausen, o-berhow'-zen: town; in the Rhine province, Prussia; 5 miles from the east bank of the river Rhine and 20 miles N. of Düsseldorf (see map of German Empire, ref. 4-C). It is a busy railway center; has zinc-smelting works, manufactures of wire rope, glass, porcelain, etc. Extensive

coal-pits are in the vicinity. It is of modern origin, its first houses being built in 1845, and received its municipal charter in 1875. Pop. (1890) 25,249.

Oberlin: village; Lorain co., O. (for location, see map of Ohio, ref. 2 G); on the Lake Shore and Mich. Southern Railway; 35 miles S. S. W. of Cleveland, 105 miles N. N. E. of Columbus. It is the seat of OBERLIN COLLEGE (*q. v.*), and contains a manual-training school, a business college, a school of telegraphy, a national bank, a State bank, and a bi-monthly, a quarterly, and three weekly periodicals. Pop. (1880) 3,242; (1890) 4,376. **EDITOR OF "NEWS."**

Oberlin, JOHANN FRIEDRICH: philanthropist; b. at Strassburg, Aug. 31, 1740; early showed a remarkable degree of benevolence; was educated at the Strassburg University; was ordained to the Lutheran ministry; became in 1866 pastor of Steintal or the Ban de la Roche, a wild district in the Vosges Mountains. Here, under his wisely directed care, deep ignorance was succeeded by general intelligence; moral darkness gave place to piety and a remarkable improvement in the industry and thrift of the district, which retained its prosperity, and in 1890 had 6,000 inhabitants. The Ban de la Roche was visited by many philanthropists, to whom Oberlin's work served as a model. D. at Waldbach, June 1, 1826. See Butler's *Life of Johann Friedrich Oberlin* (London, 1882); and the *Writings* edited by Burkhardt (4 vols., Stuttgart, 1843).

Oberlin College: an institution of learning at Oberlin, O.; founded in 1833 by Rev. John J. Shipperd and Philo P. Stewart. It was chartered Feb. 28, 1834, as Oberlin Collegiate Institute, and retained that name until 1850. The plan was to establish a Christian school for the liberal education of both sexes, encouraging students to assist themselves by manual labor. By 1835 there were theological, college, ladies', and preparatory departments; there was added in 1867 a conservatory of music. The theological seminary has an intimate relation to the Congregational churches of the U. S., but is not authoritatively controlled by them. Its graduates receive the degree of D. B. The seminary building contains accommodations for 100 students, besides the chapel and lecture-rooms. In the college proper there are three courses, the classical, the philosophical, and the scientific, leading respectively to the degrees of A. B., Ph. B., and S. B. The three courses are on an equality as to requirements for admission and graduation. After the freshman year two-thirds of the work is elective. The preparatory school is called the academy. It offers four-year courses leading to the different college courses. The general faculty consists of the president, 36 professors, and 52 permanent instructors, lecturers, and tutors. Of these, 6 professors and 17 instructors are in the conservatory of music. The productive endowment is \$620,000. The tuition is \$40 per year. The libraries contain 40,000 volumes. The men's gymnasium, the women's gymnasium, and an athletic field furnish opportunities for physical culture. The chemical, botanical, and zoological laboratories have separate buildings. There is a valuable museum and herbarium. Asa Mahan was president from 1835 to 1850, Charles G. Finney from 1851 to 1866, James H. Fairchild from 1866 to 1890. In 1891 William G. Ballantine was appointed. The board of trustees consists of twenty-four members, four of whom are elected annually. The alumni elect one-fourth of the board. Negro students have never been refused admission, and they have constituted from 3 to 5 per cent. of the whole. The total attendance of students, averaging from 1,300 to 1,500 a year, is about equally divided between the two sexes, and about half of all come from outside the State of Ohio. **ALBERT A. WRIGHT.**

O'bersteiner, HEINRICH, M. D.: alienist; b. in Vienna, Austria, Nov. 13, 1847; studied medicine in the university of that city, graduating in 1870; was appointed director of the insane asylum of Ober-Döbling in 1872, and Extraordinary Professor of Psychiatry at the Vienna University in 1880. His most important work is *Anleitung beim Studium des Baues der nervösen Central-Organ im gesunden und kranken Zustande* (Vienna, 1888). **S. T. A.**

Obes'ity [from Lat. *obe'sitas*, deriv. of *obe'sus*, fat, plump; liter., having eaten one's fill; *ob* + *e'dere*, eat]: an abnormal deposit of adipose tissue under the integument and around the viscera. The amount of adipose tissue in the organism may be considerably augmented without giving rise to any inconvenience on the part of the individual in the way of encumbering his movements or interfering with the func-

tions of the viscera, etc.; but such a condition would not come within the scope of this article. It is still a condition of health, and the term *obesity* should be applied only to those cases where the deposit of fat is so great as to incommodate the patient. Among the predisposing conditions to obesity may be mentioned, first, *hereditary susceptibility*. It is common to meet certain families in which most of the members are corpulent, and sometimes the tendency to become so may be traced through several successive generations. Inactivity and sedentary occupations exert a very material influence over the production of fat, especially when combined with a rich diet. In women the predisposition to corpulence exists in the first years of child-bearing, and again after the "change of life"; in men, between the ages of forty and sixty. The exciting cause is generally found to be malassimilation, due to some derangement of the digestive organs. Fatty food may be directly deposited as such in the tissue, but this is by no means the only source of tissue fat. The albuminoids ingested are converted into two portions, one a fatty, the other a nitrogenous, and thus albuminous food aids largely in the production of adipose tissue. Starches and sugars aid, not so much by conversion into fat as by being readily oxidizable, and therefore preventing destruction of existing fats or fatty elements newly presented. The symptoms of obesity may be enumerated as follows: Diminution of mental and bodily activity, impeded action of the viscera, the organs of respiration, circulation, and digestion. The slightest exertion will bring on panting; the blood is comparatively deficient in quality and quantity, and, as a result, the muscles become weak and flabby. The countenance becomes bloated and sallow, and the patients are liable to suffer from a variety of affections which depend on malassimilation, as gout, rheumatism, etc. Often fatty degeneration of the heart or liver coexists, and we then have the symptoms of these maladies superadded. Harvey has shown in his work on corpulence that the senses of *hearing, taste, smell, or sight* are often absent altogether or blunted to a very annoying extent in corpulent persons. The only methods of treatment that promise good results are the hygienic and dietetic. These methods, which have become famous from the labors of Banting, Oertel, and others, depend for their success upon the regulation of exercise in such manner that the processes of oxidation of food may proceed in normal manner; and regulation of the food, that no excess of fatty elements, and indeed a less quantity than normal, may be presented to the organism. To this end fatty foods are to be reduced almost to nothing, and with them also carbohydrates, whereas the albuminous food, though also reduced, is still given in somewhat liberal measure. The last is necessary that the general systematic tone and functions may be maintained for the purposes of efficient circulation and destruction of fat. Exercise requires definite regulation to suit the needs of each case. Cold bathing, by stimulating the general system and by furnishing a certain amount of exercise, is a useful adjunct. **WILLIAM PEPPER.**

Obl: a river of Siberia. See Ob.

Obliter dictum [Lat., liter., said incidentally; *obliter*, by the way; *dictum*, neut. perf. partic. of *dicere*, say]: in law, a remark or suggestion made by a judge or a court in disposing of a question which is not necessary to its decision, sometimes termed a *dictum*. Such a suggestion is not regarded as authoritative when the point comes up for positive decision. A *dictum* may, however, have much influence from its reasonableness or from the high reputation of the tribunal from which it emanates. Much law is generated in this manner, one court uttering dicta and another at a later date embodying them into decisions.

Revised by F. M. BURDICK.

Oblates, ob-lä'ts [from Lat. *oblatus* (*offer're*), offered > Span. *oblado*; Fr. *oblat*]: in the Roman Catholic Church, persons associated after the manner of monks or nuns, but without solemn vows. Some oblates are secular priests; others are without orders. The institute of oblates was one of the many reforms introduced in the diocese of Milan by St. Charles Borromeo toward the close of the sixteenth century. He made use of their services chiefly in the wild and inaccessible alpine districts of his diocese. The institute still exists.—The OBLATES OF MARY IMMACULATE are a congregation of regular clerks, founded in 1815 by Bishop Mazenod of Marseilles. They visit the poor and the prisoners.—The OBLATE SISTERS OF PROVIDENCE are a sisterhood founded at Baltimore in 1825.

Obligation [from Lat. *obligare*, oblige, liter., bind before or against; *ob*, against, before + *ligare*, bind]: in Roman and modern law, a legal relation in which one party, the obligee or creditor, has a claim against the other party, the obligor or debtor, who is burdened with a corresponding duty. The duty of the obligor is usually to do something; either to convey property or pay money (*dare*), or to render some service (*facere*). It may be, however, that the obligor is merely to refrain from doing a particular act (*non facere*). In the broadest sense, the claims of the state, of a husband, of a parent, and the corresponding duties of the citizen, the wife, the child, etc., may be regarded as obligations (the so-called obligations *ex re venientes*); but such rights and duties are mere incidents of pre-existing and more general relations, while obligations in the narrower and proper sense are special and independent relations. The term, moreover, is regularly confined to private law; and within this field, to relations of an economic character, when the *dare* or *facere* is of economic value to the obligee. Obligations, accordingly, are treated as a special class of property rights; property (*bona, biens, Vermögen*) consisting from a legal point of view partly of rights *in rem*, and partly of obligations or rights *in personam*. (See JURISPRUDENCE.) In the case of rights *in rem*, the object over which the right or power is exercised is a thing; in the case of obligations it is sometimes said to be the person of the debtor. The obligation, however, is rather a right against a person than over a person; it does not seize or cover the person of the obligor as rights *in rem* seize and cover things; it is simply a right to demand from the obligor a particular act or course of action. For this reason the Germans define the obligation as a power over the will of the debtor—a definition which is open to the objection that the law regards only his conduct.

In primitive society the remedial rights of the creditor—the means, that is, by which his claim was enforced—were rights over the person in the fullest sense; they could be pushed to the point of making the debtor a slave. In modern society, however, since the general abolition of imprisonment for debt, the ultimate sanction of the obligation is found in the possible seizure and sale of the debtor's property; and some jurists accordingly define the obligation as a right not over the person but over the purse or estate of the obligor.

Rights over things and claims *in personam* have often been brought under a single category by declaring that the obligation is a thing, an "incorporeal thing." Old German, French, and English law go a step further, and assign obligations or claims to the category of movable things. It is obvious that the word "things" in any such classification is used in the sense of property rights; and that when we declare a claim to be a movable, we merely mean that an obligation, when regarded as an asset or portion of an estate, is governed by the rules which govern personal property, and not by the rules which govern real property.

Establishment.—Obligations are called into existence by the law in consequence of various facts, the most important of which are the acts of individuals. Among these acts again the most important are agreements or contracts and wrongful acts or torts (*delicta*). The Roman lawyers, like the English, started with the idea that all obligations were either *ex contractu* or *ex delicto*; and as it became necessary to recognize obligations otherwise created, they treated them as analogous either to contractual or to tortious obligations (*obligationes quasi ex contractu, quasi ex delicto*), thus obtaining a classification which, if not wholly scientific, was at least convenient, and which has generally been retained in the modern European codes. One of the chief objections to this classification is that it confuses original and substantive rights created by legal acts with secondary and remedial rights resulting from the infringement of substantive rights—an error which English lawyers avoid by treating torts as a subject wholly distinct from contracts and quasi-contracts. On the other hand, the English habit of treating obligations principally if not exclusively under the head of contracts, and of devoting treatises on contracts mainly to the discussion of obligations, is somewhat confusing, since contract is a method of creating all kinds of private rights, not obligations merely, but also rights *in rem* and family rights. An extreme illustration of the way in which these various functions of contract may be confused is found in the declaration of the courts in the U. S., that to divest a person of title acquired by grant is to impair the obligation of contract.

Parties.—Every obligation has at least two parties, and

may have more; there may be a plurality either of obligors or of obligees. In such cases the creditors may be partial creditors and the debtors partial debtors, each of the creditors having a right to demand his share and each debtor being held to pay his share and no more. In the Roman law, and in all the modern European codes except the Prussian, the presumption is that joint obligations are of this character (*nomina ipso jure divisa sunt*). It is possible, however, that each of the creditors may be entitled to demand, or each of the debtors bound to render full performance, and that when one creditor has secured or one debtor has rendered such performance the obligation is extinguished. In such a case the continental jurists call the obligation "solidary" (*obligation solidaire, Gesamtschuldverhältniss*). The majority of German writers draw a further distinction between "correal" obligations (Lat. *correi*, joint parties) where there is really but one obligation with a number of joint creditors or joint debtors (e. g. partners, principal and surety), and "merely solidary" obligations, where there is really a plurality of obligations, but when the content or object of all the several obligations is identical. Such a relation exists, as a rule, only between codebtors (e. g. joint tortfeasors). This distinction was unknown to the early codifiers, and is generally rejected in the new codes.

In declaring an obligation "solidary" the law defines the relations between the creditors on the one hand and the debtors on the other, but not the relation between the several creditors or debtors. Whether the single creditor who has obtained performance must divide with the other creditors, and whether the single debtor who has discharged the entire debt has recourse or regress against the other debtors, are distinct and independent questions. Most of the European codes lay down the general rule that such an adjustment shall take place unless it is excluded by the contract of the parties, or by a special rule of law. As between joint wrongdoers regress is denied in nearly all the German codes (including the imperial draft code) if the offense was a willful or malicious one (*delictum dolosum*), but permitted where the common liability was incurred by negligence (*delictum culposum*). The *Code Napoléon* permits regress in both these cases.

Content.—It is essential to the validity of an obligation that the act to be performed by the debtor (Germ. *Leistung*) shall be objectively possible (*impossibile nulla obligatio*); that it shall be legally and morally permissible (immoral contracts are void *ipso jure*); and that the obligee or creditor shall have some interest in its performance. Whether the interest must be a pecuniary interest, i. e. an interest capable of pecuniary measurement, is disputed; but modern European theory and legislation incline to enforce all obligations where the creditor has even a sentimental interest in securing performance. When the debtor can be compelled to render specific performance, this rule is easy of application; but when such performance can not be secured the measurement of damages presents serious difficulties—difficulties which can be avoided, however, by previous stipulation of a definite penalty (*pæna conventionalis*) for breach of the contract.

Performance (*solutio, paiement, Erfüllung*).—An obligation need not in principle be fulfilled by the obligor; any person may fulfill it for him unless the creditor has a special interest in securing performance from his debtor, i. e. unless the performance of another is necessarily a different thing from performance by the debtor, which is never true of obligations *dare* and not always of obligations *facere*. That which the debtor is bound to do must be done, unless the creditor agrees to accept something else as an equivalent (*in solutum datio*). If the creditor chooses to take less than is due him, and takes it as full performance, the debt is extinguished, for Roman and modern European law have nothing precisely equivalent to the English doctrine of consideration. In the absence of special provision as to time of performance, the debtor may perform as soon as he will and must perform as soon as the creditor demands it. The designation of a time of performance does not, in principle, negative the former rule; the debtor may still anticipate the time unless the creditor has a demonstrable interest in its observance (*dies in dubio pro reo*); nor does the designation of a time necessarily exclude performance after the time has elapsed. The legal importance of a designated time is that non-performance regularly puts the debtor in default without demand or notice from the creditor (*dies interpellat pro homine*). If no place of performance is expressly or impliedly indicated, the debtor may perform wherever he finds

the creditor, and must perform (i. e. may be required to perform) in his own place of residence. The latter rule, however, is subject to two important exceptions. If the duty of the obligor is to transfer possession of a specific thing (*res certa*), he can not be required to transport it from the place where it was when the obligation was incurred. If, on the other hand, the obligation is to pay money, European custom and law regularly require payment to the creditor in his place of residence. If a place of fulfillment is expressly or impliedly indicated, the debtor can not free himself by performance elsewhere.

Default (mora, demore, Verzögerung).—If the creditor refuses to accept or otherwise prevents performance at the proper place and time, he is in default (*mora creditoris*). The obligation is not extinguished, but the liability of the debtor is minimized. He has a counter-claim for any losses or expenses occasioned by the creditor's default; and if performance becomes impossible without fraud or gross negligence on his part, he is freed. On the other hand, the failure of the debtor to perform at the proper place and time puts him in default, and makes him liable for all resultant damage to the creditor. The latter's claim becomes a claim for performance plus damages for delay. If the creditor can not secure performance at all, his claim changes into a claim for a pecuniary equivalent. He is to be put into as good a position, economically, as if he had secured performance at the proper place and time. This claim is also termed a claim for the recovery of damages.

The rules regarding default are not applicable to the obligations *ex delicto*, for these are not claims for performance, but claims for damages. This was practically recognized by the Roman jurists in their statement that he who has dishonestly appropriated a thing is in default from the outset (*fur semper in mora*).

Damages (quod interest, dommages-intérêts, Schadensersatz) include not only direct loss (*damnum emergens*), but whatever the plaintiff can prove that he would have gained (*lucrum cessans*) if the contractual obligation had been duly performed, or if the tort had not been committed. When the action is based on a willful or malicious wrong (*delictum dolosum*) vindictive damages may be recovered.

Extinction.—Normally, of course, obligations are extinguished by performance. They are not extinguished by tender of performance; but if it is a sum of money or a specific article that is due, and if this be tendered and refused, the debtor may free himself by depositing it in a suitable place (*sequestratio, consignation, öffentliche Hinterlegung*). Obligations are extinguished when the creditor accepts something in lieu of performance; also by NOVATION (*q. v.*) and by release (*acceptilatio, remise, Erlass*). They are extinguished without the consent of the creditor by confusion (e. g. by the fact that the creditor becomes heir to the debtor, or *vice versa*), and by offset with a counter-claim (*compensatio, compensation, Aufrechnung*). In these last two instances the creditor, if not directly paid, is at least satisfied; he has secured an equivalent. Obligations may be extinguished without satisfaction by the discharge of the bankrupt debtor (see BANKRUPTCY) by LIMITATION (*q. v.*), etc. Some obligations, principally *ex delicto*, are extinguished by the death of one of the original parties.

Transfer.—Except in the case of inheritance the Roman law (like the English) was loath to recognize the possibility of transferring obligations to new parties. Ultimately, however, methods of transfer, *inter vivos*, were devised. See MANDATE and NOVATION.

Natural Obligations.—This term was used by the Romans in a double sense: (1) To describe moral obligations to pay or do something without regard to the question whether the law attaches to such obligations a complete sanction, a partial sanction, or no sanction at all. In this sense the legal obligations constitute simply a special class of natural obligations. (2) To describe a moral obligation to which the law attaches some of the effects of a legal obligation, although it does not permit recovery by action. These are the natural obligations in the technical sense; they are imperfect legal obligations.

The recognition accorded to such obligations may vary greatly. Some of them, although not directly actionable, may be enforced as counter-claims; many of them furnish a sufficient basis for novation and for guaranty; most of them have no legal recognition except this, that payment voluntarily made can not be recovered as *indebitum*. Modern codifiers have shown little sympathy for the natural obligation, but they can not wholly escape it. Recovery of

payment at least is regularly excluded, and that without any assumption that the payment is to be regarded as a gift or donation.

Cases in which a natural obligation is more or less fully recognized are, e. g., claims outlawed by limitation, claims void by reason of defective form of contract, claims against minors, and (less generally) play-debts. MUNROE SMITH.

Obligation, Moral: the fact that we recognize an "ought" or right in conduct as binding upon us. In conscientiousness, moral obligation appears as a sense of direct responsibility to conform to the moral law. We recognize, in Kant's phrase, a "categorical imperative" which is binding upon all men universally. There are three great theories of the origin and meaning of moral obligation: First, the *naturalistic* view, which holds that our sense of duty is the result of custom and experiences of utility; either individual custom, under the pressure of compulsory obedience, or race custom which has become a matter of nervous habit. So Hume, Spencer, Darwin, Bain, Sidgwick. Second, the *intuitive* view, according to which moral obligation is an innate sense of an external law of right, and of our duty to conform to it. (See INTUITIONALISM.) Among its advocates are Kant, Reid, Hamilton, McCosh, and the theologians generally. Third, the *idealistic* doctrine, that man's sense of obligation arises from the presence in him of the absolute, realizing itself through his mental and moral life, and thus revealing itself more and more as he advances in righteousness, and realizes his true principle of being. So Hegel, Green, Caird, etc. J. M. BALDWIN.

Obligation of Contracts: an important topic of constitutional law in the U. S., by reason of § 10 of Article I. of the Federal Constitution, which declares that "no State shall . . . pass any . . . law impairing the obligation of contracts."

This term was not a common one when it was incorporated into the Constitution. It had not been employed in statutes, nor defined by courts. It did not appear in any of the original drafts of the Constitution. Its proposal and adoption excited but little discussion in the constitutional convention. (*Madison Papers*, pp. 1443, 1552, 1581.) It appears to have elicited no comment from any State convention, and the writers of *The Federalist* did not feel called upon to explain or defend it, save in the most general terms. (See Nos. 7 and 44.) It was suggested by the following clause in the ordinance of 1787 for the government of the Northwestern Territory: "No law ought ever to be made in said Territory that shall in any manner whatever interfere with or conflict with private contracts or engagements *bona fide* and without fraud previously formed"; and its unopposed adoption was induced by the state of things, which Madison thus describes in his introduction to the debates on the Constitution: "In the internal administration of the States a violation of contracts had become familiar in the form of depreciated paper made a legal tender, of property substituted for money, of installment laws, and of the occlusions of the courts of justice, although evident that all such interferences affected the rights of other States, relatively creditors, as well as citizens creditors within the State." (*Madison Papers*, p. 712.) Notwithstanding this clause became a part of the Constitution without serious challenge, it has proved a prolific source of litigation to suitors and of perplexity to courts. The questions it has raised are so manifold, and the number of judicial decisions resolving them is so great, that no attempt will be made in this article to do more than to give an outline of the principles which have been declared.

The Extent of the Prohibition.—In terms, the provision applies only to legislation by the States. Hence it is often asserted that the Federal Congress is at liberty to pass laws impairing the obligation of contracts, unless such laws conflict with other parts of the Constitution. (Cf. *Evans vs. Eaton*, Peters's Circuit Court Reports 322, and *Hepburn vs. Griswold*, 8 Wallace, p. 637.) The better view, however, is that of Chief Justice Chase, that a law of Congress, "not made in pursuance of an express power, which necessarily and in its direct operation impairs the obligation of contracts, is inconsistent with the spirit of the Constitution." *Hepburn vs. Griswold*, 8 Wallace, p. 623. Cf. *Legal Tender Cases*, 12 Wallace, pp. 501, 549, and 600; *Crocker's Case*, 100 U. S. 314.

The law of a State, in order to come within the constitutional prohibition, must be a statute enacted in the ordinary course of legislation, or a constitution established by the

people of a State as their fundamental law. This provision is not aimed at decisions of State courts which refuse to give effect to contracts; nor to the acts of administrative or executive boards or officers; nor to the ordinances of municipal corporations to which the State has not given the force of law; nor to the doings of other corporations or individuals. *New Orleans Water-works vs. Louisiana Sugar Co.*, 125 U. S. 18.

A State law which impairs though it does not destroy the obligation of a contract is unconstitutional; but not every statute which affects the value of the contract impairs its obligation. "It is one of the contingencies to which parties look now in making a large class of contracts, that they may be affected in many ways by State and national legislation." (*Hamilton Gas Light Co. vs. Hamilton City*, 146 U. S. 258.) Therefore, statutes which prescribe reasonable regulations for the exercise of contract rights are not prohibited. A railway company may be compelled to fence its track, to check the speed of its trains at specified places, or to maintain flagmen at street crossings, even though its charter does not impose any such burdens.

What Contracts are Protected.—The Supreme Court early established the doctrine that the provision applied to executed as well as to executory contracts. In the language of Chief Justice Marshall, "a contract executed as well as one which is executory contains obligations binding on the parties. A grant, in its own nature, amounts to an extinguishment of the right of the grantor, and implies a contract not to reassert that right." (*Fletcher vs. Peck*, 6 Cranch 87.) A contract to marry is within the protection of this constitutional provision, but the contract of marriage is not. Marriage is more than a contract; it is a status which can not be dissolved by the will of the parties, but is subject to the regulation and control of the State. It is therefore competent for a State to change its divorce laws at will. It may abolish old causes for divorce from marriage entered into before the enactment of the law, or create new ones without impairing the obligation of contracts. (*Maynard vs. Hill*, 125 U. S. 190; *Hunt vs. Hunt*, 131 U. S., appendix clxv.) It is often said that the clause in question covers all implied contracts; and a few State decisions support the proposition. (*U. S. vs. Williams*, 19 *Pacific Reporter* 288 (Mont.); *Butler vs. Rockwell*, 29 *Pacific Reporter* 458 (Colo.)) The later decisions of the U. S. Supreme Court, however, have distinguished contracts implied in fact from those implied in law or *QUASI-CONTRACTS* (*q. v.*), and have declared that the constitutional prohibition upon the States does not extend to the latter. This prohibition, it is said, "was intended to secure the observance of good faith in the stipulations of parties against any State action. When a transaction is not based upon the assent of the parties it can not be said that any faith is pledged with respect to it; and no case arises for the operation of the prohibition." (*Freeland vs. Williams*, 131 U. S. 405; *Morley vs. Lake Shore Ry. Co.*, 146 U. S. 162.) Hence a judgment, whether for a tort or upon a contract, is not a contract within this clause of the Constitution.

A statute is not a contract, ordinarily, and may be repealed or amended at the will of the State. It may, however, amount to a contract between the State and other parties, and thus fall within the constitutional prohibition. This was held for the first time in *New Jersey vs. Wilson*, 7 Cranch 164, where a statute of New Jersey, which provided for the conveyance to the Delaware Indians of certain lands which should not thereafter be subject to any tax, any law to the contrary notwithstanding, was declared to be a contract, and therefore not repealable by the Legislature after the adoption of the Federal Constitution. A few State courts have held that the power of taxation can not be surrendered by the Legislature, and that a statute undertaking to make such surrender is nugatory and does not give rise to the obligation of a contract. Such decisions have been overruled by the U. S. Supreme Court on the ground that "government was not organized for the purposes of taxation, but taxation may be necessary for the purposes of government. As such, taxation becomes an incident to the exercise of the legitimate functions of government, but nothing more. While a government can not surrender all power of taxation, it may in the exercise of a reasonable discretion surrender part." (*Stone vs. Mississippi*, 101 U. S. at p. 820.) In order that a statute be construed as exempting a party from taxation, its terms must be clear and unequivocal; and in order that it amount to a contract, a consideration must be furnished by the recipient of the immunity.

Statutes creating public offices and providing for the compensation of their incumbents are not contracts between the State and the officials. They provide merely for the proper performance of public functions. Hence State officers, in the absence of any provision in the State constitution, and Federal officers, in the absence of a provision of the Federal Constitution, hold their places subject to legislative change of tenure and salary at any moment. (*Butler vs. Pennsylvania*, 10 Howard 402.) This rule does not apply to a person who is engaged by the State under a statute to render certain services, not as an officer, but as an employee. *Hall vs. Wisconsin*, 103 U. S. 5.

Corporations.—The statutory charter of a public corporation is not a contract between itself and the State, so far at least as public duties and powers are concerned. It is created for the purpose of performing governmental functions, and must be subject always to legislative control and modification. (*East Hartford vs. Hartford Bridge Co.*, 10 Howard 533; *Dillon On Municipal Corporations*, 3d ed., §§ 60-79.) If it is organized not to exercise the functions of government, but primarily for the purposes of the corporations, though the public may be benefited indirectly, its charter may and generally does originate a contract obligation between itself and the State which can not be impaired by subsequent legislation. The leading case on this point is *Dartmouth College vs. Woodward*, 4 Wheaton 519, decided in 1819, reversing the decision of the superior court of New Hampshire, 1 N. H. 111, rendered in 1817. Two principal questions were involved: (1) Whether an educational college is a public or a private corporation; (2) whether the charter of Dartmouth College contained a contract between the State and the corporation. The court held that an educational corporation is private and not public, unless it is founded and maintained by the State as a part of its governmental machinery. The second question was decided in favor of the college also. Chief Justice Marshall's reasoning is briefly as follows: The objects for which a corporation is created are universally such as the government wishes to promote. They are deemed beneficial to the country; and this benefit constitutes the consideration and, in most cases, the sole consideration of the grant. The charter of Dartmouth was sought and granted for the purpose of perpetuating the application of the bounty of her donors to the specified objects of that bounty. This is plainly a contract, to which the donors, the trustees, and the crown (to whose rights and obligations New Hampshire succeeded) were the original parties. It is a contract made on a valuable consideration. It is a contract on the faith of which real and personal property has been conveyed to the corporation. It is then a contract within the letter of the Constitution.

This was one of the most momentous decisions ever rendered by the Supreme Court. While it has been severely criticised, it has been followed by the Federal tribunals, and with few exceptions by the State courts. Its doctrine, to use Justice Black's vigorous expression, "is sustained not by a current but by a torrent of authorities." (See *Shirley's Dartmouth College Causes*, St. Louis, 1879.) Sir Henry Maine has declared that it is this provision of the Constitution, as construed in the Dartmouth College case, "which has in reality secured full play to the economical forces by which the achievement of cultivating the soil of the North American continent has been performed; it is the bulwark of American individualism against democratic impatience and socialistic fantasy." (*Popular Government*, pp. 247-248.) The decision led to a radical change in State legislation relating to corporate charters. Thereafter the States, as a rule, either by general laws or by special provisions in the charters, reserved the right to amend or to repeal them. See *Greenwood vs. Freight Co.*, 105 U. S. 13.

Even where a charter amounts to a contract between the State and the corporation, the courts are unanimous in holding that no collateral agreements restricting State action will be implied. If any such are claimed by the corporation, they must be shown to have been stated expressly in the charter. (*The Charles River Bridge vs. The Warren Bridge*, 11 Peters 420; *The Binghamton Bridge Case*, 3 Wallace 51.) Although a State binds itself by an express collateral agreement, it does not thereby lose its right to exercise the power of eminent domain. Nor does the constitutional provision, under discussion, interfere with the fair exercise of the police power by a State. Hence State licenses to carry on particular trades or corporate charters for lotteries may be modified or annulled if, in the opinion of the Legislature, the license or franchise is inconsistent with the public

safety, health, or morals. "The governmental duty of self-protection can not be contracted away, nor can the exercise of rights granted, nor the use of property be withdrawn from the implied liability to governmental regulation, in particulars essential to the preservation of the community from injury." *New York Ry. vs. Bristol*, 151 U. S. 556.

State Insolvent Laws.—In the absence of a Federal bankruptcy law the States may provide by statute for the discharge of insolvents from debts contracted after such legislation, without impairing the obligation of contracts. The obligation of a contract is the duty of performing it, which is recognized and enforced by the law applicable thereto. In a State where an insolvent law exists, this obligation is conditional, not absolute; it is an obligation to pay the debt if not discharged therefrom in accordance with law. Such a statute, however, has no extraterritorial force, and does not relieve the debtor from liability to a creditor who is an inhabitant of another State, and does not become a party to the insolvency proceedings. *Ogden vs. Saunders*, 12 Wheaton 213.

State Laws Affecting the Remedy.—There has been much judicial confusion upon this topic, because of the frequent failure of the courts to observe the two senses in which the term remedy is used. It is applied to the mode of proceeding by which a legal right is enforced, and also to the law which gives or defines the right. Any State legislation which impairs the right of action upon a contract is prohibited, while that which affects only the procedure in an action is not. This distinction, though often lost sight of by the State courts, has been uniformly observed by the Supreme Court of the U. S. "In modes of proceeding and forms to enforce the contract, the Legislature has control, and may enlarge, limit, or alter them, provided it does not deny a remedy or so embarrass it with conditions or restrictions as seriously to impair the value of the right." (*Penniman's Case*, 103 U. S. 714.) Imprisonment for debt is held to be a relic of ancient barbarism, and a punishment rather than a remedy. Therefore a State law abolishing it even as to existing debts does not impair the obligation of contracts.

FRANCIS M. BURDICK.

Obnos: the name given by Manetho to Unas, the ninth and last king of the fifth Egyptian dynasty. His reign, according to the royal Turin papyrus, lasted thirty years, while Manetho gives him thirty-three years. In the account of Manetho a new epoch seems to have begun with his successor, since he sums up the years from Menes to Unas as though a period of the history had been completed. Little is known concerning Obnos-Unas except that he built a pyramid at Saqqarah, which was opened in 1881, and found to contain passageways lined with alabaster, on which were inscribed writings.

CHARLES R. GILLET.

O'boe [Ital., from Fr. *hautbois*], or **Hautboy** [from Fr. *hautbois*; *haut*, high + *bois*, wood]. Named from its high tone; a musical wind instrument of an elongated conical form and with a high piercing tone, ranging from C below the treble clef to G, the fourth line above the staff. Apparently it was at first used solely by military bands, but from the time of Bach it has been one of the most important wind instruments in the orchestra. Beethoven had an especial fondness for the oboe. Custom has led the A of this instrument to be considered the standard pitch from which the other instruments of the orchestra tune.

D. B.

O'Brien, WILLIAM, M. P.: political leader; b. at Mallow, Ireland, Oct. 2, 1852; was educated at Cloyne Diocesan College and Queen's College, Cork; entered Parliament in 1883. He is a journalist, and was editor of *United Ireland*. He is leader of the National League; has been four times imprisoned under the Crimes Act of 1887, and has visited the U. S. twice. Mr. O'Brien is one of the wisest known leaders of the Irish party, and is the senior member for Cork city.

O'Brien, WILLIAM SMITH: political leader; b. at Dromeland, County Clare, Ireland, Oct. 17, 1803; son of a baronet of ancient lineage; was educated at Harrow and at Trinity College, Cambridge; entered Parliament for the borough of Ennis 1826. Though he at first supported the Tories, he was afterward returned as an advanced Liberal for the County Limerick, which he represented thirteen years; became the ally of O'Connell and worked earnestly to secure Catholic emancipation, but in the agitation for the repeal of the legislative union between Great Britain and Ireland he favored a resort to forcible measures if necessary, and as the head of the organization known as Young Ireland he ceased to be in accord with O'Connell. He went to Paris

Apr., 1848, as a representative of the Irish confederation to solicit aid from the French republic; aided in convoking an Irish national convention (May), which was not allowed to meet; was tried for sedition in the same month, but acquitted; attempted a rising among the peasantry at Mullinahone, in the south of Ireland, July, but was compelled to flee; was captured at Thurles Aug. 5; tried and convicted by a special commission at Clonmel, with T. F. Meagher and MacManus, on a charge of high treason (Oct. 9); sentenced to be hanged; was transported for life to Tasmania, July, 1849; was pardoned 1856; traveled in the U. S. 1859. D. at Bangor, North Wales, June 17, 1864.

Obsequens, JULIUS: a Latin writer, probably of the fourth century, who compiled a record of prodigies (*prodigiorum liber*) happening between the years 249 and 12 B. C., the ultimate source being Livy. No manuscript of this work exists. The *editio princeps* was published by Aldus (Venice, 1508), a revised text by O. Jahn (Leipzig, 1863).

Obsequies: SEE FUNERAL.

Observan'tine Friars and Nuns [in Lat. name, *Fra tres strictioris observantie*, liter., brothers of stricter observance]; a monastic order of the Roman Catholic Church. The primitive rule of St. Francis, like that of many other orders of monastics, having been modified by various popes on account of the extreme severity of its discipline, there arose within the order a new party desirous of returning to the austere rule of former days. Certain followers of the severe rule in 1368, under Paoletto di Foligno, were organized as a separate congregation, called Brethren of the Stricter Observance, or Observantines; these are now, as they have long been, far more numerous and influential than the Conventuals, or followers of the mitigated rule. The Capuchins and other congregations follow a still severer rule, and are called Brethren of the Strictest Observance.

Observatory: an establishment for the systematic observation, record, and study of natural phenomena, especially those which pertain to astronomy, meteorology, or magnetism. Establishments for scientific observation date from very ancient times. The celebrated museum of the Ptolemies at Alexandria included astronomy among its objects, and observations of importance to that science as then understood were made there. The Arabs of the Middle Ages also continued the work of the Greek astronomers, and many of their observations and writings have come down to us; but probably none of their establishments formed what we should now call an astronomical observatory.

Coming nearer to our own times, the first observatory celebrated in astronomical history is that of Tycho Brahe, founded in 1576. It was situated on the island of Hveen,



FIG. 1. TYCHO'S OBSERVATORY.

in the Sound, N. of Copenhagen, and was very appropriately named Uraniborg, the city of the heavens. The foundation-stone was laid with great ceremony, and the establishment was fitted with instruments designed by Tycho himself, larger and finer than any previously known. They

were mostly designed to measure arcs from one star to another in the heavens, a method of observation which has since been entirely superseded. Although Tycho's observations suffer, when compared with ours, in value from having been made just before the invention of the telescope, they are renowned for having afforded Kepler the material for establishing his laws of the motions of the planets. See KEPLER and ORBIT.

The century which followed Tycho Brahe was made celebrated by the discovery of the telescope and the foundation of several great observatories. A very natural belief was then current, which is prevalent even at present, that the instruments of an astronomical observatory should be as high as possible above the earth. Thus the observatory of Horrebouw is pictured as eight stories high, and an immense building was erected at St. Petersburg as an observatory of the Academy of Sciences. Practically, however, it has been found that the loss is as great as the gain in mounting astronomical instruments at a great elevation above the ground. Although a clearer horizon is obtained, this advantage is slight, and is more than counter-balanced by the exposure to heavy winds, from which astronomical instruments should be thoroughly protected.

The decade 1661-70 is celebrated in the history of science, not only by the organization of the Royal Society of London and of the Academy of Sciences of Paris, but by the erection of the Greenwich and Paris observatories, both of which are still in existence. About that time also was introduced the greatest improvement ever made in the art of determining the apparent positions of the heavenly bodies by observation. The measurement of the angle between two heavenly bodies, as practiced by Tycho Brahe, was made difficult by the diurnal motion of the stars. In consequence of this motion no star would remain at apparent rest relative to the instrument, and it was therefore impossible to point two sights of the latter, or two telescopes, simultaneously at two stars. If pointed correctly on one the other would move away, or rather the instrument would be carried away by the rotation of the earth. To Roemer of Copenhagen, celebrated in connection with the determination of the motion of LIGHT (*q. v.*), occurred the idea of utilizing this very troublesome motion to determine the right ascensions of the heavenly bodies. Let the telescope move only in the meridian, and let the stars in succession pass through its field. Note the time of passage by a good clock regulated to sidereal time, and we have at once the means of determining their relative right ascensions. Thus arose the transit instrument, which is a most useful appliance of an astronomical observatory.

Ever since the time of Tycho men have taken delight in founding munificent establishments of the kind in question; but all that the astronomer really wants besides his offices, library, etc., is something to shelter his instruments from the wind and weather. The more flimsy this shelter is, the better, for a reason not at first sight apparent. One of the first requisites to good astronomical observations is that the instrument and the air around it shall be as nearly as possible of the same temperature as the air outside, no matter how cold the weather may be. If this is not the case, the currents of warm and cold air around the instrument will cause irregular refraction, which will be multiplied as many times as the instrument magnifies, and thus destroy all accurate vision. The heavier and more massive the walls around his instrument, and the more closely it is protected from the outer air, the more difficult it is to fulfill this condition. Sheet-iron is therefore a favorite material for an observing-room, and all defects of construction which have no worse result than admitting cold air are readily forgiven.

From the astronomer's point of view, the most important feature of an observatory is found in the instruments with which it is fitted up. Of these the first in importance are the transit instrument and the EQUATORIAL TELESCOPE (*q. v.*). The former has two distinct uses. One is to determine the time or regulate the astronomical clock and fix its rate, which is necessary because nearly every astronomical observation requires a somewhat accurate statement of the moment at which it was made. The other is to determine the right ascensions of the heavenly bodies. The equatorial telescope is the instrument which most interests the public. It can be readily pointed at any visible object and so moved by clockwork that the object is kept within the field of view. If positions of the heavenly bodies are to be determined, a meridian circle is also a necessity. As this is formed merely by adding circles and other appliances to a transit instru-

ment, the latter is not essential when the observatory possesses a meridian circle. Still it is convenient to have a separate transit instrument, because it can be used for determining the time independently of observations made with a more complex instrument.

Other instruments are of less universal application. The prime vertical transit, being mounted so as to move through the zenith in an east and west circle at right angles to the meridian, is quite limited in application, yet observations of extreme precision have been made with it at Pulkowa and elsewhere. This observatory is also supplied with a vertical circle, an instrument of somewhat peculiar construction for measuring altitudes on or near the meridian. The altazimuth is also found at two or three European observatories. It has over the meridian circle the apparent advantage that it can be pointed at any part of the heavens, so that the position of a heavenly body at any moment can be determined; but the very faculty of swinging around on a vertical axis, which such an instrument must always do, interferes with the precision of the observation, and is therefore a serious drawback. If an observer desires to find new comets a COMET-FINDER (*q. v.*) is a very necessary appliance.

The discovery and introduction of the spectroscope and consequent investigations on the constitution, temperature, and other peculiarities of the heavenly bodies, which were before impossible, have added greatly to the outfit of most great observatories. The application of photography to astronomy has resulted in the same way. These new methods of research have not, however, led to such changes in the construction of great instruments as might be supposed. An equatorial telescope is essential to the astronomical use of the spectroscope, which is simply fastened to its eye-end in order that the spectrum of any object in the focus may be examined. If a photograph is to be taken, an equatorially mounted telescope or something equivalent to it is also a necessity; but the ordinary visual telescope is not well adapted to take a photograph because the object-glass is not achromatized for the photographic rays. The telescope must therefore either have a special object-glass made for it, in which the flint glass shall be proportionately less powerful than in the optical telescope, or a so-called "corrector" must be put over the object-glass of the visual telescope so as to correct it for the photographic rays.

Every enlightened nation has one or more observatories of a national character, while several universities, both in America and Europe, possess them as part of their educational establishments. An exhaustive catalogue of the observatories now existing would mount up into the hundreds. We shall only mention those of each country which may be considered as scientifically most important, or which are celebrated for some work done or discovery made in connection with them.

Russia.—The great observatory of Pulkowa, founded by the Emperor Nicholas about the years 1838-40 as a monument of his reign, acquired such celebrity that it was once designated as the astronomical capital of the world. It owes its high reputation to its first director, W. Struve, one of the most renowned practical astronomers of his time, who not only devised superior instruments, but used them with a precision never before reached. Its principal work has been the determination of astronomical constants, especially those of nutation and aberration, and the preparation of more accurate catalogues of the principal fixed stars than were before made. Its work in these lines has set the standard for the world during nearly half a century.

Germany.—The University Observatory of Königsberg, founded early in the nineteenth century, is renowned for the work of Bessel, the greatest practical astronomer of his time. There is also a national observatory at Berlin, but the city has so grown around it that its work is seriously interfered with. At present the most noted national establishment of the kind in Germany is the astro-physical observatory at Potsdam, founded shortly after the Franco-German war as a noble way of expending a portion of the indemnity received from France. As its title implies, it is especially fitted up for spectroscopic and photometric studies. Its researches in these departments have given it a position worthy of German science. The researches of Vogel upon the spectrum and motions of the variable star Algol are an example of its activity. The work of making the most accurate possible determination of the magnitude of several thousand of the principal stars in the northern hemisphere is being carried forward to completion as rapidly as possible. The leading universities of Germany are also

supplied with observatories, among which that of Bonn is worthy of special mention as having afforded Argelander and his successors the means of cataloguing and studying the stars of the northern hemisphere. More recent yet is the Strassburg observatory, founded about 1873, and fitted up with the most modern instruments.

France.—Measured by the number of its astronomers and the amount of work done, the observatory of Paris is easily the first of Europe. Its activities cover every branch of astronomy, theoretical and practical. Its directors have been the most celebrated astronomers of France, beginning with the Cassinis, and including more recently such men as Arago and Le Verrier. In popular interest it is, however, outstripped by the observatory of Nice, already mentioned. This fine establishment is situated on the summit of Mont Gros, a hill some 1,200 feet in height, 2 or 3 miles N. E. of



FIG. 2.—PARIS OBSERVATORY

Nice. It commands a splendid view of the Mediterranean, and among the subjects for which it is noted is the discovery of small planets by photography and the study of the physical aspects of Venus and Mars. There are also observatories at Bordeaux, Lyons, and elsewhere, at which eminent French astronomers are seeking to add to the scientific laurels of their country.

England.—The Royal Observatory at Greenwich overshadows all other British observatories in importance. In the original warrant of Charles II., appointing Flamsteed astronomer-royal, it was prescribed that he should "apply himself with the most exact care and diligence to the rectifying the tables of the motions of the heavens and the places of the fixed stars, in order to find out the much desired longitude at sea for the perfecting the art of navigation." The most remarkable feature in the history of the Greenwich Observatory is the conscientious persistence with which the policy thus comprehensively outlined has been pursued for more than two centuries by a succession of men whose names stand high among those of the astronomers of their times. Without deviating in any way from this policy the scope of the observatory has been extended so as to include photographic and spectroscopic observations. The universities of Edinburgh, Cambridge, Oxford, and Dublin have also noteworthy establishments of the sort. Among Irish observatories the greatest interest, perhaps, centers around that of Lord Rosse, at Birr Castle, Parsonstown, celebrated for the largest telescope ever built.

The United States.—An enumeration of the observatories of this country is not possible. Many have been founded by private munificence, become known for a short time by the work of some astronomer, and finally disappeared from the sight of the scientific world. The old naval observatory at Washington was celebrated in its early years for the work of Sears Cook Walker in investigating the motions of Neptune, and for the part which it took in applying telegraphy to the determination of longitudes, and for the invention of the electro-chronograph. In 1873 it was supplied with a new equatorial telescope of 26 inches aperture, which at the time was the largest of the kind in existence. Four years later it acquired new celebrity by Prof. Hall's discovery of the satellites of Mars. More recently a new and magnificent establishment has been erected on an elevation N. of Georgetown, which in its buildings and outfit fairly rivals any in the world. The Cincinnati Observatory is one of the oldest in the country, having been founded by Prof. O. M.

Mitchell. Its work has from time to time been interrupted, but its activity persists until the present day. The Dudley Observatory at Albany, though always suffering from want of the pecuniary support necessary to such an establishment, has in recent times acquired great importance by the work of Prof. Boss, its director and astronomer, in cataloguing a zone of stars. A new structure has recently been erected for it. Princeton College, the University of Virginia, and several other institutions, are also supplied with fine establishments of the sort, of which the work redounds to the credit of the U. S. At Princeton, Prof. Young has devoted himself very largely to spectroscopic work and the study of the sun. Although his telescope is not of the largest size, it was the first one after the Lick telescope with which the fifth satellite of Jupiter was actually seen. The observatory of Georgetown University, D. C., though among the more modest of institutions of the kind, is acquiring celebrity through the application of photography to the registration of transits and zenith distances. The remarkable feature of this work is that a star as it passes across the field of the telescope is made to photograph its image on a plate in the focus of the instrument, not continuously, but at intervals of one or two seconds, thus forming a row of dots on the plate. The same method is being applied to the determination of latitudes with the zenith telescope. The success of this work is due to the ingenuity of the director, Father Hagen, S. J., and his able assistants.

The Harvard Observatory dates from 1843, the great comet of that year being the immediate incentive to its foundation. Under the energetic management of its present director it has grown to be one of the greatest in existence. It was early celebrated for the work of the Bonds, and the discovery of the eighth satellite of Saturn; more recently its principal work has been the photometry of the heavens, the photographing of the constellations, and the study of the spectra of the fixed stars. The Lick Observatory in California is remarkable for the rapidity of its rise. (See Lick.) It was not completed until 1888, but has since risen into great prominence by the activity of its astronomers under the direction of Prof. Holden. The observations of Burnham on double stars, and of Barnard on the planets and satellites, are among its noteworthy contributions to science. The discovery of the fifth satellite of Jupiter, made by Barnard in 1892, is of especial interest. The observatories of Ann Arbor and Hamilton College are noted for the discovery of minor planets made by their former directors, Watson and Peters. In recent times the Madison Observatory has done excellent work with its meridian circle and equatorial telescope.

Magnetic and Meteorological Observatories.—The principal object of a magnetic observatory is to record the changes continually going on in the earth's magnetism. The outfit necessary for this purpose is quite modest, and in consequence such establishments do not fill so great a place in the public eye as astronomical observatories. The most noted in America is that of Toronto, Canada, where continuous observations have been kept up for a considerable period. The Greenwich Observatory has also a magnetic department, where similar records are made and kept.

A meteorological observatory, as its name implies, is devoted especially to records pertaining to the weather, the readings of the barometer, thermometer, etc. In a well-fitted modern meteorological observatory the conditions of the wind and weather are automatically recorded on sheets, so as to preserve a permanent record, available for study and comparison at any future time. S. NEWCOMB.

Obsid'ian [from Lat. *Obsidianus* (corrected reading *Obsid'ianus*) *lapis*, supposed to be obsidian, liter., the stone of *Obsid'ianus* (corrected reading *Obsid'ianus*), name of the man said by Pliny to have found it in Ethiopia; Gr. *ὀψιδιανός*]; an acid volcanic glass formed by the very rapid cooling of molten material upon or very near the earth's surface. In chemical composition obsidian may correspond either to rhyolite, trachyte, phonolite, or andesite. Its practical identity with these rocks is often shown by a mass of any one of them, passing gradually into obsidian at its edge, where the cooling has been most rapid, and the crystallization of individual minerals in this way prevented. Among the acid volcanic glasses obsidian is distinguished by its low percentage of water (generally less than 1 per cent.) and its vitreous luster from *pitchstone*, which contains 4 or 5 per cent. of water and has a resinous luster, though it is otherwise identical with obsidian. Obsidian is usually dark in color

and compact in texture. Frequently it is jet black from included microscopic crystallites of magnetite, and often also of a red color. The particles included in the glass very commonly show by their arrangement the flow movement which took place in the viscous mass before final solidification. If the obsidian has acquired a porous or spongy texture by escaping gases at the time of cooling, it is called *pumice*. If, on the other hand, the cooling was slow enough to allow of the separation of some crystals, the rock becomes an *obsidian porphyry* or *vitrophyre*. The glassy equivalents of the more basic volcanic rocks, like trap or basalt, are called *basalt obsidian* or *tachylite*. Because of the greater tendency of such basic masses to crystallize, their glassy forms are much rarer than the true obsidians and pitchstones.

Obsidian and its allied glasses occur in many volcanic regions. Some of the best-known localities are in the Lipari islands, Iceland, Mexico, Siberia, New Zealand, Peru, and the western parts of the U. S. Obsidian Cliff in the Yellowstone National Park has become well known through the researches of Prof. Joseph P. Iddings.

The perfect conchoidal fracture of obsidian, and the readiness with which it yields very sharp-edged fragments, have made it a favorite material among primitive people for the manufacture of arrow-points, axes, and knives. This was especially the case with the early inhabitants of Mexico, who named their principal source of supply Cerro de las Navajas, the hill of knives. Obsidian has also, both in ancient and modern times, been cut as a gem stone.

Pumice or spongy obsidian is extensively used in the arts for dressing leather or parchment, for polishing, and for toilet purposes. The supply of this is obtained largely from the Lipari islands.

G. H. WILLIAMS.

Obstetrics, Obstetricry, or Tocology [*obstetrics* is from Lat. *obstetrīx*, midwife, deriv. of *obstare*, stand before; *ob*, before, against + *stare*, stand; *tocology* is from Gr. *τόκος*, birth + *λόγος*, discourse, reason]: the branch of medical science embracing the knowledge of the processes accompanying the reproduction of the human species, the assistance to be rendered the mother before, during, and after labor, both natural and irregular, and the care to be taken of the child during the first weeks of its life; also called *midwifery*, particularly in Great Britain. Although nature has adapted woman to bring forth children without any other assistance than that afforded her by her own inherent powers, still, from the very earliest ages, it has been found agreeable and beneficial to a woman in labor to offer her sundry more or less important services in her hour of need, by which present discomforts might in a measure be removed or possible future accidents averted. The earliest records which we find of such assistance show it to have been rendered exclusively by women. Thus the Jews employed women, called *mejledeth*; the Greeks first made use of old female nurses, who lived in the house and took care of the children. These nurses were called *mæa* (grandmother, nurse), and subsequently, when their practice rose to the dignity of a profession, they were known as *mæeutricæ*. A special tutelary divinity (Ilithyia or Artemis) protected the art. These women appear, however, to have been unlucky in their practice, for at an early period a law was passed in Athens prohibiting women from practicing physic in any of its branches. As early as the time of Hippocrates (about 400 B. C.) we therefore find men (*mæeulæi*, *mæeuteræ*) called in as assistants in difficult cases; and somewhat later, Herophilus is mentioned as a teacher of obstetrics at Athens. In the writings attributed to Hippocrates is found the first evidence of scientific research into and rational understanding of the phenomena of childbirth. Among the Romans, women (*obstetricæ*) likewise assisted in confinements; but the Emperor Augustus is reported to have called the physician Antonius Musa to attend the Empress Livia in a difficult labor, and this precedent has been followed in many countries. At the time of Pliny the royal law (*lex regia*) already provided for the performance of Cæsarean section after the death of women during pregnancy and labor. Celsus and Rufus Ephesus, during the first century of the Christian era, and Galen, Ætius, and Paulus Ægineta in the second, fifth, and seventh centuries, respectively, wrote works on obstetrics. During the Middle Ages medical science remained at a standstill in Europe, but among the Arabs and Persians considerable progress was made in obstetrics, which was practiced by women alone, physicians being called in only as consultants. The writings of Rhazes of Bagdad

(A. D. 800), Avicenna of Ispahan (A. D. 900), and Abulcasem (A. D. 1100) became celebrated, and were generally accepted throughout Europe as well as in the East. Up to the sixteenth century very indefinite ideas had existed as to the shape and capacity of the bony canal (pelvis) through which the child has to pass in order to be born; in 1543 Andrew Vesalius gave the first correct description of the normal pelvis, and 200 years later (1754) Levret in France and Smellie in England (1751) completed the description by stating the exact dimensions of the various diameters of the pelvic cavity. The great surgeon Ambroise Paré (1550) was, however, the first actual exponent of modern scientific obstetrics—"the famous restorer and improver of midwifery," as Smellie aptly calls him. He first recommended turning the child by the feet. His successors Guillemeau, and especially Mauriceau, worthily developed and improved on the teachings of Paré. That most valuable of obstetrical instruments, the forceps, was invented by an Englishman, Paul Chamberlen, about 1647; it has since been greatly modified and improved. In Germany the first scientific work on obstetrics was published by Eucharius Rössl in 1513; and in 1690 Justine Siegemund, court midwife at the electoral court of Brandenburg, became celebrated through her book on midwifery. Although numerous careful observations and studies had been made by Smellie and Ould (1742) in England, who described the manner of the entrance of the child's head into the pelvis, by Levret (1747), Solayrés de Renhac (1771), Baudelocque (1781), Madame Lachapelle (1795) in France, and Boër (1791) and Schmitt (1804) in Germany, Nægele the elder (1819) was the first to give a clear, systematic, and tolerably correct explanation of the mechanism of labor; that is, of the manner of passage of the various parts of the child through the pelvic canal. From him dates, in a great degree, the present advanced state of obstetrical science; for on the accurate comprehension of this mechanism depends in a large measure the correct appreciation of the means to be employed in abnormal cases. Among the more important improvements in the art and practice of obstetrics during the nineteenth century are the following: The use of the ear (auscultation) to detect the presence of a living child in the womb; the perfection of the knowledge of the mechanism of labor; the induction of premature labor; the more frequent use of the forceps and the less frequent employment of craniotomy (perforation of the child's head); the substitution of turning and extraction by the feet for forceps and craniotomy in many cases of pelvic deformity; the employment of anæsthetics in natural labor. Obstetrical science and practice have long been taught at all medical universities. Hospitals for the accommodation of women during the lying-in state—so-called lying-in hospitals—have been instituted in many cities of Europe, and in a less degree in the U. S. They are almost invariably connected with medical schools, and afford excellent opportunities for the study of the obstetrical art. The largest lying-in hospital at present is in Vienna, in which about 10,000 women are confined annually; others are at Paris, Berlin, Dublin, etc. Societies devoted solely to the advancement of the department of obstetrics exist in London, Berlin, Edinburgh, Dublin, New York, Philadelphia, Boston, and other cities. Journals containing only articles on obstetrical topics are published in Germany, France, Great Britain, and the U. S. On the European continent, and to a certain degree in Great Britain, women in labor are attended only by midwives, who are taught in special schools to perform the minor duties of an obstetrician, such as to separate the child from the mother by tying and dividing the umbilical cord, removing the afterbirth, and caring for the comfort of the mother and the child. Physicians are called in only in difficult cases. In the U. S., however, and among the better classes of Great Britain, the safer plan is followed of intrusting every confinement, whether natural or abnormal, to the care of an educated physician, who is assisted by a competent nurse, and who, in case of need, may be able to foresee and prevent accidents which the superficial and inferior teaching of a midwife would incapacitate her from perceiving or avoiding.

The study of obstetrics is divided into three chapters: 1. The anatomy of the organs taking part in the process of reproduction in the female; 2, the functions of those organs during reproduction: their physiology; 3, the disorders and diseases affecting these and other organs during the same period: their pathology.

1. *Anatomy*.—In the bony receptacle (pelvis) at the end of the trunk are situated the female generative organs, viz.,

the two ovaries, containing the female germs or ova; between them the womb or uterus, to which they are attached; on either side also the two Fallopian tubes, opening into the uterus; finally, the vagina or passage leading from the mouth of the womb to the external organs. The breasts, although coming into function only after the birth of the child, are generally included in this list.

2. *Physiology*.—The functions of these organs are menstruation, conception, gestation or pregnancy, labor or parturition, and lactation. They are limited to a certain period of life, generally beginning with the twelfth to the fifteenth year and continuing till the forty-fifth or forty-eighth year. The youngest authentic case of parturition on record occurred at the age of nine years, the oldest at fifty-four years. Menstruation and reproduction are generally coincident, although cases are reported in which repeated impregnation took place without menstruation having ever occurred. Conception having taken place, the impregnated ovum passes through one of the Fallopian tubes to the uterus, where it becomes attached and grows and develops (its nourishment being derived from the mother through a convolution of vessels called the after-birth or placenta, from which a cord of vessels, the umbilical cord, runs to the abdomen of the child), until at the end of a period varying from 275 to 280 days it is ready to be expelled by the contractions of the powerful muscular fibers of the womb (labor-pains). In occasional rare cases the term of pregnancy may be prolonged to 300 or 306 days; but most statements of this kind by women are not reliable and usually depend on errors of reckoning. The signs of pregnancy are manifold. The chief symptoms are: Cessation of the menses, nausea, particularly in the morning, enlargement of the abdomen and the breasts, discoloration of the space around the nipple; later, the movement of the child (or fœtus) and the pulsations of the child's heart, audible only to a practiced ear applied to the abdomen. A physical examination of the abdomen and genital organs will at all times reveal the state of affairs; still, only in exceptional cases is it possible to decide upon the existence of pregnancy before the beginning of the third month. Enlargement of the abdomen from dropsy, ovarian and other tumors, may simulate pregnancy. The part of the child presenting itself at the mouth of the womb during pregnancy or labor is called the presentation. During pregnancy the child frequently changes its position; during labor, however, the part originally presenting generally remains. The most frequent position of the child in the womb is the longitudinal, corresponding with the long axis of the mother, and by far the most common presentation is that of the head (96 in 100), generally the crown or vertex, seldom the face (1 in 200); much less frequent is the presentation of the other extremity of the child, the breech or feet (3 in 100). A transverse presentation, when the long axis of the child crosses the long axis of the mother, is met with about once in 200 labors, and always requires artificial rectification. Labor or parturition is the act of delivery of the fœtus and its appendages (the placenta and the membranes inclosing the child) through the natural passages. It may be divided into three stages: 1. From the first pains till the complete dilatation of the mouth of the womb; 2, the birth of the child; 3, the expulsion of the afterbirth and membranes. *First stage*.—At the end of pregnancy labor is ushered in by so-called premonitory pains, resulting from the beginning contractions of the womb and lasting an indefinite time, several hours or days. A mucous, slightly bloody, discharge accompanies these pains, which gradually become more severe; the mouth of the womb becomes fully dilated, and the bag of waters (in which the child floats) is protruded. *Second stage*.—The bag ruptures, the waters are discharged, the pains become still more severe, the presenting part of the child passes through the pelvic canal, always adapting its longest diameter to the longest one of the pelvic cavity, and is expelled through the external orifice, being rapidly followed by the remainder of the child's body. The *third stage* comprises the delivery of the placenta and membranes, which generally takes place within thirty minutes. The average duration of labor in first confinements is twelve hours, although eighteen to twenty-four hours would not be considered abnormal; women who have had children are generally delivered more rapidly, within six or eight hours. After labor the lying-in state begins, during which the function of lactation is inaugurated, and the womb gradually returns to its natural

size and configuration before conception, which latter event ordinarily takes place within six weeks. The child, having been separated from its connection with the mother by the ligation and division of the umbilical cord, is washed, dressed, and applied to the breast as soon as the mother has recovered from her exertions. By an early application of the child the febrile excitement known as "milk fever," ordinarily occurring on the third or fourth day, with the flow of milk into the breasts, is in a great measure avoided. The period which a woman after labor is confined to her bed varies in different countries; while in civilized communities seven to ten days is considered the proper time, in the East and among savage races the mother resumes her daily avocations immediately after delivery, and among the lower classes in Europe and the U. S. puerperal women very frequently leave their beds on the third or fourth day without evil consequences.

3. *Pathology*.—Pregnancy does not always last the stated time of 280 days, but often is interrupted at an earlier period, either by causes depending on diseases of the mother or of the fœtus and its appendages, or by accident or intention. Such interruptions may occur at any time, and during the first six months are called abortion or miscarriage, during the last three premature delivery. A fœtus born before the twenty-eighth week is ordinarily not viable, although several instances have occurred in which children born as early as the twenty-sixth week were by extraordinary care raised to maturity. The danger to the life of the mother from abortion may at times be great, either from uncontrollable loss of blood or from inflammation of the uterus or bowels (peritonitis). This is particularly liable to be the case when the abortion has been forcibly induced, as by sudden shock or with a criminal purpose. Tardieu relates thirty-four cases of criminal abortion, in which the death of the mother resulted in twenty-two. The danger is greatest during the third, fourth, and fifth months; during the first two months the impregnated ovum often escapes almost unperceived. A common cause of abortion is disease of the placenta. The physiological discomforts of pregnancy, such as nausea, neuralgic pains, constipation, may occasionally become so aggravated as to be actual sources of danger, and the pregnant woman is liable to dropsy, hemorrhoids, congestion of the kidneys, and numerous other complaints. Occasionally the impregnated ovum does not pass into the uterus, but becomes attached in the Fallopian tube or drops into the abdominal cavity and develops there. This condition is called extrauterine pregnancy (tubal or abdominal), and generally ends fatally about the third or fourth month by rupture of the tube or peritonitis. In rare cases the child has been retained until term and removed by operation alive or dead, or it has died and been discharged piecemeal through the bowel, vagina, etc. The removal of the pregnant tube with the ovum intact by abdominal section has been successfully performed by Tait, of Birmingham, England, Veit, of Berlin, Mundé, and others during the early months of pregnancy; and numerous cases are reported where after rupture the abdomen has been opened, the bleeding tube ligated and removed, and the woman recovered.

Labor is either natural or preternatural—natural when nothing occurs to mar the progress of the unaided birth of the child and appendages, preternatural when the assistance of art, either manual or instrumental, is required. The causes of preternatural labor may lie either in the mother or the child. *The mother*.—Deformities of the pelvis or of the soft genital organs, rupture of the uterus, vagina, or the external parts (perineum), flooding (either during labor, when the placenta is situated over the mouth of the womb and is detached during dilatation of that orifice—placenta previa—or after labor from the open vessels of the normal placental attachment), convulsions, inversion of the uterus. *The child*.—Too large size, monstrosity, abnormal presentation, transverse or oblique (requiring manual or instrumental interference), compression and protrusion of the umbilical cord (dangerous to the life of the child, but not to the mother, and not impeding delivery), too firm attachment of the placenta. The operations which may become necessary during pregnancy or labor are: The induction of abortion, when the preservation of the life of the mother renders it imperatively necessary that the pregnancy be interrupted, and of premature delivery, when the birth of a fully developed child at term is impossible on account of pelvic deformity; Cæsarean section, the removal of the child and appendages through an incision in the

abdomen and uterus, in cases where the pelvic deformity is so aggravated as to preclude the natural or instrumental delivery of even a mutilated child by the natural passages; the extraction of the child with the forceps; version or turning, and manual extraction by the feet, when it is desired to change the position of the child and accomplish rapid delivery; craniotomy, the perforation of the head and removal of the brain of the living or dead child to enable the passage of the diminished head through the contracted pelvis, thus sacrificing the child for the sake of the mother, etc. Of recent years the operation of Cæsarean section has been more successful both for mother and child, owing to increased experience in abdominal operations and careful antiseptic rules. A modification of the old operation was introduced by Prof. Porro, of Italy, and consists in removing the uterus and ovaries after extracting the child. It can hardly be said to have supplanted the original method. Of the dangers which assail the woman after delivery the most frequent are sore nipples and inflammation of the breasts and childbed or puerperal fever. The general mortality during parturition has decreased in consequence of the improvement in the study and practice of obstetrical science. According to a compilation by Winckel (*Path. and Therap. of the Puerperal State*, 1869) from more than a million labors, it averaged about 6 in 1,000 cases in private practice and 30 in 1,000 cases in lying-in hospitals, the large mortality in the latter institutions being mainly due to the epidemics of puerperal fever breaking out in them from time to time, the disease being rendered particularly virulent by the generally poor physical condition of the patients and the necessary crowding to which they were more or less subjected. The mortality from puerperal fever (which is now recognized to be simply blood-poisoning or septicæmia, the poison usually having been introduced from without, often in some mysterious manner) has so much decreased through the careful observance of the antiseptic rules now practiced in all surgical manipulations that even in maternity hospitals, where formerly the death-rate was the largest, the average percentage of deaths from this cause is less than 1 per cent.

PAUL F. MUNDÉ.

Ocala: city (founded in 1851); capital of Marion co., Fla. (for location, see map of Florida, ref. 4-I); on the Fla. Cent. and Peninsular, the Fla. Southern, and the Savannah, Fla. and W. railways; midway between Jacksonville and Tampa. It is the center of the orange belt of the peninsula; contains 5 churches for white people and 6 for colored, 2 public-school buildings, industrial school, several private schools, 2 national banks, a State bank, and a daily and 4 weekly periodicals; and is principally engaged in orange and vegetable growing and phosphate-mining. Pop. (1880) 803; (1890) 2,904; (1894) estimated, 4,000; with suburbs, 5,000; (1895) 4,597.

EDITOR OF "BANNER."

Ocaña, ò-kaan'yaá: a town of the department of Santander, Colombia; 235 miles N. N. W. of Bogotá; 3,820 feet above the sea (see map of South America, ref. 1-C). It is the center of the trade between Lake Maracaibo and Venezuela on the E. and the Magdalena valley on the W.; the surrounding district is one of the finest agricultural regions of Colombia. Ocaña was founded in 1572. It was formerly the capital of Santander.

H. H. S.

Oc'cam, or Ock'ham. WILLIAM OF: a Scholastic philosopher; b. at Occam, in the county of Surrey, England; d. in Munich, Bavaria, in 1347, at an advanced age. He was educated first at Oxford, and, after he became a Franciscan, in 1319, at Paris under the famous Duns Scotus. He rejected the realism of his master, and became the most eminent of Nominalists. Throughout his life, consistent with the strictest tenets of his order, he strenuously contested the pretensions of the pope to political power and secular possessions, first taking the side of Philip the Fair against Boniface VIII., and subsequently opposing John XXII., by whom he was summoned to trial before an ecclesiastical court at Avignon, whence he took refuge in 1328 with the Emperor Louis of Bavaria, just then in the midst of his struggle with the pope. He promised his pen in support of that monarch in return for his own protection (*Tu me defendas gladio, ego te defendam calamo*). Toward the close of his life he became desirous of making his peace with the pope, but he never signed the recantation demanded by him. No other scholar since the days of Abelard had applied himself so zealously to logic. His skill in handling logical weapons, his acuteness in making distinctions, his fertility in inventing reasons, gave him the name of *Doctor*

invincibilis. His careful discrimination between the logical, real, and grammatical significance of terms enabled him to silence his opponents. The hypostatic entities of the Schoolmen before him were disposed of by his doctrine of the subjective nature of thought. His favorite principle was, "Entia non sunt multiplicanda præter necessitatem." In his *Centilogium Theologicum* the greater part of his hundred demonstrations attempt to prove that theological dogmas, such as the existence, unity, or infinity of God, the Trinity, creation, incarnation, transubstantiation, etc., involve contradiction of logical principles, are irreconcilable with reason, and to be accepted only by faith. This doctrine struck a fatal blow at Scholasticism. That form of philosophy had arisen solely out of the necessity which was felt of proving the rationality of the dogma. It had been seen that agnosticism would not only undermine rational theology, but also the faith in the dogmas themselves, because it would come to be held that they are inconceivable, and hence were words to which our minds attach no meaning; but in the triumph of Nominalism this older and more correct view was for a time eclipsed. If the objects of faith could not be proved by philosophy, nor even reconciled with reason, Scholasticism had no task to fulfill except the negative one of destroying what illusions it had already created. Its decline was rapid. The chief works of Occam are (a) *Tractatus Logices*, (b) *Quodlibeta Septem*, (c) *Super quatuor libros Sententiarum*, (d) *Expositio Aurea super totam Artem Veterum*. Besides these there were commentaries and polemics. WILLIAM T. HARRIS.

Occasional Causes, Doctrine of: a doctrine invented by the Cartesians to explain the action of mind and matter upon each other. Their theory was that God, the First Cause, on the occasion of certain volitions within the mind, produces certain actions or motions of the body; since, said they, the soul, a thinking substance, can not act upon matter, which is pure extension. This doctrine was first fully set forth by Geulinx, and it made necessary extensive and ingenious treatises on the part of Leibnitz, Malebranche, and other philosophers of that epoch to explain away the difficulties involved.

Revised by W. T. HARRIS.

Occipital Bone: See OSTEOLOGY.

Oc'com, or Occum, SAMSON: an Indian preacher of the Mohegan tribe; b. at Mohegan, near Norwich, Conn., about 1723; was educated at the Rev. Ebenezer Wheelock's Indian school at Lebanon; in 1766 accompanied Rev. Nathaniel Whitaker, D. D., who was sent on a mission to Scotland, England, and Wales to raise funds for the establishment of schools for the education and Christianization of the North American Indians. Being the first preacher of these aboriginal tribes who had visited Great Britain, he created a sensation, and drew large audiences everywhere. He officiated in George Whitefield's chapel in Tottenham Court Road, London, and greatly contributed to the success of Dr. Whitaker's mission. The projected school subsequently became Dartmouth College, New Hampshire. After his return he continued in the ministry, preaching chiefly to the Indians. In 1786 he removed with a colony of Indians to what is now Oneida co., N. Y.; subsequently he lived among the Stockbridge Indians. D. at New Stockbridge, N. Y., July 14, 1792. He wrote an account of the Montauk Indians, published by the Massachusetts Historical Society (1st series, x., 106), and wrote the hymn, *Awaked by Sinai's Awful Sound*.

Occlusion [from Lat. *occludo*, to hide, deriv. of *occul'ta're*, intensive of *occu'lere*, hide; *ob-*, intensive + *celare*, hide]: in astronomy, the hiding of one heavenly body behind another. The most common cases of this phenomenon are the occultation of stars by the moon, several of which can usually be seen every month with the aid of a small telescope. Indeed, by closely scrutinizing the moon, when it is three or four days old, it will be found that scarcely an hour passes without some star being hidden behind the dark edge of her disk. Two important astronomical conclusions have been drawn from such occultations. One is that the apparent diameters of even the brightest stars do not exceed a small fraction of a second. This is shown by the fact that, when occulted by the dark limb of the moon, they retain their full brilliancy until the limb actually covers them, and then disappear completely with absolute suddenness, no matter how oblique may be the motion. There is never a visible fading away of the light, which would be the case if the star were of sensible magnitude, because then it would only be gradually covered by the moon.

Another conclusion is that the moon has no atmosphere, or at least none dense enough to exert any refraction upon the rays of light. Did such an atmosphere exist, the star, when near occultation, would be seen through it, and its light would suffer a certain amount of refraction. When a bright star is occulted it sometimes appears to be entirely projected upon the moon's limb before it disappears, as if the moon itself were transparent. This, however, is purely an effect of irradiation, which makes the moon's bright limb appear larger than it really is.

Observations of occultations are useful both for the determination of longitudes and for fixing the position of the moon. The best determination yet made of longitudes in Australia was made by Prof. Auwers from a great number of occultations of the moon observed in that region. The work of determination is, however, more laborious than that of a determination by the telegraph.

Stars are occasionally occulted by the planets. This occurrence is a comparative rarity, owing to the small size of the planets and the disappearance of the star at the approach of the brilliant body of the planet itself. S. NEWCOMB.

Occupancy: See PROPERTY.

Occupation [from Lat. *occupatio*, a seizing, deriv. of *occupare*, seize, take possession of, occupy]: in Roman law, the act of taking possession. The possession thus acquired, if the law allowed, could end in full ownership. Thus, *occupaticius ager*, in one of the old Latin grammarians, denotes land deserted by its own cultivator and occupied or taken possession of by another. The principal objects which could by Roman law be thus taken possession of were—(1) wild animals, which in their free state were held to be without an owner, and wherever taken belonged to the *captor*. If, after being taken, they recovered their freedom, they again became without an owner and could belong to a new *captor*. (2) Things abandoned by an owner with the intention of giving up his ownership and without intending to transfer his right to another. (3) Treasure-trove belonged by Roman law to the finder in certain cases only, as where it had been hid in an unusual way and so long that the owner was not to be discovered. Where it was found by a man on his own ground or on ground without an owner, it belonged wholly to him. Where it was found on the ground of another, it went half to the finder, half to the proprietor of the soil; to the state if the land was public. (4) In war the foe was looked on as without rights, and thus his property was without an owner and capable of acquisition. Things taken from a public enemy during war, however, went first to the state, which could give rights over them to others, as to the captors.

Occupation as a Means of Acquiring Territory.—Discovery, exploration, and settlement resulting in beneficial use, found a valid claim to territory hitherto unoccupied. The third of these is the essential point. By beneficial use is meant any commercial use of the resources of the new country, by fishing or fur-trading stations as well as by cultivating the soil. The rights of a civilized discoverer are held to be paramount to those of prior savages, but the ownership of the latter should be extinguished by purchase. Where settlements of different nationality are made on the same coast, the territory is equitably divided between them. The extent of country which occupation in its early stage may found claim to is vast but indefinite, including generally the drainage areas of the rivers explored. The history of the U. S. claim to Oregon and of the formation and colonization of the Congo Free State may be read in illustration.

Military Occupation.—In the *Instructions for the Government of Armies of the United States in the Field*, issued in 1863, sec. i., it is declared that "a place, district, or country occupied by an enemy stands in consequence of the occupation under the martial law of the invading or occupying army." "Martial law is the immediate and direct effect and consequence of occupation or conquest," whether a proclamation to that effect has been made or not. It "consists in the suspension by the occupying military authority of the criminal and civil law, and of the domestic administration and government in the occupied place or territory, and in the substitution of military rule and force for the same, as well as in the dictation of general laws, as far as military necessity requires this suspension, substitution, or dictation. The commander of the forces may proclaim that the administration of all civil and penal law shall continue, either wholly or in part as in times of peace, unless otherwise ordered by the military authority." In 1874 at Brus-

sels was held a conference of delegates of European powers to work over a code of the rules to be observed in civilized warfare. Their project, as modified by discussion, speaks as follows of military authority within the territory of an enemy: "A territory is considered to be occupied when it is found in point of fact placed under the authority of a hostile army. Occupation extends only to the territory where such authority is established and is in a position to be exercised.

"The legal authority being suspended and passing into the hands of the occupant, he will take all possible steps to re-establish and secure order and public business.

"With this in view he will maintain the laws in force in time of peace unchanged, except in case of necessity."

This code has never received governmental sanction; it simply represents the opinion of the delegates. There are two questions which interest us in this question of occupation: The first is, what is occupied territory? the second, what legal changes does occupation work? See BRUSSELS CONFERENCE.

Without going into these questions at length, it is enough to say that occupation, being a result of military force, must depend upon the continuance of such force. This, however, does not imply that the presence of the invading army must be constant in a given district. It does require that the military power of the dispossessed sovereign shall be inoperative in it.

As to the second query, it is to be remarked that occupation is not completed conquest. Such change of sovereignty as is implied in conquests results only from a subsequent treaty of cession or from prescriptive possession. The original sovereign retains his rights, but temporarily they are suspended. Meanwhile the will of the occupant prescribes the laws of the occupied territory as a matter of military necessity and in recognition of a state of fact. Such necessity should be the limit of his exercise of this right. He should, and probably will, keep in force the former laws, so far as relates to local order and government. He will not exact any form of military service from the inhabitants. The taxes imposed upon them, except when in the nature of penalties, should be expended for their benefit. On the other hand, all unorganized opposition to the occupant is unlawful and in its graver forms criminal. What proceedings within the occupied district on the part of discontented inhabitants should be punished with severity it is not easy to define by general rules. Thus much, however, may be said—that guerrilla warfare by parties who have no uniform, or who put on and take off a uniform at pleasure, and are without any connection with the national army, is, and on account of the atrocity and insidiousness with which such warfare is apt to be carried on ought to be, punished with severity. Revised by T. S. WOOLSEY.

Ocean [from Lat. *oceānus* = Gr. *ὠκεανός*, the river surrounding the habitable world; old proverb *ὦ- + partic. of root *kei* (κέῖμαι), lie; cf. Skr *āḍyānā-*, lying around]; the vast body of salt water, occupying the greater depressions of the earth's surface. The ocean is sometimes spoken of as the hydrosphere, between the solid geosphere and the gaseous atmosphere. Its area is 150,000,000 sq. miles, or three-quarters of the earth's surface. Its average depth is about 2 miles (according to Krümmel, open oceans, 2,000 fathoms; all salt water, 1,800 fathoms); its volume is 300,000,000 cubic miles, or $\frac{1}{43}$ of the earth's volume; its mass is 13×10^{17} tons, or $\frac{1}{3375}$ of the earth's mass.*

A marked characteristic of the ocean is its continuity, and the fact that the land areas which rise above it are mostly gathered into large continental masses, lying for the greater part in one hemisphere, instead of being scattered through the ocean in small islands. The hemisphere which has Southern England for its pole includes nearly all of the land, while the hemisphere having New Zealand for its pole includes the greater oceans. The oceans of the land hemisphere are the Atlantic with its Arctic gulf, the Indian, and a part of the Northern Pacific; the lands in the water hemisphere are Australia and the islands thereabouts, a part of South America and the Antarctic lands. The South Pacific and Antarctic Oceans may therefore be regarded as the great ocean area of the world, from which the North Pacific, the Indian, and the Atlantic-Arctic waters extend in the form of great arms, the first broad and blunt, the last long and relatively narrow.

Viewed from the standpoint of the earth's history, the ocean is that part of its mass which remains liquid at exist-

ing temperatures, but which was probably vapor or gases during the earth's early youth, when the earth was a glowing mass, and which will be frozen solid in the earth's old age. In the economy of the earth, the ocean is the great reservoir from which nearly all the circulating waters are derived by evaporation. Its vapors are carried by the winds, condensed to fall as rain or snow on the ocean again or on the lands; returning from the lands as rivers, bearing land waste in suspension or solution. The waves of the ocean beat on the shores of the lands and consume them. Thus the ocean gains contributions of all kinds of materials afforded by the lands, the coarser parts being deposited near shore, the finer suspended particles being strewn farther off shore, but seldom more than 200 or 300 miles away, while the dissolved parts remain in solution until abstracted by organic or physical process. The currents of the ocean are of extreme importance in determining the distribution of temperatures; the tides sweep the shores and bays. The level surface of the ocean is the standard of reference in all measures of the earth's form, and of the altitude of the lands.

Classification of the Ocean Areas.—The parts of the ocean are divided, first, according to depth; second, according to form. Soundings are now made with great accuracy even in depths of over a mile. Fine steel wire is used instead of rope, and the sinker is automatically detached on touching the bottom. Thermometers may be attached to the wire at various points, with automatic devices for registering the temperature at the greatest depth to which they descend. Samples of the bottom and of water from various depths are brought up. When dredging is attempted wire rope is used to haul the dredge. Soundings have shown that the great oceanic areas are all over 1,000 fathoms in depth, while the waters close around the continents are often less than 100 fathoms in depth for a considerable distance off shore. This shallow belt really belongs to the continent, although at present overflowed by the sea; it is called the continental shelf; nearly all the littoral islands are borne upon it (see ISLANDS), and it receives nearly all the waste from the adjacent lands. It is well developed along the Atlantic coast of the U. S., being over 500 miles wide in the N. E., where Newfoundland rises from it, and narrowing southward, but it is almost wanting along the Pacific coast. The shelf encroaches on the Gulf of Mexico, the deep basin of the Gulf being only about half the water area. Shelves occur along the northeast and southeast coasts of South America, but not on the western coast. A broad shelf extends from Europe across the North Sea and beyond Great Britain. Two extensive platforms of this kind stretch S. E. from Asia and N. from Australia, bearing many islands.

The deep oceans really constitute a single water body, with arms running between the lands; but we shall later see good reason for subdividing them according to their surface circulation. Partly set aside from the great ocean are the mediterraneans; the classic Mediterranean, the greatest example of the kind, the Caribbean Sea, the Gulf of Mexico, the Red, Celebes, Sulu, China, and other marginal Asiatic seas of less size. These are all of 1,000 or 2,000 fathoms depth, or more; but they communicate with the great ocean only by relatively narrow, or at least shallow, passages. It is noticeable that the ordinary geographical terminology of the oceanic areas gives no clue to their physical features. *Ocean* should never be applied to the waters on the continental shelf, as in the German Ocean. *Gulf* should be reserved for deep re-entrants, such as the Gulf of Guinea, and not applied to shallow bays, such as the Persian Gulf or the Gulf of St. Lawrence. *Sea* might advisably be applied to mediterraneans, like the Caribbean or the Chinese Sea, and not to shallow waters, like the Yellow Sea or the North Sea, or to open gulfs, like the Arabian Sea. *Bay* should be reserved for shallow re-entrants, like Delaware Bay, Chesapeake Bay, and not given to deep gulfs, such as the Bay of Biscay or of Bengal. The ordinary use of these terms is in hopeless confusion.

The greatest depths thus far discovered are in the Pacific, N. E. of Japan, 4,655 fathoms, and in the Atlantic, N. of Porto Rico, 4,561 fathoms. The great oceanic depression sinks much deeper beneath the sea-level than the mean height of the land rises above it. The reason for this is primarily the great volume of the ocean, but various secondary causes should be considered: the strength of sunshine giving active evaporation, rapid atmospheric circulation, and plentiful rainfall; the chemical activity of the atmosphere in weathering rocks into soil; the relatively slow rate of continental and mountain upheaval—all these

combine to permit the forces of degradation to reduce the greater parts of the lands nearly to sea-level. Only here and there on the earth, and only now and then in geological time, are great land elevations possible. Viewed in this way, it can be hardly accidental that the largest and driest continent has the highest mountains and plateaus.

The greater part of the deep ocean floor is smooth and monotonous, without the variety of relief that characterizes the lands. Excepting within a few hundred miles of the shore, it receives no significant share of mechanical land waste. Excepting volcanic cones, and excepting occasional inequalities near continents, not characteristic of the open oceans, the ocean floor is a gently undulating plain of calcareous or argillaceous mud or "ooze," the argillaceous ooze preponderating at depths greater than 2,500 fathoms. The ooze is derived for the most part from the disintegration of the skeletons of minute forms of life (chiefly Foraminifera which live near the ocean surface), with a small share of volcanic dust. The broad and gentle undulations of the bottom by which the shallower "swells" descend to the deeper "abysses" do not serve to break its monotony. All is cold and dark, without changes of days, weather, or seasons.

Composition of Ocean Water.—In 100 parts of ocean water, 3.5 parts are dissolved salts, whose composition as determined by Dittmar for the *Challenger Report* is:

Chloride of sodium.....	77 758	Sulphate of potassium....	2 465
Chloride of magnesium...	10 878	Bromide of magnesium...	0 217
Sulphate of magnesium....	4 737	Carbonate of calcium.....	0 345
Sulphate of calcium.....	3 600		

Besides these substances, many others exist in minute proportions, as bromine, iodine, fluorine, phosphorus, silicon, boron, gold, silver, lead, copper, zinc, cobalt, nickel, iron, manganese, aluminium, barium, strontium, etc. (*Forchhammer*).

It is noticeable that those minerals which are easily soluble make a considerable part of sea salt, even though relatively rare in the earth's crust, while the more common and less soluble rocks are faintly represented in the sea; yet two of the latter, silica and limestone, although occurring in very small proportion, are used as the framework of most marine animals. Atmospheric gases also occur in sea water: near the surface the proportion of oxygen to nitrogen is about one to three, but in deep water the oxygen is greatly diminished. Carbonic acid, believed to be loosely combined with certain of the salts, exists in much greater proportion than in the atmosphere, its source presumably being in volcanic vents, whence it must issue as a liquid under the great pressure of the deep ocean.

The salinity of the surface waters varies by small but significant amounts. The average density is 1.026, but it rises to 1.027 in the dry trade-wind belts of the open ocean, where evaporation is in excess of rainfall, and to over 1.028 in inclosed seas, like the Mediterranean and the Red Seas. A lower measure (1.026) is found around the equator under the moist air and heavy rains of the doldrums, where it is occasionally possible to gather water that is almost fresh at the surface after a heavy downpour; and also especially among islands, where the movement of the waters is retarded and the rainfall is increased, as about Java and Sumatra, where the density is 1.025. The sea surface is also slightly fresher in high latitudes, where evaporation is deficient, and in long arms of the sea (but not in trade-wind latitudes), as the Black Sea (1.021 to 1.014), the Baltic (1.023 to 1.004), and the Gulf of St. Lawrence. Large springs sometimes rise through the salt water near the shore, bringing water almost fresh to the surface.

The density of the ocean at the bottom is hardly greater than at the top, so little is water compressible, in spite of vast pressures exerted upon it, the ocean being unlike the atmosphere in this respect. According to Tait, an ocean 2 miles deep loses about 76 feet of depth by compression; the depression of the actual ocean surface in this manner being about 116 feet, thus laying bare about 2,000,000 sq. miles of coastal lowlands that would be submerged if the ocean should now assume a uniform density.

Although the water on the open ocean is remarkably transparent, it is believed that sunlight is practically extinguished at a depth of a few hundred fathoms. Under a clear sky mid-ocean water has a strong blue color, but under heavy clouds it becomes gray or leaden, and when streaked with foam under a heavy storm the water seems almost black. On "soundings" near shore the color generally becomes greenish; near large rivers it may be tinged

with yellow, even out of sight of land. Patches of red or whitish color are sometimes caused by swarms of minute animals or plants.

The mean temperature of the ocean surface varies with latitude and with the movement of its currents. The contrast of equatorial and polar temperatures is less in the ocean surface waters than in the air over the lands, being from about 85° to 30° in the first and from 90° to 10° or 0° in the second. This is because of the equalizing tendency of ocean currents. The annual variation of temperature is relatively small over all parts of the ocean surface, not only on account of the currents, but also because the temperature of the water is changed with great difficulty, by reason of its various physical properties. It warms slowly because of its reflecting power, by which much sunshine is thrown back; its transparency, by which much sunshine is allowed to penetrate beneath the surface and little is absorbed to warm the surface layer; its volatility, by which much sunshine is expended in warmer latitudes in supplying latent heat for evaporation; its mobility, by which the surface layer is frequently mixed with less warmed or cooled water from beneath; its currents, by which water now warmed is replaced by cooler water. Conversely, these physical properties all retard its cooling. It is on account of this conservatism with respect to temperature that the climate of the great south temperate oceanic zone is so inhospitable—not excessively cold in winter, not warm in summer, but always of a penetrating chill. The islands of South Georgia, no farther from the equator than Middle England, have snow in midsummer, with glaciers descending to the sea-level; this contrast not being due to any exceptional conditions in the southern islands, the climate of whose latitude they fairly represent, but to the exceptionally favorable condition of England, which lies to leeward of a large drift of warm and well-tempered ocean waters. The conservatism of the ocean as to temperatures affects the winds that blow over it, and these in turn affect the climate of leeward coasts; hence the milder climate of Western Europe, where the winds prevailing blow from the ocean, in contrast to the severe climate of Eastern North America, where the winds prevailing blow from the lands. See CLIMATOLOGY.

Salt water has its maximum density at its freezing-point, 28° , being in this respect strongly contrasted with fresh water, which is densest at 39° . The coldest waters of the ocean therefore accumulate at the bottom, but in freezing salt water expands and its ice floats. As the ice-crystals form, the salt is partially excluded from them. The floe-ice of polar seas is thus formed. When drifted by winds or currents two floes may collide, thus forming pack-ice. Unless melted by drifting into warmer latitudes, the ice may become heavier and heavier in successive winters; thus the paleocrystic ice-sheets or old heavy ice-floes of Arctic explorers are explained. Icebergs are shed into the sea from glaciers; they may float into sub-temperate latitudes; they sometimes carry boulders and gravel, which are dropped to the sea-floor as the iceberg melts.

The distribution of temperature in the deeper oceans is dependent on their supply of cold polar water which creeps along the bottom toward the equator. In the polar oceans the variation of temperature with depth is slight, the whole mass being within a few degrees of its freezing-point; in the equatorial oceans the decrease is rapid until a temperature of 40° or 38° is reached at a depth of about 400 fathoms, then there is a slow cooling to a temperature of 34° ; or 32° at the bottom. The Mediterranean seas, inclosed by comparatively shallow barriers, can not receive a supply of deep cold waters; hence their bottom temperature is dependent either on their own coldest surface waters in winter or on the temperature of the open ocean water at the depth of their deepest inlet. Thus the Mediterranean, with a maximum depth of 2,170 fathoms, has a uniform temperature of 55° at all depths beneath 260 fathoms, this being the temperature to which the whole sea is reduced in winter. The Caribbean Sea and the Gulf of Mexico, with depths of 3,428 and 2,118 fathoms, have bottom temperatures of 39° . As this is much lower than the mean temperature of the surface in winter, the depth of the deepest inlet from the Atlantic, 710 fathoms, was predicted from the previously known depth at which 39° occurred in the adjacent open ocean. The Sulu Sea, inclosed by the Philippine islands, is remarkable in having great depth, 2,550 fathoms, yet its bottom temperature is 50.5° ; hence its deepest inlet is thought to be about 200 fathoms. Be-

fore considering the cause of the movement of the cold polar waters toward the equator, other movements of the ocean must be examined.

Waves are produced by the winds blowing over the ocean surface. While the wave-form moves forward in the direction of the wind, the water particles describe orbital paths, moving forward at the crest, backward in the trough, falling and rising between. When little waves ride on the surface of larger ones, they are more exposed to the wind on the larger crests than in the troughs; hence while on the crests they are blown forward, and thus increase the orbital velocity of the particles in the larger wave, and in turn increase the movement of the larger wave. It is in great part for this reason that a film of oil, that spreads spontaneously over the water and prevents the formation of little waves, prevents also the increase in size and the combing or breaking of the larger waves; and hence in rough weather is of great service in decreasing the violence of wave-motion near a laboring vessel.

Strong gales and hurricanes produce waves of great size, but none of greater height than 30 or 40 feet have been carefully measured. When a great size is attained the progressive velocity of the wave may be as much as 60 or 80 miles an hour; the wave-length, or distance from crest to crest, a quarter to half a mile; hence such waves succeed one another in periods of fifteen or twenty seconds. While their velocity of progression is exceeded by the stronger blasts of wind in the gales that cause them, it is frequently the case that they outstrip the average gale, although in such cases the forward orbital velocity of the water particles in the wave-crest is much less than that of the wind. Once excited in a storm-area, the waves swing outward on all sides, diminishing their height, but preserving their length, velocity, and period, and gradually falling to a broad heaving of the surface, known as a swell. The winter storms of temperate latitudes thus cause a long, low swell across the doldrums of the equator, even into the hemisphere opposite to that of their source. When the swell runs ashore on a gently shoaling coast, its height increases, the length and velocity of the successive waves decrease; but their period remains unchanged; close to the shore they roll over and fall, and are hence called breakers or surf; they dash violently upon the beach, rushing forward in a sheet of foam, and returning under the next wave to form the dreaded undertow. When a strong wind blows on a steep coast over deep water, another effect is produced; here the waves attain great size, but instead of dashing against the shore they dance up and down in front of it. The stronger the wind, the deeper the on-shore water must be to manifest this motion.

Long flat waves are produced by earthquake shocks or volcanic explosions under or near the sea. The waves overwhelm the coasts near their source, causing great destruction. In the Strait of Sunda, after the explosion of the volcano Krakatoa, Aug. 26, 1883, the sea rose over 100 feet on the neighboring coasts, drowning over 30,000 persons. Waves thus excited swing far and wide across the ocean, like waves from storms, imperceptible in the open sea, but increasing considerably when running on a shoaling coast. Their velocity of progression is very great; the waves from the earthquake at Simoda, Japan, Dec. 23, 1854, were registered in San Francisco in twelve and a half hours; the waves from the earthquake at Arica, Peru, Aug. 13, 1868, were registered at Sydney, Australia, in twenty-three hours.

Storm-waves or destructive overflows of the sea are caused on low coast lands when violent on-shore winds conspire with a rising tide. The densely populated delta of the Ganges has repeatedly suffered in this manner; in the cyclone wave of Nov., 1876, it is reported that over 100,000 persons were drowned. Similar storm-waves occurred on the Louisiana coast in Oct., 1893, and on the low Carolina coast in August of the same year.

Ocean currents are of several kinds. The great surface currents are caused by the winds; the deep movement from the polar seas is due chiefly to difference of density resulting from difference of temperature; the opposed surface and bottom currents in certain straits are caused by difference of density; active alternating currents in estuaries and sounds are caused by the TIDES (*q. v.*).

Wind-made currents are caused by the brushing forward of water in wave-crests, whereby a general forward movement is communicated, first to the surface stratum, then to deeper layers. Where the winds are steady, as in the trade-wind belts, the currents are regular; where the winds

are frequently interrupted by stormy shifts, as in the temperate zones, the surface currents vary more or less with the winds, but the general drift of the sub-surface waters follows the prevailing direction of the wind. Where the winds vary periodically, as in the monsoon region of the Indian Ocean, the currents vary also, their time of change being a little later than that of the winds. The general winds of the world have an eddy-like circulation around each of the five chief oceans; but the ocean currents are much better hemmed in than the winds, and their circulatory movement gives good physical warrant for the division of the great continuous ocean into the parts generally recognized—the North and South Pacific, the North and South Atlantic, the Indian and the Antarctic Oceans. The great eddies of the northern oceans turn slowly from left to right; of the southern oceans from right to left, except that the Antarctic has a drift from left to right, or west to east, around the pole, which it shares with the three adjoining oceans. The Arctic should be regarded as hardly more than a great gulf at the end of the long Atlantic. The currents of the ocean eddies may be called drifts where they are broad and slow-moving, and streams where they are concentrated to narrow courses and rapid flow near coasts or through straits.

The circulation of the North Pacific is relatively simple and regular; its strongest movement is on the W., where the equatorial member of the eddy turns sharply from its westward course and flows N. E. past Japan, forming the Japanese current, or Kuro-siwo; there is a moderate backset or reversed eddy in the Alaskan bay, a small amount of leakage from the Arctic through Bering Strait, and some cold waters flowing southwestward past Kamchatka. The South Pacific eddy is less regular; it bears a vast volume of cooled water northward along the west coast of South America, forming the Humboldt or Peruvian current, and thus producing near the Galapagos islands the lowest temperatures in the equatorial ocean; but it loses distinctness among the many islands on its western side, it gives off branches through the Australasian archipelago to the Indian Ocean, and it is confluent on the S. with the great Antarctic eddy. The South Indian Ocean has a normal right to left eddy, but on the N. it is complicated by the alternating monsoon currents of the Bay of Bengal and the Arabian Sea. Very little if any water passes from the Indian Ocean around the Cape of Good Hope to the Atlantic. The South Atlantic eddy is confluent with the Antarctic on the S., and separated from Patagonia by a wedging current of cold water; but it is very peculiar in giving forth a great branching current across the equator, to join with the North Atlantic eddy off the coast of Guiana. The North Atlantic eddy receives the branch current just mentioned; it is complicated on the W. by the branches outside of the Antilles, as well as through the Caribbean and Gulf of Mexico. The strong stream issuing from the Gulf between Florida and Cuba, known as the Gulf Stream, is the most famous current of the world, running 80 or 90 miles a day in its narrowest part. As the North Atlantic is the only ocean communicating with Arctic waters, all their circulation is dependent on the great branch of the North Atlantic drift which splits off W. of France, passes northeastward along the coast of Norway, and, after making the round of the Arctic, returns on either side of Greenland to form the Labrador current, which wedges its way southward along the eastern coast of the U. S.

Within each oceanic eddy the more quiet waters about the center contain a greater or less amount of floating seaweed or *sargasso*, as it is called by the Portuguese, hence the name Sargasso Sea. Between the paired eddies of the North and South Pacific and Atlantic there are counter-currents of somewhat variable strength, somewhat N. of the equator, running from W. to E.; they are presumably caused chiefly by the southwest winds that occur here, particularly in the northern summer season. The latter are the extension of the southeast trade into the northern hemisphere, where it turns to a southwest wind. It is by a similar extension of the southeast trade of the Indian Ocean into the northern hemisphere, where it forms the southwest monsoon of the northern summer, that the currents there are reversed from the course that they maintain under the northeast monsoon of winter.

The very slow movement of the deep cold polar water toward the equator, proved by the distribution of temperatures already described, has by many geographers been referred to the reflux of an excess of surface waters, brushed by the winds toward the poles; but this excess is not proved.

Moreover, the branch current that crosses the equator from the South to the North Atlantic should, if the winds were the only cause of the bottom movements, produce a north-to-south movement of the deep waters beneath the Atlantic equator; but the distribution of bottom temperatures there indicates that the deep movement under the equator in the Atlantic is chiefly from S. to N.; hence some other cause than surface winds must be inferred for the bottom movement. This cause is found in the greater density of the cold polar waters; the fact of greater density being doubted by no one, but its sufficiency to cause movement being often questioned. It appears, however, from calculation, that the effective equatorward force here applied is not much less than the force by which the tides are swung back and forth twice a day, as has been shown by Ferrel; and as the equatorward force acts perpetually, it should be regarded as the chief cause of the bottom movement.

Salinity currents are found well exhibited at the Strait of Gibraltar, where the less saline surface current is inward and the denser undercurrent outward; similarly in the Bosphorus, between the dense Mediterranean and the fresher Black Sea; at the strait of Bab-el-Mandeb; and at the entrance to the Baltic. The undercurrent in these various straits always moves from the denser to the less dense water body.

The distribution of life in the ocean has been much studied by the exploring expeditions of the nineteenth century. This life is extremely abundant and varied in the littoral waters of the torrid zone, and exists in remarkable variety even in much colder latitudes, both the vegetable and animal forms of the polar seas being much more numerous than those of Arctic lands. Besides those forms found along the shores in relatively shallow water, there are others which inhabit the open sea near the surface, hence called pelagic forms; and others again which inhabit the bottom of the deepest oceans, in spite of the intense pressure of the overlying water, of the monotony of the surrounding physical conditions, and of the absence of sunlight. From the fact that certain abysmal forms possess eyes and are marked by varied colors, it is inferred that light from some other source, such as phosphorescent animals, may cause a faint illumination there. The intermediate depths of the ocean have been imperfectly explored, but if they possess any characteristic fauna it is a very sparse one. The pelagic fauna of the surface is remarkable chiefly for the excessive abundance of minute, almost transparent, forms, chiefly of the lower orders of life. It is from the minute calcareous and siliceous skeletons of these animals that the ooze of the bottom is chiefly supplied. Although the plants and animals of the land are thought to have been evolved from more primitive forms that inhabited the seas, where the earliest forms of life presumably existed, yet the larger marine mammals, such as whales, walruses, etc., are believed to have been developed from land mammals.

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Ocean Grove: town; Monmouth co., N. J. (for location, see map of New Jersey, ref. 4-E); on the Atlantic Ocean, and the Cent. of N. J. and the Penn. railways; 1 mile from Asbury Park, 6 miles S. of Long Branch. It is a popular summer resort, and is widely known as the seat of the Ocean Grove Camp Meeting Association of the Methodist Episcopal Church. This association was organized in 1869 under the presidency of the Rev. E. H. Stokes, D. D., who still (1894) retains its direction. The first preaching-stand was erected in 1874, the congregation using seats of pine planks laid on trestles and without backs. The first permanent building, a frame structure covered with green pine boughs, was erected in 1875; an auditorium, seating 5,000 people and costing \$10,000, was built in 1880; and a second auditorium, the largest audience-room for evangelistic services in the U. S., comfortably seating 10,000 persons and costing \$75,000, was dedicated Aug. 9-12, 1894. The town has numerous hotels, boarding-houses, and summer cottages, and two weekly newspapers. Pop. (1880) 620; (1890) 2,754.

Ocea'nia, or Oceanica: a term of no precise application, used by various geographical writers to denote lands in

greater or less areas of the Pacific Ocean, some including only Polynesia, Melanesia, and Micronesia, and others adding Australasia and the East Indian Archipelago. Many leading geographers and map-makers do not now employ the term at all on account (1) of the confusion above noted; (2) because it has been made to include both oceanic and continental islands, though its use should be confined to oceanic islands; and (3) because it has been used to exclude a large part of the oceanic area to whose lands it would be in strictness equally applicable, as the Atlantic islands. C. C. ADAMS.

Ocellus [Lat., a little eye]: a name given to the smaller organs of vision, especially in the Arthropoda. In these the ocelli are small, simple organs, each with its own lens and retinal layer, and are contrasted with the larger compound organs of vision so typical of the group. See EXOMOLOGY.

Ocelot [from Mex. *ocelotl*]: one of the handsomest of the cat family found in America, the *Felis pardalis* of the naturalists. It is found from Southeast Texas to Patagonia, and formerly ranged to Louisiana. The color varies from tawny yellow to reddish gray, marked with numerous black spots, and dark stripes and blotches edged with black. There is



The ocelot.

almost always one of these stripes along the region of the shoulders, and there are two black stripes on each cheek. The under parts are whitish. The ocelot is extremely variable in its markings, and it is still an open question as to whether or not several distinct species have been combined under one name. The total length varies from 3 to 4 feet, the tail being 11 to 15 inches long. F. A. LUCAS.

Ocher, o ker [from Fr. *ocre* < Lat. *ochra* = Gr. *ὄχρα*, yellow ocher, deriv. of *ὀψός*, pale, pale yellow]: any one of certain pigments made of clays colored by hydrated peroxide of iron in variable proportions, varying in shade from pale yellow to deep orange. The term is also more broadly applied to any clay richly colored by peroxide of iron. Rutile, or red chalk, is a variety of ocher consisting of decomposed *hematite*. In mineralogy, earth varieties of *hematite* or iron peroxide, if bright tinted, are known as red ocher, while argillaceous and decomposing *limonites*, or hydrated peroxides, give rise to brown ocher. Moreover, the term is used in that science, in combination, to express the earthy, pulverulent, decomposing oxides of other elements.

Ochino, ô-kee'nô, BERNARDINO: preacher; b. at Siena, in the Papal States, 1487; joined the strictest branch of the Franciscan order, and afterward the still stricter order of the Capuchins, and acquired a great reputation as a preacher. Paul III. chose him for confessor, and other honors were heaped upon him. He was chosen in 1538 by the Capuchins to be their general; but in Naples he became acquainted with the Spanish mystic Juan Valdez, with Peter Martyr, and others, and from that time began to preach on justification by faith, on the futility of indulgences, etc. Suspicions arose with respect to his orthodoxy; and when, in 1542, he published in Venice his *Dialogi VII. Sacri.*, he was summoned to Rome to explain and retract. Fully aware of the danger, he fled to Geneva, where he published six volumes of Italian sermons (*Prediche*, 1542-44), of which twenty-five were translated into English (1548). From Geneva he went to Augsburg, and thence to Strassburg, London, Zurich, Cracow, etc., in each place preaching to the Italians, publishing a number of books, but leading a somewhat erratic

life. D. at Schlackau, Moravia, 1565. In the first works he published after his flight from Italy he advocated Calvinistic views, but in the later Socinianism becomes more and more apparent, especially in his catechism, published at Basel (1561). See his *Life*, by Benrath (Leipzig, 1875; trans. into English, New York, 1877). Revised by S. M. JACKSON.

Ochoa y Ronna, EUGENIO, de: poet, critic, and scholar; b. at Lezo, Guipuzcoa, Spain, Apr. 19, 1815; d. Feb. 29, 1872. After studying at the College of San Mateo, and then in that of Santo Tomás at Madrid, he went in 1829 to Paris to study in the École des Arts et Métiers. He also essayed painting, but trouble with his eyes obliged him to abandon this. In 1834 he returned to Madrid, and began to write for the *Gaceta de Madrid*, which the famous Alberto Lista was then directing. The revolution of La Granja, however, forced him to return to Paris, where he occupied himself with editing works of the Spanish classic writers for the extensive *Colectión de los mejores autores españoles* planned by Baudry, as well as with other literary undertakings. He brought out the first modern editions of the works of the Marquis of Santillana, *Hernán Pérez de Pulgar*, etc. In 1844 he returned to Madrid and became under-librarian in the National Library. In 1847 he was made director of the state printing establishment; and soon after chief of bureau in the ministry of Public Instruction. In 1844 he was elected a member of the Spanish Academy, and a little later of the Academy of History. Besides his work as editor, he made many translations from the English and French, among others of Hume's *History of England*; Napoleon III.'s *Julius César*; Scott's *Monastery* and *St. Romain's Well*; Vergil's *Elogues* (1879). He prepared for Rivadeneyra's *Biblioteca de Autores Españoles* an *Epistolario español* (vols. xiii. and xlii.). By commission of Louis Philippe he compiled an exhaustive catalogue of the Spanish manuscripts in the libraries of Paris (1844). Worthy of mention also are his play, *Incertidumbre y Amor* (1836); *Paris, Londres, y Madrid* (1861); *Miscelánea de Literatura, Viajes y Novelas* (1867). His poetical and critical contributions to periodicals were very numerous. A. R. MARSH.

Ock'ley, SIMON: Orientalist; b. at Exeter, England, in 1678; studied at Queen's College, Cambridge, distinguishing himself by his attainments in the Oriental languages; took orders in the Church of England; became vicar of Swavesey, near Cambridge, 1705; published a Latin *Introduction to the Oriental Languages* (1706); a *History of the Jews* (1707), translated from the Italian of Rabbi Leon of Modena, with an original *Supplement concerning the Caraites and Samaritans*, and several translations from Oriental manuscripts; became Professor of Arabic at Cambridge 1711; published *The History of the Saracens* (2 vols., 1708-18). D. at Swavesey, Aug. 9, 1720.

Ocmul'gee River: a stream which rises in the central part of Georgia by several head-streams, flows in a generally S. S. E. course, and above Colquitt joins the Oconee to form the Altamaha river. Small steamboats ascend to Macon. Its lower course is through sandy pine woods; its upper, through a granite region, where there are many rapids. It is 300 miles long.

O'Connell, DANIEL: patriot; b. at Carhen, County Kerry, Ireland, Aug. 6, 1775; the son of a gentleman of small estate, but of ancient family; was educated at St. Omer and Douay, and in 1794 began to study law at Lincoln's Inn; in 1798 was called to the bar; rose at once to distinction as a barrister, and very soon became prominent in Irish politics, addressing himself to the work of the emancipation of the Roman Catholics and of Ireland. In 1815 he was challenged by Alderman d'Esterre of Dublin, whom he mortally wounded; and a duel with Mr. Peel was soon after prevented by the police. In 1823 he founded the Catholic Association, which exerted a powerful influence in favor of the repeal of legislation unfavorable to Ireland, but the Government brought in a bill to suppress it, and it dissolved itself in 1825. In 1828 he was chosen to Parliament from County Clare, but was excluded by the Test oath; in 1829, however, the Roman Catholic emancipation took place, and O'Connell entered the House of Commons. His life-work was one of agitation, both among the people and in the House of Commons, for the repeal of the Union. In 1842 he began to hold monster meetings in Ireland, and in 1843 he was arrested on a charge of conspiracy and sedition, convicted, and heavily fined; but the Lords reversed the judgment Sept. 7, 1844. In the meanwhile the Young Ireland party,

falling under the control of more impetuous spirits, began to discredit the moral force policy of O'Connell and advocate more violent measures than he approved. In 1845 his influence was fast declining, and in 1846 his support of the Whig ministry tended to make him even more unpopular with the Irish party. In 1847, enfeebled by overwork and by anxiety for Ireland, where the famine had broken out, he started on a pilgrimage to Rome, but died at Genoa, May 15, 1847. He is buried at Glasnevin, Dublin. See *Life and Speeches of Daniel O'Connell*, by his son, John O'Connell (London, 1846); Cusack, *The Liberator, his Life and Times* (London, 1872); Justin McCarthy, *History of Our Own Times* (1879-80).
Revised by F. M. COLBY.

O'Connor, Roderick, popularly called RORY: the last independent King of Ireland; b. in Connaught in 1116; succeeded to the throne of Connaught on the death of his father, Turlogh O'Connor, 1156; disputed the supremacy for several years with the O'Neals and the O'Briens; assumed the title of King of Ireland 1166; assembled a parliament of lords and clergy at Athboy 1167; aided in the expulsion of Dermot, King of Leinster, 1168; defeated the English invaders under Strongbow in several engagements, but subsequently came to terms with them and reinstated Dermot in his kingdom; afterward carried on war with the English with varying success, until in 1175, after an interview with Henry II. of England, he acknowledged that monarch as lord paramount of Ireland, retaining for himself his ancestral kingdom of Connaught. His sons having revolted against him, Roderick retired in 1186 to a monastery, where he died in 1198.

O'Connor, Thomas Power, M. P.: journalist and politician; b. at Athlone, 1848; educated at Queen's College, Galway, and graduated at the Queen's University; became a journalist; entered Parliament 1880; became one of the most prominent leaders of the Parnellite party and of the Land League; lectured in the U. S. 1881; was elected president of the Irish National League of Great Britain 1883; was elected to the House of Commons for the Scotland division of Liverpool, for which he still (1894) sits, 1885; is the author of *Lord Beaconsfield, a Biography* (1876); *The Parnell Movement* (1885), and other works; editor of the *Cabinet of Irish Literature*; started *The Star* newspaper (1887), which he sold 1890, and started *The Sun*, 1893.
C. H. THURBER.

Oconomowoc: city; Waukesha co., Wis. (for location, see map of Wisconsin, ref. 7-E); on Oconomowoc creek and Lake Kellee, and the Chi., Mil. and St. P. Railway; 31 miles W. of Milwaukee. It is in an agricultural region, is surrounded by numerous beautiful lakes, has excellent drives, valuable mineral springs, and commodious hotels, and as a summer resort has been called the Saratoga of the West. Pop. (1880) 2,174; (1890) 2,729; (1895) 3,178.

O'Connor, Charles, LL. D.: jurist; b. in New York city, Jan. 22, 1804; son of Thomas O'Connor, who emigrated from Ireland to the U. S. for political reasons in 1801, and devoted himself largely to journalism and the writing of pamphlets on Irish and Roman Catholic questions. Charles O'Connor was admitted to the bar in 1824, and by his untiring industry and native talent became the recognized leader of the legal profession in New York. He first gained repute in *nisi prius* cases before juries, but the case which first gave him an established reputation was that of the fugitive slave Jack (1835). The most celebrated of his cases were the Lispenard will case (1843), the Forrest divorce case (begun in 1850 and finally disposed of in 1868), and the Parrish will case (1862). He deprecated the civil war, and, believing that its aim was inconsistent with the original principles of the confederation under the Constitution, he sympathized with the Southern States, and became senior counsel for Jefferson Davis when he was indicted for treason. He never held public office except that of district attorney for a few months during the administration of President Pierce and that of a member of the constitutional convention in 1864. In 1868 he was nominated for the presidency by the extreme Democrats, and received about 22,000 votes. He was noted for his integrity and simplicity of character. D. at his residence on the island of Nantucket, May 12, 1884.
F. STURGES ALLEN.

Oconto: city; capital of Oconto co., Wis. (for location, see map of Wisconsin, ref. 4-F); on Green Bay, at the mouth of the Oconto river, and on the Chi. and N. W. and the Chi., Mil. and St. P. railways; 30 miles N. by E. of Green Bay.

It is in a lumbering region, and contains a public park, a national bank (capital \$60,000), flour and planing mills, iron-foundries, wagon-factories, and three weekly newspapers. Pop. (1880) 4,171; (1890) 5,219; (1895) 6,017.

Octahedron [from Gr. *ὀκτάεδρον*, liter., an eight-sided thing, neut. of *ὀκτάεδρος*, having eight sides or bases; *ὀκτώ*, eight + *ἔδρα*, seat, base]: a solid bounded by eight triangular planes. If regular, its faces are equilateral. It has twelve edges and six solid angles, each formed by four equal plane angles. Its solid contents are equal to the cube of one of its edges multiplied by .4714045.

Octane: C_8H_{18} , the eighth of the marsh-gas series of hydrocarbons. It occurs naturally in American petroleum, and can be obtained from that portion of the oil that boils between 115° and 130°. It may be produced by the dry distillation of the lime-soap of menhaden oil, by passing the vapor of the thirteenth of the same series, tridecane, $C_{13}H_{28}$, through a red-hot tube, and also from octyl iodide, phthalic acid, indigo blue, acenaphthene, etc. By long-continued fractional distillation it may be separated into two hydrocarbons, having different boiling-points, but the same composition.

IRA REMSEN.

Octavia: sister to Augustus, Emperor of Rome. She was first married to C. Marcellus, and after his death to Mark Antony. She was a woman of remarkable beauty and great accomplishments, and her life reveals a conspicuous nobility of character. Her son, M. Marcellus, was adopted by Augustus, and it was expected that he would be his successor, but he died prematurely in 23 B. C. In 32 B. C. Octavia was divorced by Antony, but she continued to devote herself to his children, and even educated his children by Cleopatra. She died heart-broken in her fifty-fourth year in 11 B. C. Augustus pronounced the funeral oration.

Revised by G. L. H.

Octo'ber [from Lat. *Octo'ber*, originally the eighth month of the Roman year, deriv. of *oc'to*, eight]: the tenth month in the Julian and Gregorian years.

Octocoral'ia [Mod. Lat., from Gr. *ὀκτώ*, eight + *κοράλλιον*, coral]: a group of animals belonging to the SCYPHOMEDUSÆ (q. v.), order Anthozoa. They are marine polyps, the parts of which are arranged in eights. Thus there are eight feathered tentacles surrounding the mouth, while the central cavity of the body is partly divided into chambers by eight radiating partitions, which extend from the mouth region to the opposite end of the body. With very few exceptions the individuals or polyps form large assemblages or colonies, varying considerably in shape. The hard skeletal portions are of two kinds. The first, spicules of varying shape, occur in the flesh, and are the product of the middle body layer or mesoglea. They are always present, and in dried specimens they form the bulk of the "bark" which covers the axial portion. This latter is not always present. When it occurs it is horny in character, and is frequently hardened, as in the precious coral, by the deposition of salts of lime. It arises from the outer layer or ectoderm of the body. The group, which is also known as Aleyonaria, contains about 700 species, the principal ones being arranged in four families. In the *Pennatulidæ*, or "sea-pens," there is a "root" (Fig. 1) which is buried in the mud or sand, while from the exposed portion the separate polyps, variously arranged, project. In some (e. g. *Pennatula*) the polyps occur on lateral outgrowths, so that the resemblance to a quill is strongly marked. In the *Gorgonidæ*, including the sea-fans and sea-whips, the colony is firmly fastened to some solid support, has a horny or calcareous axis, which like the colony itself may consist of simple whip-like branches, or stronger irregularly branching parts as in the red or precious coral of the Mediterranean, or lastly as in the sea-fans, of a broad flat network of interlacing branches. In the "organ-pipe corals" (*Tubiporiidæ*) each polyp sits in a tubular calcareous sheath, the tubes of a colony being



Fig. 1.—Kophoblemnon.

united at regular intervals by horizontal platforms. In the *Aleynauts* (Fig. 2) or cork polyps, the sessile colonies lack



FIG. 2. Part of a colony of *Anthothela lineata* (natural size).

numerous papers by Verrill, Koren and Danielssen, Milne Edwards, and the other authors.

Octopoda [Mod. Lat., plur. of *Octopus*; Gr. ὀκτώ, eight + πούς, podós, foot;]: a sub-order of Cephalopods, or cuttlefishes, in which but eight arms (feet) are developed around the mouth; the body is sac-like, and no true shell is developed. In reproduction the peculiar HECTOCOTYLE (*q. v.*) is introduced. About fifteen genera and 100 species are known. *Octopus*, the principal genus, contains several large species, one of which, weighing in large specimens 60 lb., occurs in the Mediterranean, while an Alaskan species has a "radial spread of nearly 28 feet." The genus *Argonauta* contains the "paper-mouthus" or "paper-sailor," in which the female secretes a calcareous egg-case, which is the "shell" so familiar in cabinets. This is not a true shell, but is formed by one pair of arms of the female which are expanded and modified for the purpose. The stories about this form floating about on the surface of the ocean and raising its arms as sails to catch the breeze are now known to have no foundation in fact.

J. S. KINGSLEY.

Octopus: See MOLLUSCA and OCTOPODA.

Odd Fellows, Independent Order of: a secret benevolent and benefit association which had its origin in London, England, about 1745. The earliest societies or lodges of Odd Fellows are described as assemblages mainly for social purposes, having an initiation ceremony, a collection being made to aid needy members. About the year 1800 the lodges in London and Liverpool were known as the London Order. In 1809 a member of a London lodge removed to Manchester and introduced the order into that city, where it was so favorably received that several lodges were speedily organized, and in 1814 the lodges in Manchester and vicinity were consolidated under the title of The Independent Order of Odd Fellows of the Manchester Unity. A grand lodge, composed of those who had filled the chair of noble grand (the presiding officer) a regular term in a subordinate lodge, was organized and assumed supervision of the subordinates. The London associations and other lodges throughout the kingdom refused to acknowledge the authority of the Manchester organization, and several other "Unities" sprang into existence. The Manchester adherents attained greater prosperity than any of their rivals, and the increase of lodges in Great Britain determined the Manchester authorities to organize an annual movable committee to take the place of the local grand lodge, the first meeting of which was held at Hanley, Staffordshire, May 19 and 20, 1823, and was attended by ninety-eight deputies, representing the several subordinate lodges. The early laws were crude and imperfect, and the receipts were inadequate to meet the authorized disbursements. The annual movable committee eventually established a system of rates based on the experience acquired, which enabled the subordinates to meet the relief requirements and accumulate an ample reserve fund.

The Manchester Unity, the most important body of Odd Fellows in Europe, has organized lodges in the United Kingdom, France, Turkey, Africa, North and South America, East and West Indies, and Australasia. There are many minor orders. In 1893 the Manchester Unity had 4,551 lodges, 722,725 adult and 90,057 juvenile members.

United States.—Societies or lodges of Odd Fellows were organized in New York and other cities of the U. S. as early as 1806, but had a brief existence. On Apr. 26, 1819, Thomas Wilkey and four others, who had been members of Odd Fellows' lodges in England, organized a lodge in Baltimore, Md., calling it Washington Lodge No. 1. A member of a lodge at Preston, England, visited this self-instituted body in the latter part of the year 1819, and on his return to his home procured from the Duke of York

Lodge of the Manchester Unity, located at Preston, a document dated Feb. 1, 1820, clothing the Baltimore organization with the powers of a grand as well as of a subordinate lodge under the title of "No. 1, Washington Lodge, the Grand Lodge of Maryland and of the United States of America." This action of a subordinate was confirmed by the grand committee of the Manchester Unity. On Feb. 22, 1821, Washington Lodge surrendered the English charter to a "body of past grands," and "the Grand Lodge of Maryland and the United States" was organized, the members of Washington Lodge receiving a subordinate charter from the new grand lodge. In 1823 the self-instituted lodges in Philadelphia, New York, and Boston were induced to recognize the Maryland organization, and that body immediately forwarded charters to the subordinates, as well as grand lodge charters for Pennsylvania, New York, and Massachusetts. On Apr. 15, 1824, it was deemed advisable to separate the powers of the national from the State organization, and the project was consummated Feb. 22, 1825, when the first meeting of the Grand Lodge of the U. S. was held. On Sept. 17, 1878, the name of the supreme body was changed to The Grand Lodge of the Independent Order of Odd Fellows, and on Sept. 18, 1879, the present title, The Sovereign Grand Lodge of the Independent Order of Odd Fellows, was adopted.

In 1826 Thomas Wilkey, the presiding officer of the Grand Lodge of the U. S., known as the "grand sire," visited England and obtained from the grand committee of the Manchester Unity an independent charter, granting to the Grand Lodge of the U. S. authority "to conduct the business of Odd Fellowship without the interference of any other country, so long as the same is administered according to the principles and purity of Odd Fellowship." Intimate relations between the two grand bodies continued for several years, but in 1842, after fruitless efforts on the part of the heads of the order in Great Britain and the U. S. to reconcile, by correspondence, vital differences in the work which had arisen, James L. Ridgely, grand corresponding and recording secretary, and Isaac D. Williamson, grand chaplain of the Grand Lodge of the U. S., were commissioned as special deputies to the Manchester Unity to adjust the matters in dispute. The commissioners attended the meeting of the annual movable committee at Wigan, May 16, 1842, and after a conference continued through several days found that their efforts for harmonious co-operation were futile. The commissioners presented an elaborate report of their proceedings to the Grand Lodge of the U. S. in Sept., 1842, and that body adopted a series of resolutions on the subject. The hostilities of the Manchester Unity threatened in 1842, and consummated in 1843 by their attempt to institute lodges in the U. S., resulted in an entire severance of the existing relations.

The Objects of the Order.—The objects of Odd Fellowship are "to visit the sick, relieve the distressed, bury the dead, and educate the orphan." It seeks "to improve and elevate the character of man, imbue him with proper conceptions of his capabilities for good, enlighten his mind, enlarge the sphere of his affections, and lead him to a cultivation of the true fraternal relation designed by the great Author of his being." The motto "Friendship, Love, and Truth" was known and used in connection with the order in 1775. The organization for attaining these objects has two branches, closely connected, yet distinct—lodges and encampments.

In 1851 the ladies' degree, or degree of Rebekah, was adopted. Then only Scarlet degree members and their wives were eligible to membership; now the following are eligible to membership in a Rebekah lodge: all persons who have received the degree of Rebekah; all Odd Fellows in good standing and their wives; all unmarried white women who have attained the age of eighteen years, who believe in a Supreme, Intelligent Creator and Ruler of the Universe, and who are of good moral character. The female membership of this degree Dec. 31, 1893, was 108,732.

In 1882 a degree for Uniformed Patriarchs was adopted, and this was revised and became what is now termed "The degree of Patriarchs Militant," a military side of the encampment branch of the order. To be eligible one must be a Royal Purple degree member, in good standing in his lodge and encampment. The unit of the military organization is a "canton," which consists of at least fifteen members, called "chevaliers." The cantons are organized into battalions, regiments, brigades, and divisions. The grand sire is *ex officio* the head and commander-in-chief of the Patriarchs Militant, and his instructions are issued

through the adjutant-general and department commanders of the several jurisdictions. The grand secretary of the Sovereign Grand Lodge is adjutant-general.

Qualification for Membership.—To become a member of a lodge under the jurisdiction of the Sovereign Grand Lodge, the applicant must be a free white male of good moral character, who has arrived at the age of twenty-one years, and who believes in a Supreme Being, the Creator and Preserver of the Universe. No one but a member who has attained the third (previous to 1880, the fifth) or Scarlet degree in a lodge is eligible to membership in an encampment, and can remain a member of the encampment only so long as he continues in good standing in his lodge. This latter requirement is subject to the following exceptions: When he takes a withdrawal card from his lodge or is suspended by it for non-payment of dues, his standing in his encampment is not affected for a year thereafter, or if his lodge becomes extinct and he is aged and infirm he may still retain his membership in his encampment.

Charters for Subordinate and Grand Bodies.—Five or more members of the third or Scarlet degree holding withdrawal cards granted by legal lodges may apply for a charter for a lodge to the grand lodge of the State or Territory in which it is proposed to locate. Five or more members having the third or Royal Purple degree, and holding legal withdrawal cards, may petition the grand encampment of the State or Territory in which it is proposed to locate for a subordinate encampment. Application for a lodge in a State or Territory in which no grand lodge has been organized must be made to the Sovereign Grand Lodge, and the same rule applies to a petition for an encampment. On the petition of ten or more lodges the Sovereign Grand Lodge will issue a warrant for a grand lodge of the State, Territory, or province in which the petitioning lodges are located, or for a grand encampment on a like application by five or more subordinate encampments.

Powers of Subordinates.—A subordinate lodge is invested with the power to initiate and confer the initiatory and the three degrees on persons regularly proposed and elected residing within the district assigned to it. An encampment confers in like manner three degrees. Lodges and encampments have the power to regulate the fees for initiation, degrees, and weekly dues, and may determine the amounts to be paid for weekly benefits to sick or disabled members, funeral benefits, etc., but such amounts must not be less than the minimum prescribed by the grand body having jurisdiction.

The Sovereign Grand Lodge.—A grand lodge or grand encampment is composed of the past presiding officers of its subordinates, and the representatives of the several grand bodies constitute the Sovereign Grand Lodge. Each grand body is entitled to one representative if the membership in its jurisdiction is less than 1,000; if 1,000 or more, then to two.

Statistics.—The statistics from 1830 (previous to which they are incomplete) to Dec. 31, 1893, are as follows: Initiations, 1,947,711; members relieved, 1,809,045; widowed families relieved, 209,902; members buried, 176,320; receipts, \$168,056,287.65; paid for sick and funeral benefits and the care of widows and orphans, \$64,376,265.92. According to the returns for 1893, the following is the condition of the order in the U. S.: Grand lodges, 55; subordinate lodges, 10,259; lodge members, 780,192; grand encampments, 50; subordinate encampments, 2,557; encampment members, 136,090; Rebekah lodges, 3,292; Rebekah lodge members (male and female), 202,442; cantons (in 51 departments), 648; canton members, 23,113; value of canton military equipment, etc., \$1,265,856.15; receipts, \$8,291,020.48; members relieved, 90,610; widowed families relieved, 6,320; members buried, 9,199; paid for the relief of members and widowed families, burial of the dead, education of orphans, \$3,170,121.17.

The Sovereign Grand Lodge has organized grand lodges in every State and Territory of the U. S., the provinces of Canada, and independent grand lodges in the German empire, Denmark, Switzerland, and Australasia. Subordinate lodges have been organized in France, Holland, Sweden, Mexico, Cuba, Chili, Peru, Japan, and the Sandwich islands. Grand and subordinate encampments have been instituted in nearly every locality where lodges are established. Twenty-seven monthly, seven semi-monthly, and fourteen weekly periodicals in the interest of the order are published—forty-one in the U. S., and one each in England, Germany, Denmark, Switzerland, Canada, Japan, and Australasia.

THEODORE A. ROSS.

Ode [viâ Fr. and Lat. from Gr. ὕμν, song, ode, earlier αἰδμή, deriv. of αἰδέειν, later ᾄδειν, sing]: in the modern use, a lyric piece of more dignified character than the song, and usually one in which profound feelings are expressed. The ancients originally included under this name all kinds of lyric verse. Pindar, Alcaeus, Anacreon, Sappho, Simonides, and others among the Greeks, and Horace, Catullus, and others among the Romans, were writers of odes.

Revised by M. W. HUMPHREYS.

O'denheimer. WILLIAM HENRY, D. D., LL. D.: bishop; b. in Philadelphia, Pa., Aug. 11, 1817; graduated at the University of Pennsylvania 1835; took orders in the Protestant Episcopal Church 1838; became rector of St. Peter's, Philadelphia, 1840, and Bishop of New Jersey, Oct. 13, 1859. Author of *Jerusalem and Vicinity* (1855); *Origin and Compilation of the Prayer-book; The True Catholic no Romanist* (1842); *Thoughts on Immersion* (1843); *The Young Churchman Catechized*, i., ii. (1844); *The Devout Churchman's Companion; Private Prayer-book* (1851); *Bishop White's Opinions; Ringleburgius on Study*; with Rev. F. M. Bird prepared a collection of poems on the Holy Spirit; sermons, addresses, charges, etc. D. at Burlington, N. J., Aug. 14, 1879.

Revised by W. S. PERRY.

O'dense: town of Denmark; capital of the island of Fünen (see map of Norway and Sweden, ref. 14-C). It is an old and prosperous city, with good educational institutions and an active trade. It has a castle and a Gothic cathedral built 1086-1301, and is the seat of a Protestant bishopric. Several large sugar-refineries and iron-foundries are in operation. Pop. (1890) 30,277.

O'denwald, ö'den-våält: a mountain region of Germany, occupying the southern part of Hesse-Darmstadt, and extending for a distance of about 45 miles from the Neckar, which to the S. separates it from the Black Forest, to the Main, which to the N. separates it from the Spessart Mountains. Its western declivities toward the plain of the Rhine are abrupt, but to the N. it slopes down through several terraces, and to the S. E. it gradually disappears in the level plains. Its highest peaks rise to about 2,000 feet. The mountains are covered with pine, oak, and beech, and the valleys with orchards and vineyards.

O'der: a river of Germany. It rises in Moravia at an elevation of 1,950 feet above the sea, enters Prussian Silesia, where it becomes navigable at Ratibor, traverses the provinces of Brandenburg and Pomerania, and, after a course of 550 miles, empties through the Stettiner Haaf into the Baltic. Its navigation is difficult, and along its lower course expensive embankments are required to protect the surrounding country against inundation.

Odes'sa: fortified town and seaport of South Russia; in the government of Kherson; 46° 29' N. lat. and 30° 41' E. lon.; on a bay of the Black Sea, midway between the mouths of the Dnieper and Dniester (see map of Russia, ref. 13-C). When ceded by the Ottomans at the Treaty of Yassy (1791), its site was occupied by a miserable Tartar village called Hadji Bey. It is now in population and commerce the fourth city in Russia—surpassed only by St. Petersburg, Moscow, and Warsaw—and the most important port on the Black Sea, communicating by regular steamship lines with the chief ports of Europe. Founded in 1794 by Catherine II., it rapidly increased under its sagacious governor, the Duc de Richelieu (1803-15). In consequence of an insult to the British colors it was bombarded (Apr. 22, 1854) by the allied Anglo-French fleet, when the buildings nearest the water were destroyed. Alexander I. in 1817 declared it a free port for thirty years. The bay of Odessa is exposed to violent east winds, has a soft bottom, and is shallow in many places; hence the spacious modern double harbor, capable of accommodating 350 vessels, is largely artificial, and protected by long moles; it is frozen up part of the year. The summers are hot, with little rainfalls—the clouds of white dust are almost intolerable—and the winters are long and severe. The city stands on a plateau or succession of cliffs nearly 200 feet high, with a narrow belt of shore, occupied by barracks, bathing establishments, and shipping houses. Along the edge of the plateau runs an elegant boulevard, planted with trees and lined with palatial residences. Communication with the beach is afforded by a magnificent flight of stone steps. The city is well built and has broad, straight streets. In the environs are villas and orchards, beyond which stretches a barren steppe. It has many benevolent institutions, and is a great educational

center; has a university (formerly Richelieu Lyceum) with rich museum, observatory, and library. It is the headquarters of the Eighth Army-corps. The Bishop of Kherson and the governor of the province reside here. There are numerous breweries and manufactories, as of cordage, sail-cloth, soap, and candles, but Odessa is specially important as the southern outlet for grain, which constitutes the greater part of the entire exports, valued (1891) at \$62,391,100. The imports, principally raw cotton (1891), were valued at \$15,747,330. Pop. (1892) 332,690, the majority Russians, but there are many Jews, Greeks, Armenians, Italians, Germans, Roumanians, and Tartars; also a considerable number of British residents. E. A. GROSVENOR.

Odic Force [Germ.; cf. Gr. *δδός*, way, passage]: a term originally applied by Reichenbach to a peculiar iridescence which some people could see about the arms of a magnet. It was afterward the name for a mysterious force supposed to be transmitted from a hypnotist. (See HYPNOTISM.) It has received the synonym *psychic force* from Crookes, who performed several startling experiments with Home, the spiritualist, Sergeant Cox, and others, which he asserted were due to its action.

Odin: in Scandinavian mythology, the father of gods and men. As such he is styled Alfater. He has a great number of names, one of which is Valfather—that is, “the father of the slain,” since those who fall in battle go to his great hall, called Valhal—that is, “the hall of the slain.” War is called Odin’s amusement. The sword is called Odin’s fire. He is one of the wisest of gods. He is described as a tall, long-bearded, one-eyed old man. In the dawn of time he pawned one eye for a drink of Mimer’s fountain of wisdom beneath Ygdrasil. From his high seat Hlidskjalf he looks out upon all the world and sees all that is going on. On his eight-footed horse Sleipner he rides through the air and upon the waters, clad in his blue cloak and golden helmet, and wielding his spear Gungner. He needs no food. He lives on mead; the food set before him he gives to his two wolves, Gere and Freke. Two ravens, Hugin (thought) and Munin (memory), sit upon his shoulders and tell him all that they see and hear. At dawn he sends them out to gather news and they return to him in the evening. His servant is Hermod, the swift messenger. He possesses the gold ring Draupner, from which eight other rings of the same weight as the original drop every ninth night. Both the spear Gungner and the ring Draupner were made for him by the dwarfs. Odin invented the runes, the old Scandinavian alphabet. From the giant Suttung he secures, after a desperate struggle, the skaldic mead, which the giant kept concealed in a mountain cavern. Hence poetry is called Odin’s drink, or the drink of the *asas*. Odin is found in all Teutonic countries, and by the name *Väta* he can be traced back to India. The Anglo-Saxons and Old High Germans called him *Wodan*. In the Scandinavian tongues the *w* is dropped, hence Old Norse *Óðinn*. The Latin writers usually replace this divinity with the Roman Mercury, hence *dies Mercurii*, the fourth day in the week, became in Old Norse *Óðins-dagr*, in Dan. *Onsdag*, in Anglo-Saxon *Wodansdag*, in English Wednesday, etc. Odin was the progenitor of kings, and the greatest families, the Ynglings in Sweden, the Skjoldungs in Denmark, and the Hallyngians in Norway, traced their pedigrees back to him. See SCANDINAVIAN MYTHOLOGY and bibliography under the same. RASMUS B. ANDERSON.

Odoacer: King of Italy from 476 to 493 A. D.; descended from some one of the Germanic tribes along the Danube. At about the age of thirty he entered the service of the West Roman empire, and held a high position in the imperial guard when (in 475) Orestes, commander-in-chief of the army, deposed the emperor, Julius Nepos, and placed his own son, Romulus Augustulus, on the throne. The army, consisting of barbarian mercenaries, now demanded of Orestes that one-third of the soil of Italy should be given up to them for permanent settlement; and when Orestes refused, the soldiers chose Odoacer for their leader, and a war broke out which ended with the defeat and death of Orestes and the abdication and banishment of Romulus (Aug., 476). This date is assumed as marking the fall of the Western empire, for Odoacer did not assume the title of emperor, but that of King of Italy. He was acknowledged by Zeno, the Byzantine emperor, took up his residence at Ravenna, and governed with energy and moderation. For several years Italy enjoyed peace. The laws and institutions were maintained, the Church was respected, and sev-

eral campaigns in Dalmatia and Noricum were successfully carried through. Meanwhile Theodoric, the King of the Ostrogoths, crossed the Alps, instigated and perhaps supported by Zeno, and in three great battles Odoacer was defeated, and finally shut up in Ravenna. Here he held out for more than two years, but capitulated on the condition that he and Theodoric should rule as joint kings. The agreement was confirmed by a solemn oath, but a few days afterward Theodoric put Odoacer to death, Mar. 5, 493. See Pallmann, *Geschichte der Völkerwanderung*.

Revised by G. L. HENDRICKSON.

Odobæ'nidæ: a family of mammals belonging to the order *Pinnipedia*, containing the walruses and related to the families *Phocidæ*, or true seals, and *Otariidæ*, or eared seals. The form is peculiar, but resembles that of the *Phocidæ* more than that of the *Otariidæ*; the hinder legs are flexible forward; no external ears are developed; the skull is oblong and truncated in front; the dentition is very peculiar, the canine teeth of the upper jaw being enormously developed and specialized as tusks, while those of the lower jaw are atrophied; the incisors, except the external of the upper jaw, are early lost; the molar teeth are $\frac{1}{2}$, but the posterior are generally cast in the adult; the anterior limbs are about as large as the posterior; in the anterior feet the toes decrease in a curved line, and are destitute of claws; in the posterior feet the five digits scarcely increase toward the inner, and all are provided with claws; the skin is very thick. The family is represented by the walruses or morse (see WALRUS), which are found only in the high northern seas.

Revised by F. A. LUCAS.

Odom'eter, or, more correctly, **Hodom'eter** [Gr. *ὁδός*, way, journey + *μέτρον*, measure]: an instrument by means of which the distance traveled by a carriage or other vehicle, or even a person walking, is registered. In the case of a carriage it is usually a train of wheelwork attached to the axle and one of the wheels of the carriage. It registers the number of revolutions of the wheel by moving an index on a dial. A similar instrument, called a cyclometer, can be attached to a bicycle or a tricycle. The name pedometer is usually given to an instrument for measuring walking distances. The mechanism depends upon the relative movement of a comparatively heavy suspended body accompanying each step. Thus the number of steps is measured, and the user must find the distance he walks in a given number of steps before he can interpret the reading of the instrument as applied to his own case.

Odonat'a [Mod. Lat., from Gr. *ὀδούς*, *ὀδόντος*, a tooth, in allusion to the long teeth on the labium]: that order of insects which includes the dragon-flies. (See ENTOMOLOGV.) These are insects which pass through an incomplete metamorphosis, which have strong biting jaws, and which have four membranous net-veined wings, the hinder pair about equaling the others in size. The dragon-flies lay their eggs in the water, and from these hatch out active, rapacious larvæ, remarkable for the peculiar apparatus (mask) which they have for seizing their food. The lower lip (labium), when not in use, is folded beneath the mouth, but on the approach of some other insect it can be extended some distance beyond the head, so that the sharp jaws which it bears can grasp the prey. With growth there are repeated moults, and gradually the wings appear as small outgrowths on the back. At last the larva or nymph climbs some reed, the skin splits down the back, and from the opening the adult dragon-fly appears. The adults prey upon insects and are of especial value in destroying mosquitoes. The numerous superstitions connected with these forms are without foundation. For American species, see Hagen, *Proceedings of the Boston Society of Natural History*, xviii. (1875).

J. S. KINGSEY.

O'Donnell, LEOPOLD, Marshal, Duke of Tetuan, Count of Lucena: soldier; b. Jan. 12, 1809, at Santa Cruz in Teneriffe; entered the Spanish army; became a colonel, and for his services against the Carlists at Lucena (1839) was made a grandee and lieutenant-general. In 1840 he sided with the queen-mother and went to France, where he intrigued against his former ally, Espartero. In 1843, after the latter's fall, O'Donnell was made captain-general of Cuba, where he became moderately wealthy. In 1854 he became Espartero's war minister; succeeded him as prime minister in 1856, and was several times afterward a member of the cabinet. In 1859-60 he commanded in Morocco; captured Tetuan Feb. 6, 1860; retired from public life in July, 1866. D. at Bayonne, Nov. 5, 1867.

O'Donojú, ō-don-ō-hoo, JUAN: last Spanish viceroy of New Spain (Mexico); b. about 1755. He attained the rank of lieutenant-general in the army, and held high civil positions in the Peninsula when, in 1821, he was appointed captain-general and acting viceroy of New Spain. On his arrival at Vera Cruz he found that the revolution, led by Iturbide, had acquired such strength that his own authority was practically nullified. O'Donojú himself held liberal opinions, and under the circumstances he was convinced that the only sensible course was to treat with the insurgents. On Aug. 23 he met Iturbide at Córdoba and signed a treaty by which Mexico was recognized as an independent empire, and it was agreed to invite one of the Spanish Bourbon princes to reign over it; Mexico city was surrendered to the revolutionists. Pending advices from Spain, O'Donojú was elected one of the provisional regents. He died in Mexico, Oct. 8, 1821, before he could learn of the scornful nullification of his treaty by the Spanish Cortes. H. H. S.

Odontoglossa [Mod. Lat.; Gr. *ὀδούς, ὀδόντος*, tooth + *γλῶσσα*, tongue]: a term applied by Nitzsch to an order of birds comprising the flamingoes only, on account of the tooth-like projections bordering the tongue. It is the equivalent of the *Amphimorphæ* of Huxley. F. A. L.

Odontophore: the rasping tongue of cephalopod and gasteropod MOLLUSCA (*q. v.*).

Odontornithes [Mod. Lat.; Gr. *ὀδούς, ὀδόντος*, tooth + *ὄρνις* (plur. *ὄρνιθες*), bird]: a name applied by Prof. Marsh to a sub-class of birds containing all those provided with teeth. These are all fossil forms, as *Ichthyornis* and *Hesperornis* (*q. v.*), which so far have been found in the Jurassic and Cretaceous strata. F. A. L.

O'Dwyer, JOSEPH, M. D., LL. D.: pædiatrist; b. in Summit co., O., Oct. 12, 1841; graduated M. D. from College of Physicians and Surgeons, New York, in 1866; devoted himself to diseases of children, and invented the method of treating croup and diphtheria by intubation; received degree of LL. D. from St. John's College, Fordham. S. T. A.

Odyniee, od-in'yets, ANTONI EDWARD: author; b. at Giejsztuny, Poland; was educated by Basilian priests at Boruny; studied literature at the University of Wilna; published two volumes of his poems, *Poezye* (Wilna, 1825-26). At Warsaw, where he resided in 1826-29, he published two volumes of the almanac *Melitele* (1829, 1830; 3d vol. Leipzig, 1836), which contained contributions from the foremost poets of the romantic school, and a drama in verse, *Izora* (1829). In 1829, with his intimate friend Mickiewicz, he traveled in other parts of Europe; alone he visited Paris and London; in 1831-37 lived at Dresden. During his stay in foreign lands he wrote excellent translations from Byron, Moore, Walter Scott, and others (Leipzig, 1838-43, Wilna, and Warsaw, 1874, in 4 vols.). At the same time he was a regular contributor to a number of journals. In 1837 he returned to Lithuania, and for two years was editor-in-chief of a universal encyclopædia, *Encyklopedia powszechna* (Wilna and Warsaw). At Wilna he was for twenty years political editor of the *Kurier Wileński*. His collected poems appeared at Wilna, in 1859, as *Poezye Ant. Edw. Odyńca* (3d ed. Warsaw, 1874). His dramas, *Felicita* (Wilna, 1849, Poznań, 1858), *Barbara Radziwiłłówna* (Wilna, 1858), and *Jerzy Lubomirski* (Wilna, 1861), are more lyrical than dramatic. In 1865 he removed to Warsaw where, in the *Kronika Rodzinna*, he published a series of masterly letters, *Listy z podróży* (Letters of Travel; separate ed. Warsaw, 1875-78), descriptive of his travels with Mickiewicz, which mark him as the greatest Polish letter-writer. D. at Warsaw, Jan. 15, 1885. J. J. KRÁL.

Odysseus (in Gr. *Ὀδυσσεύς*, in Lat. *Ulixes*): King of Ithaca, son of Laertes and Anticlea, a daughter of Autolycus. The name means the *hater*, and was interpreted in various ways (cf. *Od.* 19, 400-412, and 1, 62 ff.). He won as his wife Penelope, the daughter of Icarus of Sparta, in return for suggesting to Tyndareus the oath taken by the suitors of HELEN (*q. v.*). When his son Telemachus was a babe, Odysseus was prevailed upon by a ruse of Palamedes and Nestor to join the expedition against Troy, whither he sailed with twelve ships. At Troy he was distinguished for bravery, pertinacity, eloquence, and cunning. He therefore took part in expeditions that required a spy's cool and skillful work. The arms of Achilles were awarded to him after that hero's death, a fact which drove Ajax mad. At the close of the Trojan war he was driven by the ill-will of Poseidon to various parts of the world. The story of his re-

turn is told by Homer in the *Odyssey*. Finally, after ten years' wanderings and twenty years' absence from home, he reached Ithaca in safety, and with the help of his son Telemachus and a few faithful servants he slew the suitors of Penelope. In works of art he is usually recognized by his conical sailor's cap. See the article *Odysseus* in Baumeister's *Denkmäler*. J. R. S. STERRETT.

Œolampadius, JOHANNES, whose true name was HANS HUSSGEN: theologian; b. at Weinsberg, Suabia, in 1482; studied first jurisprudence at Bologna, then theology at Heidelberg, subsequently Greek under Reuchlin at Stuttgart, where he also learned Hebrew from a baptized Spanish Jew, and received an appointment as preacher in 1516 at Basel, where he assisted Erasmus in his edition of the Greek New Testament. Luther's writings made a very deep impression on him. In 1518 he became preacher in the principal church of Augsburg; from 1520 to 1522 was an inmate of the convent of Altenmünster, near Augsburg. In 1522 he returned to Basel as preacher and Professor in Theology, and after the disputations at Baden (1526) and Bern (1528) he succeeded in introducing the Reformation in Basel and Ulm. In the controversy between Luther and Zwingli concerning the Lord's Supper he gradually adopted the views of Zwingli, which he maintained in his *De genuina verborum Domini, "Hoc est corpus meum," Expositione* (1525), and in his disputation with Luther at Marburg in 1529. His gentleness of character procured for him the name of the "Swiss Melancthon." D. at Basel, Nov. 24, 1531. Besides the above-mentioned dissertation he wrote *De ritu paschali; Epistola canonicorum indoctorum ad Eccum*, and several commentaries and introductions to the books of the Old Testament. There are biographies of him by Hess (Zurich, 1791), Herzog (Basel, 1843, 2 vols.), and Hagenbach (Elberfeld, 1859). Revised by S. M. JACKSON.

Œumenical Councils: See COUNCILS, ŒECUMENICAL.

Œdema [Mod. Lat., from Gr. *οἰδημα*, swelling, tumor, deriv. of *οἰδεν*, swell]: in pathology, a condition in which a tissue or organ is puffed or swollen with fluid exuded from the blood. It is most frequent in the loose tissues under the skin, and here constitutes the condition called "dropsy." When widespread throughout the organism, the name anasarca is applied. Œdema may be caused by obstruction to the circulation, causing distension of the veins and capillaries; it may be due to a watery condition of the blood, or to changes in the blood-vessels. Where stasis of the blood in the veins is at fault a cyanotic hue of the skin is noted, while in cases due to watery blood or diseases of the blood-vessels the skin may be wholly normal in appearance.

Œdema of the glottis is a condition in which the epiglottis and tissues of the larynx are inflamed and cedematous. It occasions great obstruction to breathing, and, unless relieved promptly, will cause death by suffocation.

Œdema of the lungs is often the immediate cause of death in heart disease, Bright's disease, and other chronic affections.

WILLIAM PEPPER.

Œedenburg (Hung. *Soprony*): town of Western Hungary; near the Lake of Neusiedl; 37 miles S. E. of Vienna, with which it communicates by railway (see map of Austria-Hungary, ref. 5-F). It is a prosperous and handsomely built town, with a large trade in wheat, wine, and cattle, and manufactures of sugar and soap. Its old fortifications have been demolished, with the exception of a huge watch-tower, the highest in Hungary; remains of the Roman time are also found. Pop. (1890) 29,543.

Œdipus [= Lat. = Gr. *Οἰδίπους*]: in Grecian mythology, a son of Laius, King of Thebes, and Jocasta, who was exposed by his father on account of an ill-boding oracle, but was saved by a shepherd and brought to Corinth. Misunderstanding another oracle, he left Corinth and went to Thebes. On the way he slew his father unawares and at Thebes married his mother. She bore him two sons, Eteocles and Polynices, and two daughters, Antigone and Ismene; but the hidden horrors of his life were subsequently revealed to him. Jocasta hanged herself; between Eteocles and Polynices there was a deadly hatred, and they slew each other; Œdipus put out his own eyes and wandered blind, guided by Antigone, from Thebes to Colonos in Attica, where he died in the grove of the Eumenides. The legends of Œdipus, of which the two baneful oracles and his meeting with the Sphinx, whose enigma he unriddled, form the mystical but singularly suggestive center, were often treated by the Attic tragedians, and there still exist

two tragedies on this subject by Sophocles, *King Œdipus* and *Œdipus at Colonus*. See the article *Œdipus* in Baumeister's *Denkmäler*. J. R. S. STERRETT.

Ehlenschläger, Elen-schlö-ger, ADAM GOTTLÖB; poet; b. in Frederiksberg, a suburb of Copenhagen, Denmark, Nov. 14, 1779. His parents, who were of German extraction, were in moderate circumstances, and until his twelfth year the future poet received no regular instruction. At that time he attracted the attention of Edvard Storm, by whom he was placed in school, where he remained four years. On his leaving school it was at first determined that he should become a tradesman, then he began to prepare for the university, and finally appeared on the stage with but slight success. In 1800, with the assistance of the brothers Oersted, he entered the university as a student of law, but his natural love for poetry made his professional studies distasteful to him. In 1802, after a sixteen hours' conversation with the Norwegian critic Steffens, who had returned from Germany filled with the ideas of the new romantic school, he came to a full realization of what poetry was for him. In the symbolical poem *Guldhornene*, the motive of which was taken from the theft of the Old Norse gold horns from the museum in Copenhagen, he made the declaration of his poetic faith. His legal studies were relinquished and a collection of poems in his early style, already in the printer's hands, was destroyed and other poems written hastily in their place, among these *Sanct Hansaften-Spil*. This new poetic departure roused much opposition among the members of the old school, and stamped Ehlenschläger as the undisputed leader of romanticism in Denmark. In 1805 he received a Government stipend and spent the succeeding four years in travel. Six months were spent in Halle with Steffens, three in Weimar in intimate companionship with Goethe, and a year and a half in Paris, where he was little influenced by the life about him. In Switzerland he visited Madame de Staël, at whose home he met many of the leading writers of the day. Soon after his return to Copenhagen he was appointed Professor of Æsthetics at the university, a position for which he was not specially fitted. During this period Ehlenschläger's popularity was enormous, one of his warmest admirers being Baggesen, but on the latter's return to Copenhagen in 1813 the relations of the two poets became strained. Ehlenschläger was painfully lacking in self-criticism, and this induced him to publish many works that were wholly unworthy of his genius. Baggesen's unfavorable criticisms of these angered their author and his friends. Twelve of the latter, among them Paul Möller and Hauch, formed themselves into a body-guard called *Tyltøen*, and challenged Baggesen in Latin to defend his position. To this Grundtvig and others replied, and the controversy continued until 1819, to be renewed later by Johan L. Heiberg. The criticism of the latter is of real value, distinguishing clearly the faults and virtues of Ehlenschläger, his wonderful richness of vocabulary, his lack of dramatic instinct, the epic-lyric character of his works, and their genuine nationality. It was this latter quality that induced Tegnér in the summer of 1829 to crown Ehlenschläger in the Cathedral of Lund as the northern king of singers. His position in Danish literature is best shown by the fact that his statue shares with Holberg's the place of honor before the National theater. Among his works may be mentioned *Poetiske Skrifter* (2 vols., 1805); *Hakon Jarl* (1807); *Baldur barn gude* (1807); *Palnatøke* (1809); *Ærel og Valborg* (1810); *Correggio* (1811); *Hygeath og Signe* (1815); *Nordens Guder* (1819); *Dronning Margretha* (1833); *Dina* (1842). D. Jan. 20, 1850. See *Ehlenschlägers poetiske Skrifter*, ed., at F. L. Lichtenberg (32 vols., Copenhagen, 1857-62); *Erindringer* (4 vols., Copenhagen, 1850-51). D. K. DODGE.

Oehler, GUSTAV FRIEDRICH, von, D. D.; theologian; b. at Ebingen, Württemberg, June 10, 1812; educated at Tübingen, where he became Professor of Old Testament Theology 1852, and where he died Feb. 19, 1872. He was orthodox, conservative, yet progressive. His fame rests upon his *Old Testament Theology*, a posthumous work, made up from his lectures by his son (2 vols., Tübingen, 1873-74; 2d ed. 1882; English trans., 2 vols., Edinburgh, 1874-75; revised by Prof. G. E. Day, New York, 1883). It is the leading book in this department, though many prefer the more modern H. Schultz (1892). His *Lehrbuch der Symbolik*, edited by Johann Delitzsch, appeared in Tübingen 1876 (2d ed., by T. Hermann, Stuttgart, 1891). See his *Life*, by Josef Knapp (Tübingen, 1876). S. M. JACKSON.

Œnanthic Ether [*anantlic* is from Gr. *anantē*, to shoot of the vine, vine blossom; *œthē*, the vine + *œnthē*, bloom]; a name given by Liebig and Pelouze to a substance existing in all wines, giving them their characteristic odor. It remains behind as an oily liquid when large quantities of wine are distilled; obtained in larger quantities by distilling wine-lees after mixing with half their bulk of water. It consists essentially of capric, caprylic, and a very little butyric acids, partly free, mostly in the form of ethereal salts of isomyl and ethyl alcohols. A solid substance called *œnanthic ether* is manufactured in Bavaria and used for flavoring inferior wines. Revised by J. R. S. STERRETT.

Œnop'ides (in Gr. *Oionop'ids*): a Grecian astronomer and philosopher of Chios, who is commonly supposed to have been a contemporary of Anaxagoras; is named among the Greeks who visited Egypt and became acquainted with the learning of the Egyptians; is said to have claimed the discovery of the obliquity of the ecliptic; invented a cycle for bringing into agreement the solar and lunar year, which invention he inscribed on a brazen tablet and set up at Olympia. He proposed also a theory of the rise and fall of the waters of the Nile, and an explanation of the Milky Way as the original pathway of the sun. Revised by J. R. S. STERRETT.

Œnothera: See PRIMROSE.

Oersted, ōr'sted, ANDERS SANDØE: the greatest of Danish jurists; b. in Rudkjøbing, Denmark, Dec. 21, 1778; brother of Hans Christian Oersted. In 1810 he became a judge of the Supreme Court, a position which he held only three years. He occupied various positions in the king's cabinet and in the Diet, and in 1853 he became Prime Minister of Denmark. Oersted's chief fame rests on his services to Danish jurisprudence, which in its present condition may be regarded as the result of his labors. He was a man of remarkable industry, learning, and clear insight, and all these he brought to bear on a thorough revision of the system of jurisprudence. Among his most important works are *Håndbog over den danske og norske Lovkyndighed*, a manual of Danish and Norwegian jurisprudence (6 vols., 1822-33), and *Eunomia* (4 vols., 1815-22). His last work was *The History of my Life and Times* (Af mit Livs og min Tids Historie, 4 vols., 1851-57). His contributions to the periodical literature of his time are very numerous. D. May 1, 1860.

RASMUS B. ANDERSON.

Oersted, HANS CHRISTIAN: physicist; b. at Rudkjøbing, in the Danish island of Langeland, Aug. 14, 1777. His father was an apothecary, and in the shop he made his first studies and experiments. In 1794 he entered the University of Copenhagen. In 1799 he took the degree of doctor of philosophy, after presenting a thesis entitled *Architectonics of Natural Metaphysics*. After traveling from 1801 to 1803 in Holland, Germany, and France, he was appointed Extraordinary Professor in Natural Philosophy at the University of Copenhagen in 1806, and his lectures soon attracted attention on account of their popular form and their enthusiasm. To awaken the interest of his countrymen for the study of nature was the aim of his life, and he succeeded in establishing a polytechnic school in Copenhagen, of which he was director from 1829, and in introducing natural science as an element of instruction in the Latin schools. During a scientific journey in Germany in 1812 and 1813 he wrote an essay on the identity of chemical and electrical forces, in which he for the first time shadowed forth his ideas of the unity of electricity and magnetism which he had entertained since 1800, but his great discovery on this point was not made until 1819, and was communicated to the world in a little pamphlet in 1820, *Experimenta circa electricam conductivitate in nervo magnetico*. The discovery was immediately accepted, and honors were showered on the discoverer. His other writings comprise a large number of minor essays, most of which were translated into German, and two larger works, *Naturlærens mekaniske Deel* (Manual of Mechanical Physics) and *Aanden i Naturen*, which has been translated into English by Miss Horner under the title *The Soul in Nature*. The Danes are very proud of Oersted's name. There are two monuments in his honor in Copenhagen, and Oersted Park is named for him. D. in Copenhagen, Mar. 9, 1851.

Revised by R. B. ANDERSON.

Oertel, ōr'tel, MAX JOSEPH, M. D.; physician; b. in Lingen, Bavaria, Mar. 20, 1835; studied medicine in the University of Munich, graduating M. D. in 1863; was assistant

at Pfeuffer's clinic for four years, subsequently studying laryngology with Czermak. He paid special attention to diseases of the heart and lungs, and invented a system of graduated exercise in hill-climbing for the treatment of certain respiratory and circulatory disturbances. In 1876 he was made professor extraordinary in the Munich university. He contributed several monographs to von Ziemssen's *Cyclopædia of Practice and of Therapeutics*. Other important works are *Ueber Terrain-Curorte* (Leipzig, 1886); *Die Pathogenese der epidemischen Diphtherie* (Leipzig, 1887).

S. T. ARMSTRONG.

Oesel: an island in the Baltic, belonging to the government of Livonia, Russia. Area, 1,000 sq. miles. Pop. 53,120. Wheat, rye, oats, and barley are raised, cattle, sheep, and horses are reared, and considerable fishing is carried on. It was governed by the Teutonic Knights for a long period; passed into the possession of Denmark in 1559; was ceded to Sweden in 1645, and finally ceded to Russia in 1721. The population is principally Esthonian.

Œsoph'agus [Lat. = Gr. *οισοφάγος*; *οισο-* etym. obscure, commonly but probably erroneously connected with *οἶσιν*, the fut. of *φάγειν*, bear + *φαγέιν*, to eat]; the gullet, that part of the alimentary canal that leads from the pharynx to the stomach. In the adult man it is 9 inches long, extending in a nearly vertical line from the fifth cervical vertebra through the posterior mediastinum and through the œsophageal foramen of the diaphragm, ending in the cardiac orifice of the stomach. It has an outer or muscular coat, containing an outer layer of longitudinal muscle-fibers, and another of similar annular fibers, the upper fibers being chiefly striped and partly voluntary in the upper parts, but entirely involuntary and non-striated in the lower portion. The middle or cellular coat abounds in glands which open by long ducts. The innermost or mucous coat is lined by scaly epithelium. In caliber the œsophagus is the smallest part of the alimentary tube. In the lower animals the œsophagus has several modifications, the most remarkable of which is that singular dilatation which is called the *crop*, and which is observable in gallinaceous and vulturine birds, etc. Most articulate and many molluscous organisms have also a so-called œsophagus. See HISTOLOGY (*The Digestive Organs*).

Ofan'to: a river of Southern Italy, called by the ancients *Aufidus*. It rises 6 miles E. of Monte Marano, enters the Adriatic 4 miles N. W. of Barletta, after a course of 75 miles. The battle of Canne was fought on its right bank near its mouth.

Offa: King of Mercia; reigned in the latter half of the eighth century; greatly extended the boundaries of his kingdom, but is especially famous as the builder of the so-called Offa's dike, which for several centuries was the boundary between England and Wales. He established an undisputed suzerainty over the Heptarchy; murdered Ethelbert, King of East Anglia, and took possession of his kingdom 792; founded the abbey of St. Albans; drew up a code of laws. D. in 796.

Offenbach, *ōfen-băkh*: town; in the grand duchy of Hesse-Darmstadt, Germany; on the Main; 5 miles S. E. of Frankfurt (see map of German Empire, ref. 5-D). It has extensive manufactures of carriages, musical instruments, jewelry, carpets, hosiery, paper, tobacco, and pipes. Pop. (1890) 35,064.

Offenbach, JACQUES: composer; b. at Cologne, Germany, June 21, 1819, of Jewish parentage; studied from 1835 to 1837 at the Conservatory of Paris; played afterward the violoncello in the orchestra of the Théâtre Comique; became in 1847 leader of the orchestra of the Théâtre Français; established in 1855 the Bouffes-Parisiens, and composed a great number of burlesque operas and scenes, of which *La Fille de Madame Angot*, *Barbe-bleue*, *Orphée aux Enfers*, *La Belle Hélène*, and *La Grande Duchesse* were the most applauded. D. in Paris, Oct. 4, 1880.

Office Found: See INQUEST OF OFFICE.

Offices and Officers [from Lat. *officium*, performance, service, duty, official duty; *opus* or *ops*, work, toil + *facere*, do; cf. *officina*, workshop. Derivation from *ob* + *facere* is unlikely, as *officere* has the sense of to hinder]; in general, a public office is understood to be a right or a duty conferred or imposed by law on one or more persons to act in the execution and application of the law; while officers are those persons upon whom an office has been conferred or imposed. It is necessary to distinguish carefully between

office and employment. For as the government may enter into both public legal and private legal relations, it may have both officers and employees. The term officer is a term of the public law; the term employee is a term of the private law. It has been said that the former "embraces the idea of tenure, duration, emolument, and duties." (*United States vs. Hartwell*, 6 Wallace 385.) An office finds its sources and its limitations in some provision of public law; an employment is based upon a contract. An office not being a contract, it is held that it may be terminated at any time, and that the salary, if any, attached to it may be diminished during its term without violating the provisions of the Federal Constitution, preventing a State from impairing the obligation of a contract. (*Butler vs. Pennsylvania*, 10 Howard 402.) Where, however, a salary has been attached to an office, it is held that if the salary has been earned it becomes a claim against the Government in the nature of a contract which may be enforced by suit against the Government where the Government may be sued, and may not be diminished in amount even by a State Legislature. (*Fisk vs. Police Jury*, 116 United States 131.) This fact that an office finds its sources and limitations in the public rather than the private law has a great influence over all contests which may arise relative to the duties and to the rights of officials, the courts holding very strictly to the rule that the provisions of the private law are not to be applied to this public legal relation. *Fitzsimmons vs. Brooklyn*, 102 New York 536; *Andrews vs. Portland*, 79 Maine 484.

Offices differ in the way in which they are organized. Thus an authority may consist of one person or more than one person. The first method is known as the single-headed system; the second is usually called the board system. Each of these methods of organizing offices has its advantages. The single-headed system is generally chosen for all offices whose duties require energy, rapidity of action, and a well-defined responsibility; the board system for all branches in which carefulness of deliberation and impartiality of decision are necessary. The former method of organizing offices is therefore usually chosen for all executive and administrative offices; the latter for judicial offices.

Officers, like offices, may be variously classified. In many states there is an important distinction between professional and honorary offices. The first are those who devote their entire time to the discharge of their duties; the latter are those who merely employ a part of their time in the discharge of public functions, relying on some other occupation as the means of their livelihood, and generally having short terms and receiving no or a very small salary. A system of administration relying mainly upon these honorary officers is called a self-government system, while a system relying upon professional officers is known as a bureaucratic system. In the U. S. the rule is that the administrative organization is based upon the self-government system, while upon the continent of Europe the organization is usually bureaucratic. At the same time, in certain branches of administration in the U. S., e.g. in the municipal administration, the bureaucratic system is being adopted on account of its greater efficiency, and, notwithstanding the fact that salaries are paid, its greater economy. It has, however, the disadvantage of preventing the people as a whole from accustoming themselves to the discharge of public duties and of fostering the development of an official class which has the monopoly of government.

The official relation is usually formed in either one of two ways, by election by the people or by appointment by some governmental authority. Originally the method of filling offices in the U. S. was by an executive appointment, the only exception being found in the case of the purely local, such as the town offices; but as a result of the partisan use of the power of appointment, and as a result of the increasingly democratic character of the people throughout the States, the method of election grew more popular, and most of the important offices are filled by popular election. In the Federal Government, which was formed before this democratic spirit had so fully developed, the Constitution provides that most of the offices shall be filled by appointment. The tendency, however, in the U. S. would seem to be toward the adoption of the appointive system. This tendency is particularly marked in the cities where the application of the principle of popular election of all important officers had led to a diffusion of responsibility and to inefficient administration. Originally in the English and U. S. system of administration acceptance of office was regarded as oblig-

atory, and we find cases in the early English reports where those persons who have refused to accept office have been indicted, and also where they have been forced by the courts to assume the burdens of the office; the duty to serve as officer of the Government being regarded just as obligatory as the present duty to serve upon the jury. In the course of the nineteenth century, however, this obligation to serve as officer has been in many cases abolished, and to fill the various Government offices reliance is placed upon the well-known desire of most persons to serve in official capacities.

The law generally provides certain qualifications for office; the power to hold office being regarded not as a right belonging to every individual, but as a privilege which is granted only to those who are qualified to perform official duties. These qualifications differ somewhat in the case of elective and appointive offices, being more stringent in the case of the latter than in the case of the former. For elective offices the qualifications consist usually in the possession of citizenship or the right to vote, the attainment of a certain age, and the possession of good character; to the majority of offices men only are eligible. In the case of purely local offices residence in the locality in which the duties of the office are to be performed, or some equivalent therefor, is generally required, while in some cases the possession of real property or the payment of a certain amount of taxes is required. In the case of appointive offices, in addition to these requirements, the law often provides quite stringent requirements, which are to insure the possession by the incumbent of the office of the necessary intellectual qualifications. The possession of these intellectual qualifications is to be shown in either one of two ways. In the case of offices, the performance of whose duties requires the possession of technical knowledge, it is usually provided that no one is qualified who has not received a thorough course of training to be evidenced by the possession of some diploma or certificate. Such is the case generally for judges and the law officers of the Government, who must be admitted to the bar and must have practiced for a certain time. Such is also the case for the engineering service of the Government, where the incumbent must be a qualified engineer or surveyor. In the case of the great majority of appointive offices where the duties are largely of a clerical nature, the civil service reform movement has resulted in the adoption of less stringent but, at the same time, of rather important educational and intellectual qualifications, usually to be shown by examinations. These are either competitive in character or ordinary pass examinations, where it is merely required of the candidate who presents himself for appointment that he must have passed the examination at a certain standard. For a further consideration of this matter, see CIVIL SERVICE AND CIVIL SERVICE REFORM.

All officers have by law certain rights upon which they may insist, and also certain duties which they may be compelled to perform. Among the rights possessed by officers may be mentioned the right to exercise the functions of the office. Any one who has been properly appointed or elected may, by appeal to the courts, force the granting to him of the office which he has been chosen to fill. In the second place the criminal law offers a special protection to all officers who come in contact with the people, as bearers of a direct command of a competent authority to do or not to do some particular thing. In such a case they may use force to execute their orders, and any resistance offered to them is made a crime. Where the law specifically provides that officers shall receive a salary, they have also the right to such compensation, which may be enforced by an action in the courts, but inasmuch as the official relation is a relation of public and not of private law, the claim for salary can not be based upon the fact that services of an official character have been rendered, but is to be found solely in the fact that the law has stated that a compensation shall be attached to a given office. As has been said, the compensation is governed entirely by the rules of the public law. Thus the fact that a person does not discharge the duties of the office has no effect upon his right to obtain salary; he will not lose the right to the salary from the fact that by sickness he has been unable to perform his duties, so long as he has not been actually removed. (*O'Leary vs. Board of Education*, 93 New York 1.) The salary of officers is enforced by suit against the Government where suit is allowed, or by application to the proper court for a *mandamus* to force the accounting officers to grant the salary. In some cases in addition to the salary there is a civil pen-

sion attached to the office, though this is not common in the U. S. outside of the judicial service and the police and fire services of the various municipalities.

Among the duties imposed upon officers may be mentioned the requirement to take the oath of office before beginning to perform its functions, the giving of an official bond, and in general the faithful performance of the detailed duties assigned to the office by the statutes providing for it. The performance of the duties of the office is insured by a threefold responsibility. In the first place, if anybody is injured by the negligence of an officer in the performance of his duties, in many cases he may recover damages from such officer. In the second place, the law often punishes as a crime the non-performance of official duties. In the third place, the violation of duties where the administrative system is at all centralized, and where the superior administrative officers have a strong disciplinary power, will result in an administrative responsibility. Thus in many cases the superior officers have the power to impose fines and to suspend and even to remove delinquent officers. In the U. S. Federal Government the disciplinary power is very strong, but in the States very generally, the system being so extremely decentralized, we find very few examples of this disciplinary power. The only possible exception to this statement is to be found in the cities where, as a result of recent development, the disciplinary power of the mayor over the rest of the city officers has been very largely increased.

The official relation is terminated in various ways. In the first place the law often provides a fixed term for an office. In this case the expiration of the term renders the officer incapable to perform his duties except where it is provided, as it often is, that he shall hold over until his successor enters the office. Further, in order to prevent an official interregnum, the courts often hold that an officer will be regarded as an officer *de facto* after the expiration of his term, and that his acts may not be questioned collaterally in the courts in an action to which such officer is not a party. The term of office is usually fixed in the U. S. at from two to four years. The attempt has been made, however, to do away with this fixed term for all offices whose duties are not of the highest importance, in the hope that the tenure will become one practically during good behavior. (See on this point the article on CIVIL SERVICE AND CIVIL SERVICE REFORM.) As a general thing also the official relation may be terminated by the resignation of the officer. This is absolutely true except in the cases where the office is obligatory, and the statutes provide that an officer shall hold over until his successor shall enter upon the performance of his duties. In such a case resignation by the officer will have no effect upon his duty to continue the performance of official duties. (*Badger vs. United States*, 93 United States 599.) Again, loss of qualifications generally entails loss of office. Thus the attainment of a certain age, which in the U. S. often vacates the office, sometimes renders one holding an office unqualified to perform its duties. In these cases, however, of loss of qualifications it is usually provided that the loss of qualifications must be determined by the courts, and all persons dealing with officers are not required to find out whether they have become disqualified, inasmuch as the principle applicable to *de facto* officers will be applied in these cases of loss of qualifications. The official relation may also be terminated by removal. Where the office is filled by election it is usually held by the courts that unless the statute so specifically provides the officer may not be removed, but that where an officer is appointed and there is no provision made by the law as to his term, he may be removed by the appointing officer, the power of removal being held to be incident to the power of appointment. (See *Ex parte Hennen*, 12 Peters 230, 239.) In a great many cases, however, the power of removal of an appointing officer is limited to the case where cause presents itself. In such a case the removal may be reviewed by the courts, it being held by the courts that what is cause is a question of law over which they have jurisdiction. (See *People vs. Fire Commissioners*, 73 New York 437.) In these cases of removal for cause the courts also insist that the individual removed shall be given an opportunity to be heard in his defense; and the proceedings for the removal take on somewhat the character of a regular trial. (*Dullam vs. Willson*, 53 Michigan 392.) Finally the official relation may be terminated by the action of the Legislature, which has the power, as a result of the fact that the official relation is a relation of public law and is not in the nature of a contract, to ter-

minate the official relation by abolishing the office, by shortening the term, by declaring the office to be vacant, or by transferring the duties of one office to another, or finally also by means of impeachment. *State vs. Douglas*, 26 Wisconsin 428, and *Augusta vs. Sweeney*, 44 Georgia 463.

FRANK J. GOODNOW.

Offset: in surveying, a short distance measured at right angles to a straight line in order to locate the position of a point. The method of determining the position of an irregular line by means of offsets is to run a straight course in the general direction of the line, and at suitable points of this course to measure offsets to the line in question; then, knowing the distance of each offset from the origin of the course, the length of each offset, and its direction, whether to the right or left, the corresponding points of the irregular line may be plotted. The method of offsets is particularly valuable in filling in the outlines of a topographical survey, and especially in tracing the courses of roads, streams, and coast-lines.

Offerdingen. *ōf-ter-ding-en*, HEINRICH, von: the name of a supposed minnesinger who is mentioned in the Middle High German poem *Saengerkrieg auf der Wartburg*, but of whom we have no further reliable accounts. Despite the latter fact he became the favorite hero of the romantic school (Novalis), and was at one time even supposed to be the author of the *Nibelungenlied*. J. G.

Ogam: See IRISH LANGUAGE AND LITERATURE.

Ogar'ev. NIKOLAI PLATENOVICH: author; b. on his father's estate in the government of Pensa, Russia, in 1818; d. 1877. During a trip to the Caucasus in 1838 he made the acquaintance of the banished poet Prince Odoevskii, with whom he became intimate and to whom he addressed some of his earliest verses. His first poems to be printed appeared in the *Otechest vennyia Zapiski* (Annals of the Country) in 1840, and for a number of years after this he continued to contribute to various journals. In 1848 Ogarev settled in London, where he took an important part in editing *Kolokol* (the Alarm Bell) and other revolutionary publications of Herzen, his friend from college days. A third edition of his poetical works appeared in 1863. A. C. COOLIDGE.

Ogden: city; capital of Weber co., Ut. (for location, see map of Utah, ref. 3-L); at the confluence of the Ogden and Weber rivers, the mouth of Ogden cañon, and the foot-hills of the Wasatch Mountains; on the Union Pac., the Central Pac., and the Rio Grande West. railways; 37 miles N. of Salt Lake City. It derives excellent power for industrial purposes from the rivers, has an abundant supply of water from mountain springs and good natural drainage, and is in an agricultural, fruit-growing, iron, salt, lime, building-stone, and coal region. The main and branch railway connections give it importance as a commercial receiving and shipping point. It contains Ogden Academy (Congregational), a military academy, 12 public schools, public-school property valued at \$250,000, various manufactories, 3 national banks, a State bank, an incorporated bank, a loan and trust company, and a semi-weekly, a monthly, and 3 daily periodicals. Pop. (1880) 6,069; (1890) 14,889; (1895) 15,828. EDITOR OF "STANDARD."

Ogdensburg: city (known as the "Maple City," founded in 1749, incorporated in 1868) and port of entry; St. Lawrence co., N. Y. (for location, see map of New York, ref. 1-H); at the confluence of the St. Lawrence and the Oswegatchie rivers; on the Central Vt. and the Rome, Watertown and Ogdensburg railways; opposite Prescott, Canada, with which it is connected by steam-ferry; 175 miles N. N. W. of Albany. It is well built, has handsome maple-shaded streets, and obtains power from the river, which serves many manufactories. The city is the headquarters of a line of screw steamers plying between Chicago and intermediate lake ports, and annually handles a large amount of grain and lumber, besides general lake and river freight. There are a U. S. Government building, a Roman Catholic cathedral, several public parks, public-school property valued at \$100,000, large grain elevators and warehouses, 2 libraries containing together about 15,000 volumes, a national bank, a State bank, and 2 daily and 4 weekly newspapers. Pop. (1880) 10,341; (1890) 11,662; (1892) State census, 11,959. EDITOR OF "JOURNAL."

Ogé, ō'zhā', JACQUES VINCENT: one of the forerunners of Haitian independence; b. at Dondon about 1755. He was a light mulatto of a wealthy family; was educated in Paris, and served in the army of one of the German electors.

When the French Revolution broke out he was chosen deputy for Haiti to the Constituent Assembly, where he was a prominent member of the Amis des Noirs society. In 1790 he organized a secret expedition in the U. S. with the object of freeing the slaves of Haiti; landed at Cape François, Oct. 23, with 250 men, and at first gained some partial successes; but he was soon after defeated, and gave himself up on condition that his life should be spared. Notwithstanding this he was broken on the wheel at Cape François Feb. 26, 1791. His death excited the colored population to fury and led to the massacre of the whites soon after. H. H. S.

Ogham, or Ogam: See IRISH LANGUAGE AND LITERATURE.

Oglesby, RICHARD JAMES: soldier; b. in Oldham co., Ky., July 25, 1824; left an orphan at the age of eight years, he removed to Decatur, Ill., in 1836; learned the carpenter's trade, which with farming occupied his time until 1844, meanwhile studying law, and in 1845 was licensed and began practice at Sullivan. In 1846 he returned to Decatur, and was commissioned first lieutenant in the Fourth Illinois Regiment (Col. E. D. Baker's), with which he participated at Vera Cruz and Cerro Gordo. Resuming his practice at Decatur in 1847, he pursued a course of study at the Louisville Law School, graduating in 1848; in 1849 he journeyed overland to California and engaged in mining until 1851, when he again resumed his residence and practice at Decatur. In 1858 he was defeated for Congress, but was elected to the State Senate in 1860, which seat he resigned, and accepted the colonelcy of the Eighth Illinois Volunteers; commanded a brigade at capture of Forts Henry and Donelson; was made brigadier-general Mar. 21, 1862, remaining in command of brigade until the battle of Corinth, where he was severely wounded and disabled until Apr., 1863, when he returned to duty, having meanwhile (Nov., 1862) been promoted to be major-general, and was assigned to the Sixteenth Corps. Resigned May, 1864, and in November of that year was elected Governor of Illinois (1865-69); re-elected in 1872, but chosen U. S. Senator Jan., 1873, and served through the term ending 1879; was Governor of Illinois 1885-89.

Oglethorpe, JAMES EDWARD: founder of the State of Georgia; b. in London, Dec. 21, 1698; entered the army about 1712; studied at Oxford for a short time; served under Prince Eugene and Marlborough 1715-17; entered Parliament in 1722 for Haslemere; obtained a charter in 1732 and a grant for the founding of Georgia and the colonization of poor debtors in that province; founded Savannah 1733; received the Protestant emigrants of Salzburg 1734, and soon after revisited England, but returned to Savannah with John and Charles Wesley in 1735. In 1738 he took a regiment of troops thither, and after war was declared between Great Britain and Spain he commanded the Georgia and South Carolina forces in an invasion of Florida. He made an unsuccessful attack on St. Augustine 1741, and in 1742 repelled by stratagem the attack of the Spaniards upon Georgia; returned finally to England 1743; served against the Pretender 1745, and was court-martialed for misconduct 1746, but acquitted. In 1765 he retired as a general upon half pay. D. at Cranham Hall, Essex, Jan. 30, 1785. See biographies by Harris (Boston, 1841), Wright (London, 1867), and Bruce (New York, 1890).

Revised by F. M. COLBY.

Ogowe: one of the largest rivers of Western Africa; rises between 2° and 3° S. lat., near 14° E. lon., and after a general N. W. course for about 300 miles, turns S. W. near the equator, then W., and enters the Atlantic through many streams, forming a large delta extending nearly 50 miles along the coast a little S. of the equator. Many attempts to explore the Ogowe were defeated by the natives, but Savorgnan de Brazza (beginning in 1876) revealed its entire course, which is considerably impeded by cataracts. In its upper reaches the Ogowe traverses wide savannas, but lower down runs mostly through dense forests. There are many large islands in the lower part, where the river is very wide and shallow. A large part is navigable in high water by light-draught vessels; many European trading-posts are on its banks; the native population is numerous; and the river is the most important natural factor in the work of developing the French Congo territory. C. C. A.

Og'gyes (in Gr. *Ὠγύγης* and *Ὠγυγος*): in Greek mythology, the first King of Thebes, whose oldest gate was called after him the Ogygian. During his time the waters of Lake



Copais rose above its banks and inundated the whole valley of Boeotia. An Ogygian deluge is also spoken of in Attica, and Ogyges himself is sometimes represented as a Boeotian autochthon, sometimes as an Egyptian king, and was brought into manifold connections with the earliest legendary history of Greece. Revised by J. R. S. STERRETT.

O'Hara, THEODORE: soldier and poet; b. at Danville, Ky., Feb. 11, 1820. He served in the army during the Mexican war, and afterward practiced law at Washington, D. C. On the outbreak of the civil war he took part with the South and became a colonel in the Confederate army. D. near Guerryton, Ala., June 6, 1867. He is remembered chiefly by his very popular poem *The Bivouac of the Dead*, written to commemorate the Kentuckians killed at Buena Vista during the war with Mexico. H. A. B.

O'Higgins: an interior province of Chili, S. of Santiago, from which it was separated in 1883. Area, 2,524 sq. miles. The eastern portion is included in the Andes; the western part is in the "valley of Chili" and is very fertile, producing wheat, wine, fruits, etc. Near Rancagua, the capital, there are celebrated hot springs. Pop. (1891) 92,892.

O'Higgins (Span. pron. ô-ee'gēens), **AMBROSIO**: administrator; b. in County Meath, Ireland, about 1730. His real name was Ambrose Higgins, and he was of a poor and respectable family. His uncle, a priest in Cadiz, Spain, took charge of his education, eventually gave him a small outfit of goods, and sent him to trade in South America. He landed at Buenos Ayres and made his way over the Andes to Chili, where for many years he was a trader and peddler in a small way. Eventually he obtained a commission in the army, distinguished himself in the Araucanian wars, rapidly rose in rank, and in 1788 was made captain-general of Chili; before this time he had changed his name to O'Higgins, as a more aristocratic form. His rule was very successful; he was created Marquis of Osorno, and in 1796 was nominated Viceroy of Peru, a position which he retained until his death at Lima, Mar. 18, 1801. H. H. SMITH.

O'Higgins, BERNARDO: soldier; illegitimate son of Ambrosio O'Higgins; b. at Chillan, Chili, Aug. 20, 1776. He was educated in England, where he associated with Miranda and other prominent Spanish-American republicans; returned to Chili in 1802, joined the revolutionists in 1810, and soon attained prominence as a military leader. On the deposition of Carrera from the command of the army (1813) O'Higgins was chosen to fill his place. The violent opposition of Carrera and his faction divided the country into two hostile camps; civil war was impending, when the arrival of a Spanish army from Peru forced the rivals to combine their forces against the common foe. Relying on the aid promised by Carrera, O'Higgins encountered Osorio at Rancagua; Carrera—intentionally, as was charged—did not re-enforce him, and he was disastrously defeated Oct. 2, 1814. Chili was deserted to the Spaniards, and the patriot leaders fled over the Andes. O'Higgins joined the army of San Martin at Mendoza, and in the patriot invasion of Chili (1817) was his principal lieutenant; his charge decided the victory of Chacabuco Feb. 12, 1817, and the consequent occupation of Santiago. San Martin declined the office of supreme director of Chili, and on Feb. 15 it was given to O'Higgins with dictatorial powers. O'Higgins governed for nearly six years, during which the last Spaniards were driven from Chili, and the country was rapidly developed; his steady support of San Martin did much to secure the overthrow of the Spaniards in Peru. His efforts to form a popular representative government were less successful; the opposition of the aristocratic party and of the old adherents of Carrera at length led to a revolution, and O'Higgins was forced to resign Jan. 28, 1823. He went to Peru, and died at Lima, Oct. 24, 1842. HERBERT H. SMITH.

Ohio: one of the U. S. of North America (North Central group); the fourth State admitted into the Union; popularly known as the "Buckeye State."

Location and Area.—It lies between lat. 38° 25' and 41° 57' N., and lon. 80° 34' and 84° 49' W.; is bounded N. by Michigan and Lake Erie, E. by Pennsylvania and West Virginia, S. by West Virginia and Kentucky, and W. by Indiana; greatest length from E. to W. about 215 miles, greatest breadth from N. to S. about 210 miles; area, 41,060 sq. miles, of which 300 sq. miles are water surface.

Physical Features.—The surface consists of an undulating plain, from 450 to 1,550 feet above the sea-level. The highest point is near Bellefontaine, in Logan County, which has

an altitude of 1,550 feet. The highest extended portions are in the central part, while the watershed separating the St. Lawrence system from the Mississippi valley system runs from N. E. to S. W. across the State, attaining an average height of from 1,100 to 1,300 feet. This dividing range enters the State in Ash-tabula County but a few miles from Lake Erie, and crosses irregularly to the central western border, passing thence S. W. into Indiana. The northern side of this watershed is naturally smaller and the rivers are shorter, though the descent from the high central table-land is more gentle

than in the southern slope. In the northwestern part the lands were originally swampy. There are a few small lakes in some of the western counties. The rivers in the northern or St. Lawrence system emptying into Lake Erie are the Maumee, Sandusky, Huron, Vermilion, Black, Rocky, Cuyahoga, Chagrin, Grand, Ashtabula, and Conneaut. In the southern system as tributaries of the Ohio are the Mahoning, the Walhonding, and Tuscarawas, which unite to form the Muskingum, the Scioto, Little Miami, and Great Miami. Of these only the Maumee is navigable, and that for only about 20 miles from Lake Erie.

Geology.—The entire geological series of Ohio consists of stratified rocks of Palaeozoic time, having an aggregate thickness, if the average of the different strata be reckoned, of about 3,500 feet. The important geological feature is the Cincinnati axis or anticlinal. The main fold extends N. W. from Southwestern Ohio into Indiana, and thence an offshoot extends N. E. across Ohio to the islands of Lake Erie. From this Cincinnati axis the strata dip gently on the two sides in a W. and S. E. direction. The Trenton limestone underlies Northern and Western Ohio at a depth of from 1,000 to 2,000 feet, whence it has been traced to the extreme southwestern part, where it shows an outcrop. The Utica black shale, which overlies this in the N. W., shows an outcrop nowhere in the State. The Hudson River group underlies the entire State, and covers in the outcrop about 4,000 sq. miles in the S. W. It consists of alternate layers of limestone and shale. The Medina shales (red or yellow non-fossiliferous shales) and the Clinton limestone occur as outcrops only in the southern and southwestern part. The Clinton limestone yields small quantities of petroleum, at a few points is the source of gas, and occasionally contains hematite ore, but not in workable quantities. The Niagara group, shales and limestones, occupies about 3,000 sq. miles in its outcrop in the W. and S. The Lower Helderberg limestone occupies a large area, though it is covered for the most part by drift deposits. The outcrop of the Devonian limestone (Upper Helderberg or Corniferous) is found in a narrow strip running from the center of the State to the N. and including the islands in Lake Erie, also in a similar belt through the northwestern counties. The Ohio shale overlies the preceding in Central Ohio, and in its outcrop stretches in a belt from 10 to 20 miles across the center of the State. The natural gas and the petroleum of North-eastern Ohio come from these shales. Passing from the Devonian system, the Subcarboniferous system brings in the Waverly group of shales and sandstones, which show a broad belt across the State, immediately E. of the Devonian shale outcrop, and forms the western rim of the coal-basin which occupies all of the eastern and southeastern parts. Of the five strata making up the Waverly group the most important is the Berea grit, which is a source of fine building-stone and of grindstone grit, and where it dips beneath the surface is the repository of invaluable supplies of petroleum, gas, and salt water. The Carboniferous system, including the Conglomerate series and the coal-measures, form the surface of about one-quarter of the State, extending from the Waverly group to and beyond the southeastern boundary. The Conglomerates and the lower coal-measures con-



Seal of Ohio

tain thirteen distinct seams of bituminous coal, while in the upper coal-measures there are ten seams, less valuable than those in the lower measures. The different seams vary widely in character, but embrace all varieties of bituminous, steam, coking, gas, and cannel coal. The seams range in thickness from a few inches to 13 feet. The lower measures furnish the greater portion of the coal mined in the State. The amount of coal in this district is estimated by Prof. Orton at 20,000,000,000 tons, or, at the ordinary rate of consumption, sufficient to supply the demand for 1,000 years. These seams in all the coal-measures occur in interstratification with shales, limestone, fire-clays, and iron ore. The glacial drift covers about two-thirds of the State with sand, gravel, and clay to the depth of from 25 to 300 feet.

Mineral Productions.—The mineral resources of Ohio are such as to give her a prominent place among the States. While the variety of her mineral products is not large, they represent a vast amount of capital, and the volume and value of the productions are annually increasing in nearly every line. She ranked fifth among the States in value of mineral productions for the census year 1889-90, which is given as \$26,653,439. In the production of iron ore there has been a marked falling off, the output in 1886 being 344,484 tons; in 1889, 252,409 tons; and in 1892, 89,722 tons. In 1859 the first well was drilled in the U. S. for petroleum. Ohio had a fairly conspicuous part in the great economic movements resulting from this beginning, and has made several unique contributions to the subject. The oil-field of Mecca, Trumbull County, is one of these. It yields a heavy lubricating oil of great excellence from wells only 30 to 50 feet deep, the oil being drawn by buckets as in ordinary water-wells. The Macksburg oil-field of Noble and Washington Counties was the first in the State to attain large proportions. Better than its oil production is the knowledge that it has yielded of the laws of petroleum accumulation. In its best year, 1885-86, it yielded fully 750,000 barrels. In 1873 the inflammable gas that always accompanies oil was first turned to account in a large way. An iron-mill in Pittsburgh was supplied with gaseous fuel brought in by a pipe line from a well 10 or 12 miles distant. This led to the drilling of deep test-wells in almost every county in Ohio, and one of these wells, drilled in Firdlay in Nov., 1884, led to the most surprising discovery ever made in the economic geology of the State, namely, that the Trenton limestone of Lower Silurian age is, under certain conditions, a prolific source of gas and oil. The surface rocks of Northwestern Ohio, which are Upper Silurian limestones, hold at a depth of 1,000 to 1,500 feet reservoirs of oil that yield not less than 5,000 barrels to the acre, and volumes of gas, under a pressure of 400 to 600 lb. to the square inch, flowing out at a rate of 10,000,000, 20,000,000, or 30,000,000 cubic feet a day. The Trenton limestone also furnishes by far the largest portion of the illuminating oils of the U. S. The natural gas of Ohio is used to a large extent in manufacturing, especially glass-making; also for domestic fuel, both in and out of the State. (See NATURAL GAS.) The gas used in Columbus, Newark, and Lancaster is derived from the Clinton formation of Upper Silurian age, and the fact that this stratum is petroliferous is another contribution of Ohio to the knowledge of this class of products. Of crude petroleum the annual output has increased over three hundredfold since 1880. The nature and amount of the mineral productions of Ohio for the census year (1889-90), together with her rank in each, are shown in the following table:

MINERAL PRODUCTS.	Amount.	Rank.
Bituminous coal, tons.....	9,976,787	3
Crude petroleum, barrels.....	12,471,466	2
Sandstone, cubic feet.....	16,016,258	1
Limestone, value.....	\$1,514,934	7
Lime burned, barrels.....	1,725,336	3
Gypsum, tons.....	9,920	5
Natural gas, receipts from consumers.....	\$1,120,997	3

In 1892 the production of coal was 14,599,908 tons; of fire clay, 1,253,110 tons. The clays constitute a resource which is already the basis of a large industry that seems destined to become one of the foremost in the State. Ninety-eight per cent. of all the grindstones produced in the U. S. are from Ohio. The State ranks second in number of stone quarries of all kinds and in value of their products.

Soil and Productions.—In the southeastern portion the soils are formed directly from the underlying and outcropping rocks, while in the rest of the State, above the line of the terminal moraine, the soil is of foreign origin, being de-

rived from the clay and gravel of the drift, a mixture of the various formations lying in the path of the glacial ice. These drift-soils fall into three classes—the limestone soils in the western part of the State, the clay of the uplands, and the swamp lands, especially of the northwest. Of these the first two are the best, and are excellently adapted to agriculture. The uplands are especially suited to the cultivation of wheat, and every cereal product which the latitude permits is raised in the State. In the northeastern part dairy products constitute the great staple. Of the soils outside the drift-covered area, the limestone in the extreme eastern and southeastern counties are among the best in the State. Many of the soils are well adapted for fruits and berries, which are raised in great abundance. The grape is largely cultivated.

The native trees embrace eighty-eight known varieties, the most common of which are the oaks, hickories, maples, elms, the ash, poplar, and beech. Fourteen varieties of oaks are found, including the white (the most common tree in the State), red, black, yellow, burr, swamp Spanish, and swamp white; four varieties of maple; six of hickory; three of elm; white, red, green, blue, and black ash; papaw; basswood; buckeye; yellow and honey locust; catalpa; butternut; black walnut; three varieties of birch—cherry, yellow, and red; chestnut; beech; five varieties of poplar, including the quaking ash, cottonwood, and balsam poplar; five varieties of pine; hemlock; and tamarack. The flora of the State embraces a wide variety and large number of species, but none peculiar to Ohio.

Agriculture has always been the leading occupation, though the value of the land has decreased in common with that of immediately neighboring States. This fact, due in great measure to the opening of the trans-Mississippi lands, is beginning to produce its effects in changing the character of Ohio agriculture. While the cereal products still continue far in the lead, fruit and truck farming are receiving increasing attention. Ohio is the foremost State in the number of sheep and the amount of wool produced, while dairy farming, especially in the Western Reserve, constitutes one of the most flourishing and extensive occupations.

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.
Total number of farms.....	247,189	251,430	* 1.7
Total acreage of farms.....	24,529,226	23,352,408	+ 4.8
Value of farms, with buildings and fences.....	\$1,127,497,353	\$1,050,031,828	+ 6.9

* Increase.

+ Decrease.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1893:

CROPS.	Acreage.	Yield.	Value.
Corn.....	2,709,549	64,487,266 bush.	\$25,794,906
Wheat.....	2,683,904	38,916,608 "	23,182,467
Oats.....	952,300	27,335,780 "	8,170,734
Rye.....	63,189	960,473 "	451,422
Barley.....	34,955	793,479 "	372,935
Buckwheat.....	13,841	166,092 "	99,655
Tobacco.....	41,659	18,246,642 lb.	1,186,032
Potatoes.....	177,576	10,299,408 bush.	6,900,603
Hay.....	2,486,295	3,306,772 tons	33,233,059
Totals.....	9,163,268	.....	\$98,391,813

On Jan. 1, 1894, the farm animals comprised 864,360 horses, value \$47,408,225; 20,700 mules, value \$1,220,326; 767,735 milch cows, value \$19,915,046; 803,236 oxen and other cattle, value \$16,780,881; 3,765,704 sheep, value \$8,506,725; and 2,350,838 swine, value \$15,046,303—total head, 8,572,573; total value, \$108,877,506.

Climate.—The location of the State subjects it to the climatic conditions of both the lake region and the Ohio-Mississippi valley, and hence to a wide range in temperature and rainfall. Not only is the annual range great, but the changes are often sharp and sudden, especially in the central part. The summers are extremely warm in the southern part, the thermometer not infrequently reaching 100°. In the central section the heat is rarely so intense, while in the north it is materially tempered by the presence of the large body of water on the boundary. The winters are quite variable, seldom rigorous in any part of the State, but occasionally severe in the northern part, where the snowfalls are also often heavy. In general, the climate is healthful, and has proved itself conducive to vigorous animal and vegeta-

ble growth. The following table presents the important facts as to temperature and rainfall, and is based on the observations of the Ohio Weather and Crop Service, extending over a period of years:

MONTHS.	TEMPERATURE.			PRECIPITATION		
	Mean.	Max.	Min.	Mean.	Max.	Min.
January	26.0	76	-34	3.13 in.	8.33 in.	0.64 in.
February	31.3	80	-18	3.97	10.38	0.42
March	35.3	87	-17	2.85	9.58	0.33
April	49.8	95	10	3.09	9.49	0.20
May	59.6	99	21	4.60	11.67	0.76
June	69.9	102	34	4.08	10.83	0.63
July	72.9	108	40	3.37	10.83	0.07
August	69.9	104	33	3.20	11.53	0.10
September	64.2	100	23	2.90	10.25	0.25
October	51.6	99	12	2.62	8.39	0.11
November	40.5	80	-8	3.06	8.00	0.68
December	32.5	78	-32	2.48	6.52	0.50
Year	50.1	108	-34	39.35		

Divisions.—For administrative purposes the State is divided into eighty-eight counties, as follows:

COUNTIES AND COUNTY-SEATS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-SEATS.	Pop. 1890.
Adams	8-D	21,005	26,093	West Union	825
Allen	3-D	31,314	40,644	Luna	15,981
Ashland	5-G	23,883	22,223	Ashland	3,566
Ashtabula	1-J	37,139	43,655	Jefferson	1,346
Athens	7-G	28,411	35,194	Athens	2,620
Auglaize	4-D	25,444	28,100	Wapakoneta	3,616
Belmont	5-I	49,698	57,413	St. Clairsville	1,191
Brown	8-D	32,911	20,899	Georgetown	1,473
Butler	6-C	42,579	48,367	Hamilton	17,565
Carroll	1-I	16,416	17,566	Carrollton	1,228
Champaign	5-D	27,817	26,980	Urbana	6,510
Clark	5-D	41,948	52,277	Springfield	31,895
Clermont	7-C	36,713	33,553	Batavia	953
Cinton	7-D	24,736	24,240	Wilmingon	3,079
Columbiana	3-J	48,602	59,029	Lisbon	2,378
Coshocton	4-G	26,642	26,703	Coshocton	3,672
Crawford	3-F	30,583	31,927	Bucyrus	5,974
Cuyahoga	2-H	196,943	309,970	Cleveland	261,353
Darke	5-C	40,496	42,961	Greenville	5,473
Defiance	2-C	22,515	25,769	Defiance	7,694
Delaware	4-E	27,381	27,189	Delaware	8,224
Eric	2-F	32,610	35,462	Sandusky	18,471
Fairfield	6-F	31,284	33,939	Lancaster	7,555
Fayette	6-E	20,364	22,309	Washington C. H.	5,742
Franklin	5-E	86,797	124,087	Columbus	88,150
Fulton	1-D	21,053	22,023	Wauseon	2,060
Gallia	8-G	28,124	27,005	Gallipolis	4,408
Geauga	2-I	14,251	13,489	Chardon	1,084
Greene	6-D	31,349	29,820	Xenia	7,301
Guernsey	5-H	27,197	28,645	Cambridge	4,361
Hamilton	7-C	314,374	374,573	Cincinnati	296,908
Hancock	2-D	27,784	42,563	Findlay	18,553
Hardin	3-D	27,023	28,939	Kenton	5,557
Harrison	4-I	20,456	20,800	Cadiz	1,716
Henry	2-D	20,585	25,080	Napoleon	2,764
Highland	7-D	30,381	29,018	Hillsboro	3,620
Hocking	6-F	21,126	22,658	Logan	3,119
Holmes	4-G	20,776	21,139	Millersburg	1,923
Huron	2-F	31,609	31,949	Norwalk	7,195
Jackson	7-F	23,686	28,408	Jackson	4,320
Jefferson	1-H	33,018	39,415	Steubenville	13,394
Knox	1-F	27,431	25,990	Mt. Vernon	6,027
Lake	1-I	16,326	18,235	Painesville	4,755
Lawrence	8-F	31,068	39,556	Ironton	10,939
Licking	5-F	40,150	43,279	Newark	14,370
Logan	4-D	20,267	25,386	Bellefontaine	4,245
Lorain	2-G	35,526	40,295	Elyria	5,611
Lucas	1-E	67,577	102,296	Toledo	81,434
Madison	5-E	20,120	20,057	London	3,313
Mahoning	3-J	42,871	55,773	Youngstown	33,320
Marion	4-E	20,565	24,727	Marion	8,327
Medina	2-G	21,153	21,742	Medina	2,073
Meigs	7-G	32,925	29,843	Pomeroy	4,726
Merger	4-C	21,808	25,220	Celina	2,702
Miami	5-C	36,158	39,754	Troy	4,494
Monroe	6-I	26,496	25,175	Woodfield	1,031
Montgomery	6-C	78,550	100,852	Dayton *	61,220
Morgan	6-H	20,074	19,143	McConnellsville	1,771
Morrow	1-F	19,072	18,120	Mt. Gilead	1,869
Muskingum	5-G	49,774	51,210	Zanesville	21,090
Noble	6-H	21,138	20,753	Caldwell	1,218
Ottawa	1-E	19,782	21,974	Port Clinton	2,019
Paulding	2-C	13,485	25,692	Paulding	1,879
Perry	6-G	28,218	31,151	New Lexington	6,556
Pickaway	6-E	27,415	26,980	Circleville	6,556
Pike	7-E	17,965	17,482	Waverly	1,567
Portage	4-I	27,500	27,868	Ravenna	3,447
Preble	6-C	24,533	23,121	Eaton	1,717
Putnam	2-D	24,713	30,188	Ottawa	1,473
Richland	3-F	36,366	38,072	Manchester	13,473
Ross	7-E	40,267	39,454	Chillicothe	11,288
Sandusky	2-E	32,067	30,617	Fremont	7,341

* Reference for location of counties, see map of Ohio.

COUNTIES AND COUNTY-SEATS—CONTINUED.

COUNTIES.	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-SEATS.	Pop. 1890.
Scioto	8-E	33,511	35,377	Portsmouth	12,394
Seneca	2-E	36,947	40,869	Tiffin	10,801
Shelby	4-C	24,135	24,707	St. Joe	4,850
Stark	3-H	64,031	84,170	Canton	26,189
Summit	2-H	43,788	54,089	Akron	27,601
Trumbull	2-J	44,880	42,373	Warren	5,973
Tuscarawas	4-H	40,198	46,618	New Philadelphia	4,456
Union	4-E	22,375	22,860	Marysville	2,810
Van Wert	3-C	23,028	29,071	Van Wert	5,512
Vinton	7-F	17,223	16,045	McArthur	888
Warren	6-C	28,392	25,468	Lebanon	3,050
Washington	7-H	43,244	45,380	Marietta	8,273
Wayne	3-G	40,076	39,005	Wooster	5,901
Williams	1-C	23,821	24,867	Bryan	3,068
Wood	2-D	44,022	44,392	Bowling Green	3,467
Wyandot	3-E	22,395	21,722	Upper Sandusky	3,572
Totals		3,198,062	3,672,316		

* Reference for location of counties, see map of Ohio.

Since the census was taken the court of common pleas of Montgomery County has decided that the annexation of that part of Dayton city included in Harrison, Mad River, and Van Buren townships was illegal. The population of this territory is 3,242, and is included in total for Dayton city.

Principal Cities and Villages, with Population for 1890.—Cincinnati, 296,908; Cleveland, 261,353; Columbus, 88,150; Toledo, 81,434; Dayton, 61,220; Youngstown, 33,220; Springfield, 31,895; Akron, 27,601; Canton, 26,189; Zanesville, 21,009; Findlay, 18,553; Sandusky, 18,471; Hamilton, 17,565; Lima, 15,981; Newark, 14,270; Mansfield, 13,473; Steubenville, 13,394; Portsmouth, 12,394; Chillicothe, 11,288; East Liverpool, 10,956; Ironton, 10,939; Tiffin, 10,801; and Massillon, 10,092. There were seventy cities and villages with a population of 4,000 and upward each.

Population and Races.—1860, 2,339,511; 1870, 2,665,260; 1880, 3,198,062; 1890, 3,672,316 (native, 3,213,023; foreign, 459,293; males, 1,855,736; females, 1,816,580; white, 3,584,805; colored, 87,511, comprising 87,113 persons of African descent, 183 Chinese, 22 Japanese, and 193 civilized Indians).

Industries and Business Interests.—Ohio is among the foremost States in variety and amount of her industrial products. In 1890 it ranked third in the number of manufacturing establishments; fifth in amount of capital invested, value of product, and wages paid; and fourth in number of persons employed. The total number of establishments was 28,673, employing 331,548 persons. The capital invested was \$402,793,019; wages paid, \$158,768,883; cost of materials used, \$341,016,464; and value of products, \$641,688,064. The following table includes the chief industries in 1890:

INDUSTRIES.	Capital.	Persons employed.	Value of product.
Agricultural implements	\$20,399,930	8,326	\$14,333,258
Boots and shoes, factory product	3,176,318	5,991	8,489,728
Brick and tile	6,212,838	9,301	5,813,437
Carriages and wagons	13,052,571	10,504	18,777,866
Clothing, men's, factory product	13,106,296	16,355	20,604,134
Clothing, women's, factory product	2,056,455	2,636	4,352,098
Coffee and spice, roasting etc.	1,411,728	608	7,806,763
Flouring and grist mill products	13,472,455	1,266	39,468,409
Foundry and machine-shop products	32,589,248	29,628	43,617,072
Furniture	7,255,804	6,408	8,780,689
Glass	4,094,677	6,651	5,649,182
Iron and steel	31,865,847	21,373	57,134,110
Iron and steel, nails and spikes	3,723,812	2,654	7,929,912
Leather	4,380,015	1,569	6,701,670
Liquors, distilled	2,109,879	484	12,033,884
Liquors, malt	21,491,924	3,491	15,899,629
Lumber, planing-mill products	7,908,742	5,938	12,910,538
Paints	3,906,580	824	4,528,764
Paper	7,581,536	3,042	7,209,750
Petroleum-refining	15,871,138	2,291	16,343,493
Printing and publishing	11,442,602	10,791	17,015,401
Saddlery and harness	2,694,665	3,208	6,340,355
Ship-building	2,950,561	2,822	3,804,838
Slaughtering and meat-packing	3,582,540	1,693	17,012,198
Tobacco (chewing, snuff, etc.)	2,105,848	1,940	5,991,177
Tobacco (cigars and cigarettes)	2,729,275	6,575	7,024,748

Finance.—The value of property in 1892, the basis for taxation of 1893, was: Real estate in cities and villages, \$581,575,849; real estate not in cities and villages, \$585,729,798; personal property, \$563,950,820—total, \$1,731,256,467.

The rate of taxation for 1893 for State purposes was 2.75 mills per dollar. The total taxes levied were \$37,682,930.38, of which \$4,759,127.23 were for State purposes, \$9,499,000.05 for county purposes, and \$23,486,892.07 for township, city, school, and special purposes. The receipts of the State for general purposes in 1892 were \$3,740,298.10; expendi-

tures, \$3,762,535.02. The funded State debt, Nov. 15, 1892, was \$2,041,665.

Banking.—On May 4, 1893, there were in operation in the State 219 national banks, with capital of \$27,356,845; surplus and undivided profits, \$9,758,726; circulation, \$8,073,932; deposits, \$65,882,345. In 1892 there were 86 State banks, with capital of \$7,618,325 and deposits of \$30,308,570; 12 stock savings-banks, with capital of \$1,860,000, and deposits of \$9,659,304; 4 mutual savings-banks, with deposits of \$24,946,909; and 229 private banks, with capital of \$4,732,435.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 3,291 post-offices, of which 186 were presidential (8 first-class, 53 second-class, 125 third-class) and 3,105 fourth-class, with 1,056 money-order offices, 23 money-order stations, and 39 postal-note offices. Of newspapers and periodicals there were 140 daily, 4 tri-weekly, 24 semi-weekly, 775 weekly, 3 bi-weekly, 19 semi-monthly, 125 monthly, 2 bi-monthly, and 16 quarterly publications; total, 1,108.

Means of Communication.—In Jan., 1894, there were in the State 8,643-18 miles of railway (all but 191-4 miles being of standard gauge), owned by 88 corporations and operated under 54 systems. The Baltimore and Ohio system operated the lines of 12 distinct corporations within the State, and the Pennsylvania Company 10 lines. The State is crossed by five of the great east and west trunk lines, viz.: the Pennsylvania, the Baltimore and Ohio, the Lake Shore and Michigan Southern, the New York, Lake Erie and Western, and the New York, Chicago and St. Louis. The Cleveland, Cincinnati, Chicago and St. Louis, the Columbus, Hocking Valley and Toledo, the Cincinnati, Hamilton and Dayton, the Columbus, Sandusky and Hocking, the Norfolk and Western, and others traverse the State from N. to S., and afford with many smaller lines thorough facilities for the distribution of Ohio's products and especially those of the coal districts. The cost of the railways within the State was \$431,455,825; cost of equipment, \$59,333,385; net earnings were \$29,565,216; and dividends paid, \$12,600,728.

There are four canals, built, owned, and operated by the State, having an aggregate length of 697 miles, distributed as follows: Ohio Canal (from Lake Erie at Cleveland to the Ohio river at Portsmouth), including feeders, 334 miles; Miami and Erie Canal (from the Ohio river at Cincinnati to Lake Erie at Toledo), including branches, 282 miles; Hocking Canal (branch of the Ohio Canal), 56 miles; Walwhonding Canal, 25 miles. The total cost of construction was \$14,340,572.99; the total expenditures for superintendence and repairs to Nov. 15, 1892, were \$10,068,747.12; total receipts, \$15,878,875. For many years the earnings were largely in excess of the expenses, and the canals added many times their cost to the value of commodities produced, in lessening the cost of transportation to the markets, but for several years they have been operated at a loss.

Churches.—The Roman Catholic Church has an archdiocese, Cincinnati, and two dioceses, Cleveland and Columbus; and the Protestant Episcopal Church divides the State into the dioceses of Ohio and Southern Ohio. The census of 1890 gave the following statistics of the religious bodies having a membership in the State of 5,000 and upward:

DENOMINATIONS.	Organiza- tions.	Churches and halls.	Members.	Value of church property.
Roman Catholic	586	591	336,114	\$7,395,640
Methodist Episcopal	2,310	2,335	240,650	8,749,970
Presb. in the U. S. of America	618	647	82,444	5,754,350
Baptist, Regular	616	632	57,685	2,543,888
Disciples of Christ	475	475	54,425	1,462,250
United Brethren in Christ	745	735	47,678	1,198,870
Reformed Church in the U. S.	294	288	35,946	1,128,275
Congregational	247	260	32,281	2,014,525
German Evan. Synod of N. A.	107	107	31,617	836,200
Lutheran, Joint Syn. of Ohio, etc.	191	201	31,261	839,272
Christian	273	265	25,952	392,500
Methodist Protestant	234	233	18,931	441,000
Lutheran, General Synod	189	185	18,437	1,039,950
Protestant Episcopal	166	191	17,454	2,069,787
Lutheran, General Council	118	114	15,915	463,100
Lutheran, Synodical Conference	54	55	15,440	409,975
United Presbyterian	136	140	14,710	697,550
Evangelical Association	216	216	14,673	491,355
German Evan. Protest. of N. A.	22	23	11,793	438,800
Friends, Orthodox	95	97	10,884	202,250
African Methodist Episcopal	111	114	10,025	318,250
Brethren, or Dunkards, Conserva- tive	95	133	8,490	153,365
Baptist, Free will	128	127	6,982	149,350
Jews, Reformed	17	17	6,576	636,225
United Brethren in Christ, O. I.	250	254	5,822	257,940

Schools.—Ohio was the recipient of the first gift of land from Congress for the support of public education, and also received the first grants of land from Congress for the establishment of a college or seminary of learning, through which grants the idea of a State university became firmly fixed in the public mind as an essential part of the educational system of every Western State. When the State was admitted into the Union the control and disposal of these lands passed to it, with the single restriction that whatever the manner of that disposal might be only the income should be used for the purposes specified. The State at first leased the lands for long periods, but after 1827 the policy of selling was adopted. The proceeds, borrowed by the State, have been constituted a permanent irreducible debt on which the State pays 6 per cent. interest. Nearly all of the original grant of 704,488 acres has been sold, producing a fund the income of which is \$203,696.56. The unsold lands are leased. In addition to this income there is levied annually a tax of 1 mill on the dollar of all taxable property for the maintenance of a State common school fund, which is distributed annually to each county in proportion to school enumeration. Since 1821 the townships and school districts have had authority to levy taxes for the further support of schools. Finally, fines for many petty offenses are by law payable to the townships for school purposes. Since 1889 a compulsory education law has been in force. In 1892 there were 1,136,539 children of school age, of whom 800,356 were enrolled in the public schools; 12,825 school houses; \$244,013 income from land grant, \$1,693,494 from common school fund, \$408,255 from fines, licenses, etc., \$1,509,984 from sale of bonds, and \$8,757,138 from local taxes—in all, \$12,612,886; and school property valued at \$34,527,816.

The land given by Congress in 1787 for a seminary of learning in the Northwest Territory passed in 1803 to the Ohio University at Athens. Miami University at Oxford became in like manner the beneficiary of a similar grant in the Symmes purchase of lands in the Miami valley. Like the Ohio University, its trustees are nominated by the Governor, and both institutions receive small annual appropriations from the State treasury. The Ohio State University at Columbus was established by the State to receive the congressional land grant of 1862. In 1891 a permanent annual levy of one-twentieth of a mill on the taxable property of the State was granted to this university. In the number of colleges Ohio outranks any other State. Among them are several well-known denominational institutions. In 1890-91 there were 37 colleges, with 727 professors and instructors, and 12,030 students in all departments. Among the best established of these colleges are Adelbert, Kenyon, Marietta, Oberlin, Ohio Wesleyan, Cincinnati, and Wooster. There are several medical colleges, 3 law schools, and numerous commercial colleges in the State.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, Ohio had 193 libraries, containing 1,320,099 bound volumes and 171,977 pamphlets. The libraries were classified as follows: General, 39; school 37; college, 47; college society, 12; law, 5; theological, 9; medical, 7; public institution, 7; State, 1; Y. M. C. A., 4; social, 12; scientific, 5; historical, 3; I. O. O. F., 2; mercantile, 1; historical and scientific, 1; historical and theological, 1.

Charitable, Reformatory, and Penal Institutions.—The care of the insane, deaf and dumb, and blind is enjoined upon the State by the constitution, and systematic provision has been made for these and other dependent classes, as well as for the delinquent classes. The general organization of these institutions is the same. The affairs of each are managed and officers and employees selected by a separate board of trustees. These boards usually consist of five members appointed by the Governor and so arranged that the term of one member expires each year. There are five State hospitals for the insane, and the erection of a sixth one, near Massillon, was provided for in 1893. Those in operation are at Athens, Cleveland, Columbus, Dayton, and Toledo. The State also in part supports the Longview Asylum at Carthage. An asylum for epileptics, on the cottage plan, near Gallipolis, was authorized in 1890. For the training of other defective classes there are institutions for feeble-minded youth, the deaf and dumb, and the blind—all at Columbus. The State has also provided homes for the permanent or protracted residence of certain classes of its citizens, as follows: Working Home for the Blind, at Iberia; Soldiers' and Sailors' Orphans' Home, at Xenia; and Soldiers' and Sailors' Home, at Sandusky. The State re-

formatory institutions consist of a boys' industrial school, at Lancaster, and a girls' industrial home, at Delaware. A State reformatory at Mansfield has been authorized, which will occupy an intermediate position between the industrial homes and the State penitentiary at Columbus. In addition there are children's homes in forty of the counties, and an infirmary in every county. A State board of charities and correction, consisting of six members appointed by the Governor, is charged with the duty of investigating the whole system of public charities and correctional institutions, and of examining into the condition and management of prisons, jails, infirmaries, public hospitals, and asylums. In 1892 the expenditure of public money for charitable, reformatory, and penal purposes was \$83,959,704.39.

Political Organization. The government of Ohio, while conforming to the general type of State governments, presents a few peculiarities. The legislative power is vested in a General Assembly of two branches, chosen biennially and meeting in even-numbered years; but since 1854 there has always been an adjourned session in the intermediate year. The normal number of Senators is 35, of Representatives 100, but by a peculiar system of apportionment the whole number is generally a little larger or a little smaller (as, in 1893, Senators 31, Representatives 107). The apportionment is made decennially by the Governor, auditor, and secretary of State. The concurrence of a majority of all members of each house is necessary to the enactment of a law, but the approval of the Governor is not necessary. The executive department is vested in the Governor and the usual State officers. All elected State officers are chosen for two years, except the auditor, chosen for four years, and the school commissioner and members of the board of public works, whose terms are three years. These officers are divided into two groups, elections for which occur in alternate years, thus necessitating State elections each year. The Governor is commander-in-chief of the military forces, grants reprieves and pardons, and exercises such appointing power as may be conferred on him by law. He does not possess the veto power, and as his relation to the appointive offices is dependent on the Legislature, his power in the government is less than that of the Governor of most States. The judicial system embraces a Supreme Court, circuit courts, and courts of common pleas. The Supreme Court consists of six judges chosen, one each year, for terms (since 1892) of six years. The State is divided into eight circuits with three judges in each, chosen, one every two years, for terms of six years. The judges in each circuit sit as a single court. There are ten common pleas districts, nine of which have three subdivisions each, with one judge in each subdivision, and more if the Legislature so provides. The common pleas judges are elected for five years. The elective franchise is limited to sane male citizens of the U. S. over twenty-one years of age who have resided in the State one year, in the county thirty days, and in the precinct twenty days. Those who have been convicted of infamous crimes are excluded from voting or holding office. The local government is a mixture of the county system of the South and the township system of New England. The greater share of local powers is exercised by the county. The county commissioners construct and care for the public works and buildings of the county, and have the power to levy taxes for these purposes. They may create new and change the boundaries of old townships. All other county officers report to them annually. Their term of office is three years. The county treasurer receives all taxes within the county—State, county, and local (township, city, village, or district).

History.—The territory embraced within Ohio was discovered and explorations were begun by the French under La Salle about 1670. The French possession of the territory till the middle of the eighteenth century was undisturbed, though by charters of James I. and Charles II. Virginia and Connecticut were granted jurisdiction over the region. About 1748 and 1749, when the English began to establish trading-posts and to plan for the settlement of the Ohio region, disputes arose with the French resulting in war. In 1763 the Treaty of Paris established the English possession. No attempts at settlement beyond temporary trading-posts were made before the war of independence. During that period several battles were fought with the Indians on this territory, and disputes arose between the States as to the ownership of the western lands. Massachusetts, Connecticut, New York, and Virginia laid claim to the northwestern region, while the other States regarded the land as the joint possession of the thirteen. Maryland's re-

fusal to accede to the Articles of Confederation unless the individual States gave up their claims brought about a cession to Congress of the title to the lands in question, save that Connecticut reserved a tract (popularly known as the Western Reserve) along Lake Erie, W. of Pennsylvania, containing 3,666,291 acres, and Virginia reserved a similar tract, to pay her land bounties, between the Miami, Scioto, and Ohio rivers, containing 3,709,848 acres. In 1785 provisions were made by Congress for the survey and sale of western lands, and in 1787 the famous ordinance for the government of the territory N. W. of the Ohio, forbidding slavery in the entire region, was passed. In the same year the Ohio Company, an association formed in Boston, purchased a large tract on the Muskingum, and in Apr., 1788, the first settlement was made at Marietta, by a colony from Massachusetts. In July of the same year the territorial government was formally organized. In December a settlement was made in Cincinnati. During the next four years the settlers were disturbed by Indian raids, but in 1794 Gen. Anthony Wayne won a victory over the Indians on the Maumee, and the treaty of Greenville in 1795 secured peace for the territory. Settlements followed rapidly, and in 1799 the second stage of territorial life was entered upon, when a legislature was elected which met at Cincinnati. Ohio was admitted to the Union as a State on Feb. 19, 1803. The constitution was revised by a convention in 1850-51, and the revision was so complete as practically to make a new constitution. It was ratified in June and went into effect in September of the same year. Another revision was made in 1873, but the constitution was rejected in 1874. Chillicothe was the State capital in 1800-10 and 1812-16, Zanesville in 1810-12, and Columbus has been the capital since 1816. During the war of 1812 the State suffered from British and Indian raids, and during the civil war it was twice invaded by Confederate troops. The history of Ohio has been in the main that of a peaceful industrial development.

GOVERNORS OF OHIO.

<i>Territorial.</i>		William Medill (acting), July, 1833-Jan. '54	
Arthur St. Clair	July, 1788-1802	William Medill	1854-56
C. W. Byrd (acting)	1802-03	Salmon P. Chase	1856-60
		William Demason	1860-62
<i>State.</i>		David Tod	1862-64
Edward Tiffin	1803-07	John Brough*	1864-65
Thomas Kirker (acting)	1807-08	C. Anderson (acting)	1865-66
Samuel Huntington	1808-10	Jacob Dolson Cox	1866-68
Return Jona. Meigs	1810-14	Rutherford B. Hayes	1868-72
Othniel Looker (acting)	1814	Edward F. Noyes	1872-74
Thomas Worthington	1814-18	William Allen	1874-76
Ethan Allen Brown	1818-22	Rutherford B. Hayes	1876-77
Allen Trimble (acting)	1822	Thomas L. Young (acting)	1877-78
Jeremiah Morrow	1822-26	Richard M. Bishop	1878-80
Allen Trimble	1826-30	Charles Foster	1880-84
Duncan McArthur	1830-32	George Hoadly	1884-86
Robert Lucas	1832-36	Joseph B. Foraker	1886-90
Joseph Vance	1836-38	James E. Campbell	1890-92
Wilson Shannon	1838-40	William McKinley, Jr.	1892-96
Thomas Corwin	1840-42	Asa S. Bushnell	1896-
Wilson Shannon	1842-44		
T. W. Bartley (acting)	1844		
Mordecai Bartley	1844-46		
William Bebb	1846-49		
Seabury Ford	1849-50		
Reuben Wood	1850-Jan., 1853		

AUTHORITIES.—Geology: *Geological Survey of Ohio*, especially the volumes by Edward Orton, State geologist. Statistics: *Census Reports and Bulletins* (1890); *Ohio Statistics*, compiled annually by the secretary of State; *Ohio Weather and Crop Reports*; *Executive Documents*. Education: Knight and Commons, *History of Higher Education in Ohio*. History: Hinsdale, *The Old Northwest*; King, *Ohio*; Ryan, *Ohio*; Short, *Ohio*; a *Sketch of Industrial Progress*.
GEORGE W. KNIGHT.

Ohio River: the largest of the affluents of the Mississippi in respect to its discharge of water, which averages 158,000 cubic feet per second, that of the Missouri being but 120,000 feet. The Ohio originates at Pittsburg, Pa., in the confluence of the Allegheny and Monongahela rivers. Its length below Pittsburg is 975 miles; total length to its ultimate source, 1,265 miles. A straight line from Pittsburg to Cairo, Ill., at its mouth, measures 615 miles. Its drainage area is 202,400 sq. miles, according to Ellet, or 214,000, according to Humphreys. Its elevation at Cairo is 322 feet; at Pittsburg, 1,021 feet. Its mean fall is .72 of a foot to the mile. Its mean rate of flow is about 3 miles an hour. Its mean rise in flood is some 30 feet above extreme low water; occasionally, as in July, 1884, the rise exceeds 60 feet. Above Cincinnati it is in many places

low water for six or eight weeks; but during the rest of the year it is navigable throughout its length for flat-bottomed steamboats. It has two classes of islands: one kind is fertile, and the other mere sandbanks, called "tow-heads" by boatmen. With its numerous tributaries (some of them navigable the year through), it has fully 5,000 miles of high-water navigation. It has no important rapids, except at Louisville, Ky., where it falls 22½ feet in 2 miles. It was discovered in 1669 by the French under La Salle, and called by them La Belle Rivière (the beautiful river).

Revised by REUBEN G. THWAITES.

Ohio State University: an institution of learning at Columbus, O., where it owns and occupies 337 acres of land within the city. It is founded on the congressional land grant for education made in 1862, and was opened in 1873. Its land is worth at least \$1,250,000; it has eight buildings for instruction worth \$330,000; other buildings worth \$45,000; a laboratory equipment worth \$75,000; agricultural and horticultural equipment worth \$15,000; museums worth \$50,000; and a library of 13,000 volumes. Its cash endowment is \$544,745.97. Annual income (1892): Interest on endowment, \$32,684.75; proceeds of State tax, \$85,000; congressional appropriation, \$19,000; fees and rents, about \$20,000—total, \$156,684.75. It offers courses of study for degrees in arts, three in philosophy (the Latin, the modern language, and the English), science, agriculture, horticulture and forestry, civil, mining, mechanical, and electrical engineering, pharmacy, and veterinary medicine; also a two-year course in agriculture and one in mining. Military instruction and training are given by an officer of the U. S. army. A law department was opened in 1891, and a school of industrial arts and manual training in Sept., 1893. The university has (1894) 67 professors, associates, and assistants, and 800 students. W. H. SCOTT.

Ohio University: a coeducational institution at Athens, O., projected in 1787 in the purchase made from the Government of the U. S. by the Ohio Company. By a contract between these two parties two townships of land were set apart and placed under the care of the Legislature of the State. The university was organized under an act of the Legislature passed in 1804. Instruction began to be given as early as 1809, and the first graduate was the well-known Thomas Ewing, whose diploma bore date 1815. The regular faculty was organized in 1822, and the first president was elected in that year. Owing to adverse legislation the original endowment fund was very much reduced, and the income is consequently small. For several years the Legislature has supplemented the income of the institution by an annual appropriation varying from \$5,000 to \$20,000. The trustees are appointed by the Governor of the State, who is an *ex officio* member of the board. Charles W. Super, Ph. D., LL. D., became president in 1883. The present (1894) faculty consists of 8 professors, 5 associate professors, and 6 instructors. The number of students in 1893-94 exceeded 300, of whom 110 were in the collegiate department. The institution is non-sectarian. CHARLES W. SUPER.

Ohio Wesleyan University: a coeducational institution at Delaware, Ohio; organized under the auspices of the Methodist Episcopal Church in 1844. The grounds embrace University Campus, Monnett Campus, Barnes Hill, and Merrick Park. Upon University Campus is a famous sulphur spring and an arboretum consisting of over 600 varieties of trees and shrubs. There are eight buildings, including University Hall, erected at a cost of \$175,000. The total value of grounds and buildings is estimated at \$470,000. The endowment is \$455,000, of which \$255,000 still pays annuities to donors. The presidents have been Edwin Thompson, D. D., LL. D., Frederick Merrick, D. D., L. D., McCabe, D. D., LL. D., Charles H. Payne, D. D., LL. D., and since 1889 James W. Bashford, D. D., Ph. D. The university embraces graduate, collegiate, preparatory, musical, art, and commercial departments. The number of students enrolled in 1894 was 1,139. These came from thirty States and Territories and ten foreign countries. About 33 per cent. of its graduates have entered the ministry, and a large number have become missionaries. J. W. BASHFORD.

Ohl, öl, JEREMIAH F., Mus. Doc.: clergyman; b. in Northampton co., Pa., June 26, 1850. Studied in Muhlenberg College, Allentown, Pa., and Theological Seminary, Philadelphia; was pastor at Quakertown, Pa., 1874-93; director of Deaconess Institute, Milwaukee, Wis., and Professor of Liturgies and Church Music in Lutheran Theological Seminary, Chicago, Ill., since 1893. He has published *School and*

Parish Hymnal (Philadelphia, 1892), besides numerous musical contributions in sheet and pamphlet forms.

H. E. JACOBS.

Öhlenschläger, ADAM GOTTLÖB: See (E)HLENSCHLÄGER.

Ohm: the unit of resistance in ELECTRICITY (*q. v.*). The *practical ohm*, which was till lately in use, is a resistance equal to that of a certain standard coil of wire made of German silver. It was constructed by a committee of the British Association for the Advancement of Science in 1863. The *legal or congress ohm*, adopted by the International Electrical Congress in Paris in 1884, is defined as the resistance, at a temperature of 0° C., of a column of pure mercury, 106 cm. in length and 1 sq. mm. in cross-section. These are close approximations to a certain theoretical ohm which is 10⁹ C. G. S. units of resistance. R. A. ROBERTS.

Ohm, òm, GEORG SIMON: physicist; b. at Erlangen, Bavaria, Mar. 16, 1787; studied in his native city, and was appointed Professor in Physics in 1817 at the Jesuit College of Cologne, director of the Polytechnic School in Nuremberg in 1833, and professor in 1849 at Munich, where he died July 7, 1874. He discovered the so-called Ohm's law (see ELECTRICITY) set forth in his *Galvanische Kette, mathematisch bearbeitet* (Berlin, 1827), which was translated into English in Taylor's *Scientific Memoirs* (vol. xi., London, 1841), and was rewarded with the Copley medal by the Royal Society of London. Besides his principal work, *Beiträge zur Molecularphysik* (Nuremberg, 1849), he wrote, among others, *Bestimmung des Gesetzes, nach welchem die Metalle die Contact-Elektricität leiten* (1826).

Ohm's Law: See ELECTRICITY.

Oidium: an old name for the first stage (conidial) of the powdery grape-mildew. See MILDOW.

Oil-cake: the residue which is left, after the expression of fixed oils from crushed or ground seed of any kind. It is used both as food and as a direct fertilizer. The cake is frequently pulverized before using, and is then called *oil-meal*. Linseed-oil cake is valuable for fattening cattle. It is largely exported from the U. S. to Great Britain. *Cottonseed meal* is used for feeding cattle, and is a valuable manure. Rape-cake and colza-cake are fed to sheep or applied directly to the land. Bean-cake is similarly used by the Chinese.

Oil City: city (incorporated as a borough in 1862 and as a city in 1870); Venango co., Pa. (for location, see map of Pennsylvania, ref. 3-B); at the junction of the Allegheny river and Oil creek; on the Allegheny Valley, the Erie, the Lake Shore and Mich. South., and the West. N. Y. and Pa. railways; 8 miles E. N. E. of Franklin, the county-seat, 18 miles S. of Titusville. It is in the center of the great petroleum-oil district, and in its early days was wholly dependent on that industry. It contains several large oil-refineries, pipe-works, iron-foundries, engine and boiler works, and other manufactories; and has street-railways, electric lights, city hospital, public library, an oil exchange, public-school property valued at over \$100,000, a national bank, a State bank, 3 private banks, and a semi-weekly, a weekly, and 2 daily periodicals. From Clark's Summit, near the city, a splendid view of the region is had. Pop. (1880) 7,315; (1890) 10,932. EDITOR OF "DERRICK."

Oil-cloth: See CARPETS.

Oil-engine: See GAS-ENGINE.

Oil Islands: See CHAGOS ARCHIPELAGO.

Oil of Tar: See TAR.

Oil of Turpentine: See TURPENTINE.

Oil Rivers: chiefly branches of the Niger. They form the Niger delta, though some of them have sources independent of that river. From them comes most of the palm oil exported from West Africa. They form a wonderful network of more or less navigable rivers and creeks extending from the eastern boundary of the British colony of Lagos to the northern frontier of the German Cameroons. The land along the lower part of these rivers is marshy and covered with mangrove, but at some distance above tide-water the marshy banks become firm dry land and the mangrove is gradually supplanted by the screw pine and other vegetation. The rivers are under the administration of a British imperial commissioner, and the chief port is Akasa at the mouth of the main Niger. The climate of this delta region is less unhealthy for Europeans than in the other West African possessions of Great Britain.

C. C. ADAMS.

Oils [plur. of *oil*, from O, Fr. *huile*, *uile* > Fr. *huile* < Lat. *oleum*, from Gr. *ελαιον*, olive oil, oil, deriv. of *ελαία*, olive-tree]; liquid fats (see FATS and FOOD) existing ready formed in nature. They are mostly fluid at ordinary temperatures, unctuous to the touch, stain paper with a permanent greasy spot, are insoluble in water, little soluble in alcohol (castor oil excepted), completely dissolved by ether, often, but not always, tasteless and odorless, and form soaps with alkaline bases, setting free glycerin. In short, the oils are glycerides, and fall under the general designation of fat-oils, including certain pasty sorts, like palm oil, cocoa oil, and other butter-like vegetal fats. The fat vegetal oils are all fixed, while the essential oils are all volatile. The volatility of some of the fatty acids forms no exception to this statement. The essential or volatile oils mostly exist ready formed in plants, from which they are obtained by distillation. They are distinguished from the fat-oils not more by their volatility and odor than by their action with alkaline bases, not being capable of saponification. The volatile oils are therefore separately considered (III.), while the fixed fat-oils are conveniently grouped with reference to their origin, as I. Vegetable Oils and II. Animal Oils.

I. VEGETABLE OILS.—In plants the fat-oils exist chiefly in the seeds, sometimes in the flesh or pulp about the seeds, as in the olive, dogberry, etc., and much more rarely in the roots, as in the earth-almond (*Cyperus esculentus*), which contains 26 per cent. of oil disseminated in minute globules in the cellular tissue. In the oil-producing seeds the oil is often associated with albuminous matters, gum and mucilage; as in linseed, for example. When such seeds are bruised or ground and diffused in water, these albuminous bodies suspend the oil, entangled in a milky emulsion of a glairy and mucilaginous consistency. Linseed is a prominent example of this sort of seeds. The vegetal oils are usually divided into two groups: (1) *The drying oils*, like linseed oil, which on exposure to air absorb oxygen and dry to a resinoid surface or varnish; and (2) *the fatty or non-drying oils*, of which olive oil is an example. The latter class become rancid on exposure to air, but as a rule such oils do not dry up, although many of them thicken.

Purification of Oils.—The crude oils come from the press more or less changed by the heat employed, and contaminated by albumen, resinous and coloring matter, which must be removed to fit the oils for nice purposes. The treatment originally proposed by Thénard in 1801 is still in general use—mixing the oil with 2 or 3 per cent. of concentrated sulphuric acid in a lead-lined vat, and stirring it until it assumes a greenish tint. After twenty-four hours' repose about 2 per cent. of its volume of water, of about 170° F., is added, and the whole agitated vigorously until the liquid appears milky, when the mixture is transferred for rest to large reservoirs at a constant temperature of about 80° F. After some days' rest the clear oil is decanted and filtered either through cotton, carded wool, or flannel, sometimes through river sand and branches of trees free of leaves. The saturation of the acid is accomplished after Dubrunfaut by chalk without the use of so much water. The oil-cake itself is sometimes employed in a state of dry powder, to avoid filtration, 50 kilog. of the powdered cake being capable of clarifying 200 hectoliters of oil in successive portions of about 6 hectoliters each. Oils like cottonseed and palm oil are treated in England by a mixture of nitric acid and potassium chlorate, which rapidly oxidizes the coloring-matters. About 1 to 2 per cent. of this mixture suffices, and an excess of chlorate is to be avoided as well as of nitric acid, which with alkalies gives a strong red color to the oil. Many other methods of purification have been proposed for oils, of which we mention only that of *air-treatment* with acid by Michaud, who proposed in 1869 to blow air through the oil, while the acid is permitted to fall in, in numerous small streams. The oil charged with air forms with the feculence a mixture of less density, which gathers as a bulky scum on the surface, which is skimmed off, while the operation is repeated until this scum ceases to appear. The oil is then treated by a current of steam until it is warmed to 212°, and with a diminishing quantity of steam it is in half or three-quarters of an hour ready to separate from the water and filter.

Physical Properties.—All the oils are lighter than water, but their densities vary greatly with temperature; e. g. olive oil at 12° C. has sp. gr. 919; at 26°, 911; and at 94°, 862. The congeling-points of the oils vary also greatly, being for olive oil 2° (C.); colza, -6.25°; groundnut, -7°; almonds, -10°; grape, -16°; poppy and castor, -18°; lin-

seed, -27.6°; pine, -30°. The oils vary equally in electric conductivity, that of olive oil being 677 times less than the others. This peculiarity was made the basis of Rousseau's *diagoneter*, an instrument designed to detect adulteration in olive oil by the varying intensity of an electrical current moving a magnetic needle.

Chemical Properties.—The effects of air upon the vegetable oils have already been given. In general, the non-drying, both vegetable and animal, become rancid by exposure to air, while the drying oils become gummy or resinous. This effect is quickened or intensified by boiling them with oxide of lead, peroxide of manganese, and borate or acetate of manganese—an operation attended with the production of a high color. For colorless varnishes drying oils are treated in the cold by oleate of lead prepared by acting on oleic acid by litharge. The same result is obtained by the use of protoxide of manganese, precipitated by an alkali from a protosalt of manganese, rapidly washed, and incorporated with the oil. On driving into the mixture a finely divided current of air the manganese is peroxidized in the midst of the oil, giving after washing with oil a colorless and very drying oil. The action of acids and alkalies upon oils is considered under OLEIC ACID and SOAP. See also CASTOR OIL, LINSEED OIL, OLIVE, etc.

II. ANIMAL OILS.—The animal oils and fats have a constitution closely identical with the non-drying vegetal oils. They are in general ethereal salts of glycerin and the fatty acids, so rich in oleic acid as to remain fluid at ordinary temperatures. The animal oils have, as a class, a characteristic and very persistent odor, referable to their origin, which in some of the fish oils is peculiarly offensive. This animal odor adheres with great obstinacy to the soaps made from even the sweetest animal oils. The liquid animal oils are largely derived from marine animals. *Sperm oil* occurs in the cavity of the head of the sperm whale (*Physeter macrocephalus*), mixed with spermaceti, from which it is separated by crystallization and pressing in the cold. It is saponified with difficulty by potash, yielding the same fatty acids as spermaceti fat. It is esteemed the most valuable of animal oils, and brings the highest price. *Whale or train oil* is obtained from the blubber of the right whale (*Balena mysticetus*), from the blackfish, and from other species of whales. Its sp. gr. varies from .919 to .929. Dolphin oil and porpoise oil contain a peculiar fat called delphinine, phocénine, or dolphin fat. It is a neutral, very mobile oil, of sp. gr. 0.948-0.954, of a faint, peculiar, somewhat ethereal odor, like that of valeric acid. Seal oil, shark oil, sea-calf oil are fat-oils obtained from the blubber of these animals, and have characteristics in common with whale oil. The menhaden of the Atlantic coast are extensively taken for their oil and the *fish-guano* produced from the compressed fish after boiling to separate the oil.

Cod-liver Oil. See COD-LIVER OIL.

III. ESSENTIAL OR VOLATILE OILS.—The essential oils of plants consist chiefly of mixtures of hydrocarbons with acid of oxygenized bodies of the same class. They are mostly isomeric or polymeric with oil of turpentine, represented by $C_{10}H_{16}$. Turpentine oil is the product of various species of *Coniferae*, and is obtained from wounds or incisions in the bark, from which it exudes in combination with the resin and other vegetable juices, and is separated from them by distillation. While all the volatile oils thus obtained from coniferous plants are alike in general properties, as of odor, solvent power, etc., they really differ much in density, and more especially in optical properties, some revolving the polarized beam to the right (dextro-rotatory), while others revolve it to the left (lavo-rotatory), and in unlike degrees. Most kinds of turpentine oils are mixtures of two or more isomeric or polymeric hydrocarbons, differing in physical and sometimes in chemical properties. The oxidized constituents of the essential oils are sometimes the direct products of the oxidation of the hydrocarbon itself, in which case they are usually viscid resins; while in other cases the two classes appear distinct. The hydrocarbons from essential oils may be arranged in three polymeric groups, having the formulas, respectively, $C_{10}H_{16}$, $C_{15}H_{24}$, $C_{20}H_{32}$. The first group comprises the greater number of these bodies—turpentine, orange, caraway, nutmeg, anise, thyme, etc.; the second, those from cloves, rosewood, cubebs, calamus, etc.; while the last group has only one representative, colophene. These groups are distinguished by the vapor-densities of the bodies belonging to them—viz., the first group requires a theoretical vapor-density of 4.71, while actual experiment on oil of turpentine, pepper, juniper, lemon, orange, etc.,

gives closely approximate results. For calamus and patchouli oils Gladstone got densities of 6.80 and 7.2, respectively, while theory requires for the formula $C_{15}H_{24} = 7.06$ sp. gr.

The volatile oils generally absorb oxygen rapidly, rarefying and gaining color in the process, and sometimes forming crystals of camphor-like bodies. Oil of turpentine in four months absorbs twenty times its volume of oxygen, and in forty-three months 128 volumes; it thus acquires the properties of ozone, and its bleaching power is seen on the cork used to stop the bottle containing it. Chlorine, bromine, iodine, and hydrochloric acid gas are all absorbed by turpentine and other oils of that group, which are thus changed generally into resins, balsams, or camphors. The oils of lemon, orange, etc., by exposure seem spontaneously to lose their delicate perfume and change to the odor of turpentine. The volatile oils are generally obtained by distilling the parts of plants in which they exist, as the leaves, bark, roots, and even wood, either alone or more usually with water, the vapor of which carries over mechanically the oils of a higher boiling-point. These usually emit at 212° a vapor of considerable tension, which gives the characteristic odor of the plant, and is condensed with the steam, separating in the receiver into a milky or turbid layer, usually, but not always, lighter than the water. Many oils of delicate perfume, like oil of lemons, orange, etc., exist in cells in the skin of the fruit and leaves in a state sufficiently abundant to permit their separation by mechanical pressure, while heat would impair their delicacy. The *essences* are only the watery solutions of essential oils, and are often prepared in domestic economy, as rose-water, essence of pennyroyal, mint, etc., by distillation or by addition of the oils to a sufficient quantity of water to hold them in emulsion or hydration, forming the so-called *distilled waters* of the apothecary.

Some of the volatile oils contain acids, aldehydes, etc., the study of which has shed important light on organic chemistry—e. g. oil of winter-green (*Gaultheria procumbens*) and meadow-sweet (*Spiraea ulmaria*) furnishing salicylate of methyl and salicylic aldehyde. Bitter almonds furnish benzoic aldehyde, and aldehydes of analogous constitution are obtained from the essential oils of cumin (*Cicuta virosa*), oil of cinnamon and cassia, etc. Sulphur exists in certain oils, as of garlic and mustard. The number of the volatile oils of vegetable origin is very large. Gmelin in his *Handbook* describes over 170. There are large areas of the earth where plants with a terebinthine or balsamic odor abound almost exclusively, as in portions of Nevada and California. The properties of the plants referred to remain, for the most part, to be investigated.

The odors of volatile oils are by no means all agreeable. Many are pungent, irritating, and even repulsive; their taste is usually aromatic, often burning. Alcohol and ether are their proper solvents. Many volatile oils are the result of decomposition of other compounds by heat, fermentation, and the action of acids; such are eupione, creosote, fusel oil, oil of wine, etc.; while others which exist ready formed in plants, like those of *Spiraea ulmaria* and *Gaultheria procumbens*, may be formed artificially. There are volatile oils of animal origin, as in ants, castoreum, skunk, etc.

The adulteration of volatile oils is often practiced with fixed oils, when it may be detected by a permanent greasy stain left on paper after evaporation and warming; by distilling off the volatile oil, leaving the fixed oil behind; or by dissolving the volatile oil in three or four volumes of 80 per cent. alcohol, when the greater part of the fixed oil remains behind. Alcohol is also a frequent adulterant, and may, when the quantity is large, be detected by dilution of the adulterated oil with water, when it becomes very turbid. Oil of turpentine is often used to adulterate the costly oils of the same series, as of orange, lemon, neroli, etc. It may often be detected by the smell, or after setting fire to it and then blowing it out.

The odor of volatile oils is closely connected with their oxidation. Oil of turpentine, lemon, clove, and the like, when distilled in carbonic acid or nitrogen, and over lime, are nearly odorless. Air restores the odor. Moisture seems essential also to the development of the odor of volatile oils. All odorous flowers are more fragrant when moistened with dew, and in dry climates roses and other fragrant blooms are scentless after the dry season sets in and dew no longer falls. Violets dried over calcium chloride under a bell lose all odor, but regain it completely when moistened again with water; and paper moistened with a volatile odor and

then perfectly dried ceases to emit odor until it is again moistened with a little water. Rose-leaves and other fragrant petals yield a much stronger water if distilled from a bath acidulated with sulphuric acid—a fact noticed by Albertus Magnus. It is a curious fact that many distilled waters when kept in well-closed bottles become slimy, lose their proper odor, and acquire an offensive smell; whereas if kept in loosely covered vessels they remain unchanged, or even recover their proper odor when exposed, after change, to air again. Gmelin suggests that this is due to albuminous and mucous matters carried over in the distillation, which, when they putrefy, rob the volatile oil of a portion of its oxygen, depriving it of its proper odor. See *Neues Handwörterbuch der Chemie, Oele und Oele Ätherische*.

Revised by IRA REMSEN.

Oinomania: See DELIRIUM TREMENS.

Oise, wāaz: river of France. It rises in the Ardennes, Belgium, and joins the Seine after a course of 158 miles, half of which is navigable.

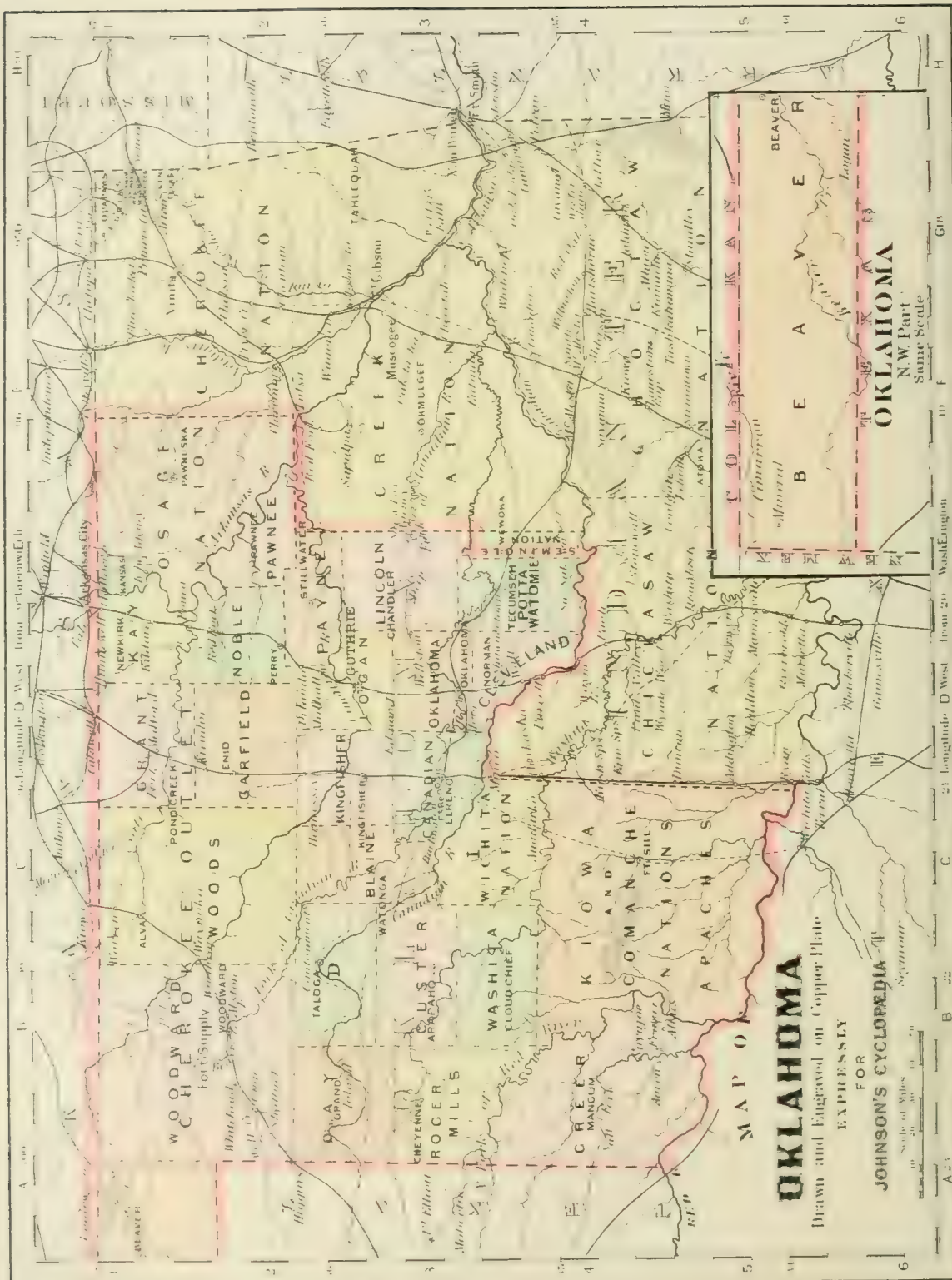
Oise: department of France, along the Seine and the Oise. Area, 2,261 sq. miles. The surface is flat, and the soil rich and very well cultivated. The wine is of inferior quality, but large crops of wheat are raised, and enormous quantities of fruit and vegetables are sent to the Paris markets. Iron manufactures are carried on, besides various industries on a small scale. Pop. (1891) 401,835. Capital, Beauvais.

Ojeda, or **Hojeda**, ō-hā dāā, ALONSO, de: cavalier and adventurer; b. at Cuenca, Spain, about 1468. He was noted for his daring athletic feats and harebrained enterprises. In 1493 he joined Columbus for the second expedition to the New World, and during the two years following he led several military expeditions and explorations in the interior of Española. His most audacious feat was the capture of the Indian chief Caonabó from the midst of his tribe. Ojeda was again in Spain when accounts arrived of the third voyage of Columbus and the discovery of the coast of Paria, and through the influence of Bishop Fonseca he was permitted to fit out a trading and exploring voyage to the same region. With him were associated Amerigo Vespucci and Juan de la Cosa, probably as pilots. Leaving Cadiz May 20, 1499, with four ships, they followed nearly in Columbus's course, reached the coast of Guiana, passed between Trinidad and the mainland, and followed the continent westward, trading with the Indians for gold and pearls. At Lake Maracaibo, their farthest point, they found Indian villages built on piles in the water, whence they called the place Venezuela; and this name passed in time to the surrounding country. Returning they touched at Española, and reached Spain in June, 1500. In 1502 Ojeda explored the same coast to Cape Vela. Soon after he was imprisoned in Española, and again by his debtors in Spain; but his influence in court circles procured his release, and in 1505 he made a third voyage to South America, exploring on this occasion as far west as the Gulf of Darien. In 1508 he obtained a royal grant to colonize and govern the region called Nueva Andalucía, corresponding to the northern coast of Colombia from Cape Vela to the Gulf of Darien. Nicuesa received a similar grant of the Darien region. The two governors fitted out expeditions at Santo Domingo, and Ojeda sailed in Nov., 1509, with 400 men. At Cartagena Bay he landed with part of his force to capture Indians for slaves. The Indians, after their first surprise, gathered in great numbers, attacked the Spaniards, and killed all except Ojeda and one other, who escaped by concealing themselves in the swamps; they were rescued, when nearly dead, by a party sent from the ships. Ojeda then sailed to the eastern side of the Gulf of Darien, where he founded the colony of San Sebastian; but his reckless treatment of the Indians provoked their hostility, and the Spaniards were forced to keep within the fortifications, where they suffered terribly from hunger. Ojeda himself was severely wounded by a poisoned arrow. He at length left the colony in charge of Francisco Pizarro, and sailed away to seek re-enforcements; but, after being shipwrecked on Cuba, he finally reached Santo Domingo, with fortunes completely broken. Unable to secure aid for his colony, he died at Santo Domingo in complete poverty about 1514. For the subsequent history of the colony, see DARIEN.

HERBERT H. SMITH.

Ojibwas: See ALGONQUIAN INDIANS.

O'ka: a river of Central Russia and the chief affluent of the Volga. It rises in the government of Orel, becomes navi-



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Longitude D West from Washington 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180

gable at the city of Orel, and joins the Volga at Nijn-Novgorod, after a course of 837 miles. As it runs through some of the most fertile and densely peopled regions of Russia, it is of great importance as a commercial highway.

Okaw River: See KASKASKIA.

Okayama, *ô-kâ-yâ-mâ-mâ*: a town and prefecture in the province of Bizen, Central Japan; situated on the northern shore of the inland sea, and connected by rail with Hiogo and the East (see map of Japan, ref. 6-B). It is an important mission-station. Pop. of the town, 32,989. J. M. D.

Okecho'bee, Lake: the largest lake in the Southern U. S. It lies in Southern Florida: is 40 miles long, has an area of about 1,250 sq. miles, and is only 12 feet in maximum depth. It contains but few fishes. It receives several streams, of which Kissimmee river is the most important. A large part of the lake is grown up with grass and weeds. Its waters are discharged through the Everglades mainly by the Caloosa river. Nearly all the shores of the lake are impenetrable, swampy jungle, and the lake itself is nearly inaccessible. It contains a few low islands. It has been partially drained.

Okefenokee Swamp: one of the largest swamps of the U. S.; covers an area of about 500,000 acres, in Charlton, Ware, and Clinch cos., Ga., and Baker co., Fla. It is about 40 miles N. and S. by 30 E. and W. The eastern part is mostly an open lake dotted with small floating islands. The lake portion is 12 miles in width. This swamp has forests of heavy timber, and is the abode of countless rattlesnakes, moccasins, and alligators, besides many species of game-birds.

O'ken (originally *Ockenfuss*), LORENZ: naturalist; b. at Bohlsbach, Baden, Aug. 1, 1779; studied medicine and natural science at Würzburg and Göttingen, and was appointed Professor of Medicine at Jena in 1807 and of Natural Science in 1812. In 1816 he began the publication of *Isis*, a periodical of a miscellaneous character, though chiefly devoted to natural history and philosophy. Some political criticisms which it contained gave the Government an opportunity of interfering, and in 1819 Oken resigned his office and lived as a private teacher till 1828, when he received a professorship at Munich. In 1832 he removed to a similar position in Zürich, where he died Aug. 11, 1851. His principal works are *Lehrbuch der Naturphilosophie* (1808-11; Eng. trans. by Dr. Tulk, London, 1847); *Lehrbuch der Naturgeschichte* (1813-27); *Die Zeugung* (1805); *Ueber die Bedeutung der Schädelknochen* (1806), etc. As a pupil of Schelling, the general character of Oken's works has not been acceptable to naturalists, speculation having been cultivated too much at the expense of observation, and his hypotheses now exist chiefly as a warning against "transcendental" excesses. Even the hypothesis of the vertebral composition of the skull, which he developed, after but independently of Goethe, has now little acceptance.

Okhotsk' Province of Siberia: See MARITIME PROVINCE.

Okhotsk, Sea of: a large inlet of the Pacific Ocean on the eastern shore of Asia, between the island of Saghalin, Siberia, Kamchatka, and the Kurile islands. Its northern part is frozen from November to April.

Oklaho'ma: one of the Territories of the U. S. of North America (South Central group); organized May 2, 1890; capital, Guthrie.

Location and Area.—It lies between 31 and 37° N. lat. and 96° and 103° W. lon.; is bounded N. by Kansas and Colorado, E. by Indian Territory, S. by Indian Territory and Texas, W. by Texas and New Mexico. Area, 39,030 sq. miles, of which 200 sq. miles are water surface.

Physical Features.—The greater part of Oklahoma is an upland prairie, rising gradually toward the N. and W. The Wichita Mountains in the S. are the principal elevations. The Cimarron and Canadian rivers, important tributaries of the Arkansas, with a general course from N. W. to S. E., water the northern and central portions, while the Red river forms a part of the southern boundary, and its two forks, with numerous smaller feeders drain the southwestern portion.

Soil and Productions.—The soil in general is similar to that on the same meridians in Texas and Kansas, and is adapted to the cultivation of almost every kind of plant. Wheat has averaged 20 bush. to the acre throughout Oklahoma, with maximum production in places of 62 bush., and corn and oats have averaged 40 bush. to the acre. Cotton yields an average of 500 lb. to the acre. Horticulture

thrives in every section, the more hilly portions being especially adapted to apples and grapes. The woodlands contain walnut, oak, hickory, pecan, and other trees common to the latitude. In 1893 the farm lands under cultivation comprised 2,372,482 acres, and with buildings and implements were valued at \$13,363,106. The corn area was 284,254 acres; wheat, 222,310; oats, 109,374; cotton, 21,311; sorghum, 18,755; Hungarian millet, 14,121; potatoes, 6,890; and vineries, 8,059. The farm animals on Jan. 1, 1894, comprised 29,515 horses, value \$1,165,843; 5,427 mules, value \$263,210; 20,275 milch cows, value \$364,950; 121,219 oxen and other cattle, value \$1,878,895; 18,222 sheep, value \$38,266; and 24,158 swine, value \$126,830. The minerals so far as known comprise gold, silver, coal, iron, salt, gypsum, asphaltum, petroleum, building-stones, and flagging-stones. A number of building-stone quarries have been worked profitably, but no extensive mining operations have been undertaken.

Climate.—The climate of Oklahoma is so equable that the staple products of both North and South can be cultivated with profit by the farmer. The average annual temperature is 58° F. The mean annual rainfall is about 35 inches.

Divisions.—For administrative purposes Oklahoma is (1894) divided into twenty-three counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1890.	Pop. 1894.	COUNTY-TOWNS.	Pop. 1890.
Beaver	5-G	2,674	2,846	Beaver	
Blaine	3-C	None.	5,890	Verdugo	
Canadian	3-C	7,108	15,890	El Reno	285
Cleveland	3-D	6,905	12,716	Norman	787
Comanche	2-B	None.	1,040	Tulaga	
Day	2-B	None.	215	Board	
DeWitt	2-B	None.	2,712	Atopah	
Kingfisher	2-C	8,332	15,155	Kingfisher	1,134
Grant	1-D	None.	11,022	Edmond	
Lincoln	3-E	None.	14,754	Chandler	
Logan	2-D	12,710	19,532	Guthrie	2,788
Woods	1-C	None.	16,000	Alva	
Woodward	2-B	None.	9,241	Woodward	
Garfield	2-D	None.	11,394	Enid	
Oklahoma	3-D	115,42	26,525	Oklahoma	4,151
Noble	2-D	None.	7,570	Perla	
Payne	2-E	7,215	13,407	Stilwell	480
Pottawatomie	4-E	None.	12,375	Tocumson	
Pawnee	2-E	None.	8,615	Pawnee	
Roger Mills	3-B	None.	1,023	Cheyenne	
Greer	4-B	5,338	5,338		
Washita	3-B	None.	1,000	Cloud Chief	
Totals		61,834	219,779		

* Reference for location of counties, see map of Oklahoma.

+ Governor's report. † Formed since 1890 census.

‡ Claimed by Texas.

Principal Cities and Towns, with Population for 1894.—Oklahoma, 4,151; Guthrie, 2,788; East Guthrie, 2,141; Kingfisher, 1,134; Norman, 787; Stillwater, 480; West Guthrie, 404; Frisco, 327; Edmond, 294; El Reno, 285; Reno, 234; Lexington, 223; and Maugum, 202.

Population and Races.—1890, including inhabitants of Greer County, which was claimed by Texas, 61,834 (native, 59,094; foreign, 2,740; males, 34,733; females, 27,101; white, 58,826; colored, 3,008, including 2,973 persons of African descent, 25 Chinese, and 10 civilized Indians).

Industries and Business Interests. Though Oklahoma was organized as a Territory on May 2, 1890, the census returns show that on June 1 following 72 manufacturing establishments reported. These had a combined capital of \$95,519, employed 195 persons, paid \$71,918 for wages and \$56,518 for materials, and had products valued at \$180,445.

Finance.—In 1894 the assessed valuations aggregated \$19,947,818.38, Oklahoma, Logan, Kingfisher, Canadian, Cleveland, and Payne Counties having the largest in their order. A number of the counties had issued bonds for public purposes.

Banking.—In July, 1894, there were 6 national banks, each with capital of \$50,000, 19 State banks, 17 private banks, 4 incorporated banks, and 4 miscellaneous banks—in all, 50; and a loan and trust company.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 280 post-offices, of which 7 were presidential (2 second-class, 5 third-class) and 273 fourth-class, with 48 money-order offices and 2 postal-note offices. Of newspapers and periodicals, there were 10 daily, 1 semi-weekly, 73 weekly, 1 semi-monthly, and 5 monthly publications; total, 90.

Means of Communication.—The Atchison, Topeka and Santa Fé Railroad had in 1894 a main track of 117.68 miles and side track of 15.50 miles within the Territory, across K. P. Logan, Oklahoma, and Cleveland Counties; and 116.30 miles of main track and 8.08 miles side track across M. N. and Day Counties. The Chicago, Rock Island and Pacific Railroad had 116.86 miles of main track and 7.73 miles of side track. It extends S. from Caldwell, Kan., and crosses the Cherokee Strip, Kingfisher, and Canadian Counties, into the Chickasaw country. The Choctaw Coal and Railway Company connects Oklahoma with the coal-fields of the Choctaw Nation, and had 31.40 miles of main track.

Churches.—In 1893 the Roman Catholic Church had 25 organizations, with a reported membership of 10,000; the Methodist Episcopal Church North, 165 organizations, 2,136 members; the Baptists, 25 organizations, 800 members; the Presbyterian Church, 24 organizations, 750 members; the Congregationalists, 24 organizations, 616 members; and the Protestant Episcopal Church, 6 organizations, 166 members. There were 50 organizations of the Young People's Society of Christian Endeavor, with 1,000 members.

Schools.—The school population of Oklahoma in 1894 was 74,384. Besides direct taxes the school districts receive the proceeds of fines in criminal cases, and also moneys arising from the rental of lands set apart for educational purposes. The Legislature has established a university at Norman, a normal school at Edmond, and an agricultural and mechanical college at Stillwater. The thirteenth section of the former Cherokee Outlet has been reserved for the benefit of these institutions.

History.—Oklahoma (beautiful land) is a part of the Louisiana purchase of 1803, and of the tract set apart for Indian tribes by act of Congress June 30, 1834. Patents granted to the "five civilized tribes" covered materially all the lands in Indian Territory. By a treaty in 1866 the western half of the Creek territory, containing 3,402,450 acres, was ceded to the U. S. for settlement of other civilized Indians and freedmen, the Government to pay 30 cents an acre. The Seminoles at the same time ceded their tract of over 2,000,000 acres at 15 cents an acre, purchasing 200,000 acres of the Creek cession. Remnants of seven tribes were located by the Government on the ceded lands, but a large portion remained unoccupied. In 1879 schemes were projected by speculators for taking possession of these unoccupied lands. Parties of settlers entered the Territory with the intention of obtaining homes. President Hayes issued proclamations forbidding such movements, and ordering the ejection of all intruders. Many of the invaders were arrested and expelled from the Territory, but new expeditions were started. Colonization companies were formed, and lands guaranteed to members. This state of things continued till 1887. Legislation then began to be discussed in Congress looking toward the formation of a new Territory in the coveted region. The first bill for territorial organization passed the House, but was lost in the Senate. Meanwhile the Creeks and Seminoles were induced to enter into an agreement for the complete cession and release of their lands provisionally ceded in 1866. The Government paid for these cessions \$4,193,799, receiving an aggregate of 5,439,865 acres. President Harrison's proclamation opened the unoccupied portion to settlement Apr. 22, 1889. A military force equal to a regiment of cavalry and more than a regiment of infantry was employed to keep out intruders until noon of the designated day, and to preserve order among the throngs of expectant settlers. Two land-offices were opened and a U. S. court established. More than 50,000 persons entered the Territory on the first day. During the afternoon of that day a bank was opened at Guthrie with a capital of \$50,000. Four months later the town of Guthrie had four daily newspapers, water-works, street-car and electric-light companies, and six banks. For the first year the settlers had no organized government, but early in 1890 a law was passed by Congress and signed by the President creating Oklahoma Territory. The Territory was made to include the lands ceded by the Creeks and Seminoles, together with the Public Land Strip, or No-Man's Land. The Cherokee Strip was to be added to the Territory whenever the Indian title should be extinguished, without further legislation. The district known as Greer County was claimed by Texas, and provision was made for the judicial determination of the title. Further cessions were made by the Sac and Fox, Pottawatomie, Shawnee, Cheyenne, and Arapahoe Indians, and as a result nearly 300,000 acres of land

formerly held by these Indians was opened to white settlers during 1891. In Sept., 1893, the Government having perfected its title to the Cherokee Strip by treaty and purchase, this entire tract, consisting of some 6,000,000 acres of land, was opened to settlement by the President's proclamation. The scenes at the first settlement of Oklahoma, in 1889, were repeated. It was estimated that 90,000 people struggled to possess themselves of a title to the soil. Much suffering resulted from lack of water and provisions. The incorporation of the Strip makes the southern boundary of Kansas the northern boundary of the Territory.

GOVERNORS OF OKLAHOMA.

George W. Steele.....	1890-92
Abraham J. Seay.....	1892-93
William C. Renfrow.....	1893-97

Revised by WILLIAM C. RENFROW.

Oklahoma City: city (settled Apr. 22, 1889); capital of Oklahoma co., Okl. (for location, see map of Oklahoma, ref. 3-D); on the North Canadian river, and the Atch., Top. and Santa Fé Railroad; 25 miles S. of Guthrie. The river has a fall of 27 feet in 4 miles, and the power thus obtained has been brought into the city for manufacturing purposes by means of a canal. The city is the largest cotton-market in Oklahoma; contains flour-mills, cotton-gins, brick-yards, packing-houses, and several hotels; and has a large trade in agricultural products and lumber. There are 3 national banks and 2 daily and 4 weekly newspapers. Pop. (1890) 4,151.

EDITOR OF "GAZETTE."

Okra: See GUMBO.

Ok'ubo. TOSHIMICHI: statesman; b. in the province of Satsuma, Japan, about 1830 A. D. Trained under the able lord of Satsuma, who died in 1858, he early directed all his energies to the overthrow of the Tokugawa shogunate or *bakufu*, whose most determined enemies were found in the Satsuma clan, and Okubo became their leading spirit. Their ideal was the restoration of the imperial power as it existed before 1200 A. D., and this change was effected in 1868 by means of Western appliances. From 1870-78 Okubo was the most powerful minister in the imperial cabinet. He went on a special mission to China in 1874, and successfully settled the Formosan difficulty. Later, Saigo Takamori separated from him and raised a revolt in Satsuma; but the suppression of this rebellion in 1877 left Okubo's policy triumphant. On May 14, 1878, when on his way to the palace in Akasaka, Tokio, he was murdered by six braves belonging to the party of the deceased Saigo. A handsome monument has been erected on the spot. Okubo was a prominent member of the Iwakura embassy which visited Washington in 1872.

J. M. DIXON.

Ok'uma. SHIGENOBU: statesman and financier; b. in the province of Kiushiu, Hizen, Japan, in 1837. He studied Dutch at Nagasaki, and also English; after the restoration entered the Foreign Office, and became a councilor of state in 1870, with charge of the Finance Department. For the next twelve years he directed the finances of Japan, but the depreciation of the fiat currency and other circumstances led to his removal. In 1882 was organized the Kaishinto, or constitutional-liberal party, of which he is the acknowledged leader; it seeks the overthrow of clan rule, and the subordination of cabinets to the parliament. In Oct., 1889, Okuma, who had returned to office as Minister for Foreign Affairs, was attacked by an assassin, and had his leg blown off by a dynamite bomb. Okuma's liberal schemes for a revision of the existing treaties fell through, and he resigned office in Nov., 1891. He founded a college in Tokio—the Semmon-Gakko—largely devoted to the study of political economy.

J. M. DIXON.

Olaf. SAINT: the patron saint of Norway; b. about 995; King of Norway 1015-28; a son of Harald Gränske, a grandson of Harald the Fair-haired; commanded a Viking fleet when twelve years old, and was one of the most famous and most dreaded sea-kings of the North before he was nineteen. In 1014 he returned from a pillaging jaunt along the coasts of France and Spain, and installed himself in his patrimony, the throne of Norway. He now set about introducing Christianity among his countrymen, but his measures were so severe and violent that the Norwegians rose in rebellion against him, and when, in 1028, Knud (Canute) the Great, King of Denmark and England, who laid claim to Norway, landed with an army near Throndhjem, then called Nidaros, Olaf was compelled to flee to Russia. Two years afterward

he returned with aid from Russia and Sweden, and gave battle at Stiklestad, near Thronthjem, July 29, 1030, but his army was routed, and he himself slain and buried on the spot. Subsequently, when Norway became thoroughly Christianized, his body was taken to the cathedral of Thronthjem and enshrined behind the high altar. Great miracles were reported; crowds of pilgrims journeyed to his shrine; legends and folk-lore gathered around his name; and in the following century he was solemnly canonized and declared the patron saint of the country. On Aug. 21, 1847, King Oscar I. instituted the order of St. Olaf. See NORWAY.

Revised by R. B. ANDERSON.

Olaf Trygvason: King of Norway 985-1000; b. in 964; great-grandson of Harald Haarfager, and a son of Trygve (Old Norse, *Tryggvi*), who was viceroy in Southeastern Norway, and who was assassinated by Gudröd, son of Erik Bloodaxe. The widow of Trygve and her son fled through Sweden to Russia. The stories of his experiences in Russia and of his Viking expeditions in Baltic and British waters are so full of miracles and romance that it is difficult to sift the wheat from the chaff. Meanwhile it is certain that the young man became celebrated as the greatest hero and athlete of his time. He plundered in England with the Danish king Svend, but made peace with King Ethelred in 994, accepted the Christian faith, and was baptized, King Ethelred himself being his god-father. Olaf promised never again to attack England, and the following summer (995) he returned to Norway. He arrived there in the most opportune moment, the ruler, Hakon Jarl, having just been driven from his throne and murdered by this thrall. Olaf found no trouble in getting possession of the crown. He devoted all his time and strength to the introduction of Christianity, but his methods were too severe and the cause made but little progress. He founded Nidaros (now Thronthjem), and made it the capital of the kingdom. He also sent Christian missionaries to the Orkneys, Faeroes, Iceland, and to Greenland. Leif Erikson, who discovered Vinland (see VINLAND), was the missionary he sent to Greenland. Finally he organized an expedition against the Wends (in Pomerania) to secure some possessions belonging to his queen, Thyra, a sister of Svend Forkbeard of Denmark. At the same time an alliance was formed against him by the Danish king Svend, the Swedish king Olaf, and the banished Norwegian Jarl Erik Hakonson. The allied forces attacked Olaf near Svolder (an island near Rügen in the Baltic), and after one of the fiercest naval engagements known in old Norse history he fell Sept. 9 in the year 1000. Olaf Trygvason is the most conspicuous figure in old Norse history, and he is the subject of many a song and story. See NORWAY.

RASMUS B. ANDERSON.

Olathe: city; capital of Johnson co., Kan. (for location, see map of Kansas, ref. 5-K); on the Missouri river, and the Atch., Top. and Santa Fé and the Kans. City, Ft. Scott and Memphis Railways; 22 miles S. W. of Kansas City, Mo. It is in an agricultural region; contains an academy, the Kansas Institution for the Education of the Deaf and Dumb, a commercial college, 2 libraries, a national bank, State bank, and private bank, and 5 weekly newspapers; and has flour-mills, canning-factory, and a number of wood-working establishments. Pop. (1880) 2,285; (1890) 3,294; (1895) 3,456.

EDITOR OF "HERALD."

Olbers, HEINRICH WILHELM MATHIAS: astronomer; b. at Bergen, near Bremen, Oct. 11, 1758; studied medicine at Göttingen, and practiced as a physician at Bremen, where he died Mar. 2, 1840. His leisure hours he gave to the study of astronomy, especially comets. He invented a new method of calculating the orbits of comets from three observations, which proved easier and more accurate than the old one; and his calculations and observations of comets, collected and published in the *Astronomisches Jahrbuch* in 1782-1820 and 1833, enjoy a great reputation. Of the planets between Mars and Jupiter, which were eagerly sought after by the astronomers in the beginning of the nineteenth century, he discovered two—Pallas, Mar. 28, 1802, and Vesta, Mar. 29, 1807.

Old Age, Diseases of: The natural history of the bodies of animals, in common with that of all living beings, includes the following stages: First, the embryonic stage; second, that of infancy; third, that of adolescence; fourth, that of adult life or maturity; fifth, that of old age (senescence) or decline, which is terminated at death. Each of these stages is marked by physiological conditions differing in the main from those of other stages. In man, it is well known that

the physiological activity of infancy and adolescence is in marked contrast to the physiological deliberateness (we may say) of adult life and the physiological inactivity of old age. Likewise there are certain diseases that are very common in early life, but practically unknown in old age; so also in old age certain disorders are more likely to occur than at other times of life. Conditions which predispose to these diseases are, in general, the physical inability to perform movements and exercises which in earlier life are not only easy but usually pleasant; the inactivity of the muscles of the internal organs, such as the intestines or the bladder; and the rigidity of the blood-vessels, which opposes an obstacle to the motion of the blood propelled by a heart which does its work less actively than formerly; and the increasing fragility of these blood-vessels. In addition to this, every tissue in the body of an old person differs from similar tissues in the young just as surely as an old leaf differs from a newly developed one. This difference can be seen to a certain extent in the microscope, but beyond this, changes which elude sight and chemical analysis mark the old tissues, and are clearly evinced by the functional inactivity of these tissues. They are the occasion of accidents and diseases to which the old are more liable than the young. Among the diseases of old age we can not properly class those changes in the hair and the scalp which make one gray and the other bald, nor perhaps that common alteration of the skin known technically as vitiligo (leucoma), which consists in the disappearance of the pigment matter from beneath the cuticle in certain places, so that there are patches lighter in color than the general hue of the skin; but there is a special tendency in the old to the formation of small collections in the skin, due to the stopping up of the sebaceous follicles and the suppression, to a certain extent, of the function of perspiration; and they are often sufferers from erysipelas and carbuncles.

In the eyes, the development of far-sightedness (presbyopia) can not be considered a disease, but the formation of cataracts (opacities of the crystalline lens) can.

In the ears, the dull hearing is physiological, and the disposition to the accumulation of wax (cerumen) in the external auditory canal comes in the same category.

In the muscular system, the changes of old age consist in weakening of the muscle fibers and disappearance of the fat which normally surrounds them, resulting in leanness, which is a familiar feature of advanced age. In what may be called early old age there is sometimes a development of abnormal quantities of fat beneath the skin and among the muscles, but if persons with this development live long they almost invariably lose their fat and present the normal picture of senility. The muscular system of old persons is not more subject to disease than that of adults.

The bones of the old undergo an alteration of the proportions of their animal matter (organized matter) compared to their mineral ingredients (unorganized matter). The former is reduced in relative quantity, the latter is increased. As a consequence, the bones are more brittle and more liable to fracture. An example of fracture caused by trifling violence is seen in that of the neck of the thigh-bone (femur). This part of the bone may be broken by a wrench occasioned by tripping upon a carpet, or even by the weight of the body alone—what is known as "spontaneous" fracture. Connected with these changes in the bones there is often stiffness in the joints, due partly to alteration in the membrane covering the ends of the bones which make up the joint, partly to diminished secretion of the lubricating fluid (synovia) of the joint, and partly to the weakness of the muscles.

More serious troubles than those of the parts already mentioned occur in the internal organs of old persons. The circulatory apparatus undergoes changes, which—if not in themselves pathological—predispose to accident and disease. The tissues composing the walls of the heart and blood-vessels, as age advances, lose their elasticity and contractile force by the substitution of fat for muscle-cells, and eventually the deposit of calcareous salts. Fatty degeneration of the heart, with the deposit of various salts immediately under the thin lining membrane (endothelium) of the heart and arteries, weakens the heart, and may be followed by dilatations of its walls or of the walls of the arteries, resulting in the latter case in aneurisms. Further, fragments of such deposits on the valves of the heart and of the aorta may become detached and be carried forward in the circulation (embolism) until they lodge in some vessel too small to permit their further progress, and by blocking it up cut off the circulation of a certain area in the brain or lungs or

some other portion of the body (infarct). When fatty or calcareous degeneration occurs in the nutrient arteries of the heart (coronary arteries) the result may be what is known as angina pectoris, or some other form of disease, which in time is surely fatal. When an embolus lodges in the brain and becomes an infarct, the result is disturbance of that part of the brain; and this may go so far as to cause paralysis of the portion of the body over which it presides. In the lungs an infarct is likely to cause pneumonia. In the kidney an infarct causes also destruction of a certain portion of its working tissue. An infarct occurring in a toe is a common cause of what is called senile gangrene. The changes in the circulatory apparatus of old persons sometimes leads to unusual distension of the blood-vessels (plethora) or to dropsy caused by the leakage of their contents through their impaired walls.

The respiratory apparatus of old persons is especially liable to injury and disease. This is seen in the development of asthma, which may be considered here, although it is often regarded as a disease belonging to the nervous system and only showing its effects in the lungs. A very common cause of asthma is the development of emphysema, which is a dilatation of the air-cells (alveoli) that, like the leaves on a tree, are found at the ends of the minutest ramifications of the bronchial tubes. The lining membrane of the bronchial tubes is especially prone to disease in old persons, who suffer often and severely with bronchitis, and in whom this disease is almost as dangerous as it is in little children, whose bronchial tubes are so small that they are easily blocked up by an excess of their normal secretion. In advancing age there is a tendency to the development of consumption (phthisis), which finds its largest number of victims before the age of thirty years, and then diminishes in frequency until about the age of fifty years, when persons with weak lungs pass through a second period of danger.

The disorders of the digestive apparatus in old persons are to a certain extent connected with the loss of their teeth and the imperfect activity of their salivary glands. Partly on this account and partly because of the growing old of the mucous membrane of the stomach, indigestion is very frequently found in the old. The liver, which is part of the digestive apparatus and a most important organ in producing regular evacuations of the bowels, undergoes senile changes which sometimes result in jaundice, and frequently in constipation or in actual obstruction of the bowels, the former impairing the health and the latter being very dangerous to life. These changes sometimes lead to dropsy, because they constrict the large (portal) vein which brings back to the heart the blood from the abdominal viscera.

After middle life and in old age the kidneys often undergo changes, consisting in alterations of their structure caused by gout (gouty kidney), which are like those of the form of kidney disease called Bright's disease. In old age albumin or sugar may be excreted by the kidney to such an extent as to constitute a true albuminuria, or a diabetes mellitus. In some cases dropsy may occur. The old, like the very young, are liable to the discharge of small concretions from the kidney—what is called gravel. Such concretions, remaining in the kidney of the old, may cause the formation of stones (calculi), and these in turn may give rise to an inflammation accompanied by the formation of matter (pus), constituting what is known as pyelitis. In the old, and especially in men, the urinary bladder is frequently the seat of disease. Owing to the weakness of the muscles in its wall, there is often in the old an inability to properly evacuate this organ, leading sometimes to accumulation of its contents (technically called "retention"), which may result in partial paralysis of the organ and dribbling away of its contents, which deceives the sufferer into the notion that the organ must surely be empty. This involuntary evacuation sometimes depends upon a weakness in the circular muscular fibers at the neck of the bladder, and is then called "incontinence." In old men the prostate gland, which is situated close to the neck of the bladder, sometimes grows to such a size as to furnish a mechanical obstacle to the proper evacuation of the bladder. In such cases, and in others in which the bladder is not properly emptied, there often develops an inflammation of the bladder (cystitis), which may occasion very serious difficulty and even death. This inflammation is sometimes propagated along the tubes which lead from the kidneys to the bladder (ureters), and sets up what has been mentioned above as pyelitis.

The brain and nervous system in the old are peculiarly liable to functional and organic disorders. Vertigo is only

a manifestation of a defect in the circulation within the brain. Stoppage of the circulation by an infarct may cause a passing disturbance or a paralysis which leads to death. The breaking of a blood-vessel in the brain, with the pouring out of blood into the general tissue of the brain, constitutes what is called apoplexy. There is also another form of apoplexy called serous, in which there is an internal dropsy caused by the passing of the watery parts of the blood through the thinned walls of the blood-vessels. In the old, palsy with its tremblings is frequently seen, and changes which elude detection by the microscope give rise to what is called senile dementia.

The constitutional diseases to which the old are especially liable are gout and rheumatism. To mention the many disturbances which may depend upon these diseases would require much more space than can here be given to the subject, and those who wish information on these points may consult articles under these titles.

Protection against the diseases of old age is best secured by attention to the general principles of health. The old should be well housed, well clothed, with especial care to protect their extremities; they should rest, and avoid strains of body or mind as far as possible. Moderate exercise is healthful; but it should be remembered that rest, and not activity, is the normal state of the old. In eating and drinking, the old should exercise temperance, as suggested by nature. The comparative inactivity of the body in old age is accompanied by a comparatively limited demand for food, and this should be taken at rather longer intervals than is common in the more active stages of life. Speaking from the physiological standpoint, the use of spirits should be regulated by the custom of each individual. Those unused to wine have no need for it when older; those accustomed to it may usually continue its use in moderation.

CHARLES W. DULLES.

Old'castle, Sir JOHN, Baron Cobham, popularly known as "the good Lord Cobham": religious reformer; b. in England about the middle of the fourteenth century; fought with credit in the French wars; obtained by marriage the title of baron; was an early convert to the doctrines of Wycliffe; took part with John of Gaunt, Duke of Lancaster, in his efforts to promote ecclesiastical reform, presenting a remonstrance on the subject in Parliament, entitled *Twelve Conclusions addressed to the Parliament of England*; wrote a number of discourses and satirical verses; declared the pope to be Antichrist; consequently was accused of heresy, and thrown into the Tower in the first year of Henry V. (1413); escaped to Scotland, and thence into Wales; was falsely accused of raising an army of 20,000 Lollards to overthrow the king; thereupon was outlawed by Parliament and a price set on his head. He was captured in Wales, was hung in chains alive upon a gallows, and burned to death by a slow fire at St. Giles's Fields, London, Dec. 25, 1417. See *his Life*, by Gilpin (1808).

Old Catholics: a body of seceders from the Roman Catholic Church. The movement dates from a protest against the papal infallibility decree of the Vatican Council in 1870 as being contrary to history and conscience. Dr. DÖLLINGER (*q. v.*), who had done more than any one else to incite to rebellion against the Vatican decrees, in an open letter to the Archbishop of Munich (formerly his pupil), declared (Mar. 28, 1871) that "as a Christian, as a theologian, as an historian, and as a citizen, he could not accept the Vatican decrees"; whereupon he was excommunicated Apr. 17, 1871, as being guilty of "the crime of open and formal heresy." His colleague, Prof. Friedrich, incurred the same fate. The latter became an Old Catholic, but Döllinger did not follow. The movement spread with considerable rapidity in Germany and Switzerland. It professed to retain the whole Catholic system, with the exception only of the Vatican decrees, which were regarded as dangerous innovations. It never identified itself with Protestantism in any form; but it is regarded by the Roman Catholic Church as neo-Protestant, since it denies her authority, rejects her specific doctrines, and affiliates with many religious bodies considered by her outside the pale of the true faith. It was formally organized in 1873 by the election of Prof. Joseph Hubert Reinkens as bishop. He was consecrated by the Jansenist bishop Heykamp at Rotterdam Aug. 11, 1873, and recognized in this new dignity by the Prussian Government. He resides at Bonn on the Rhine. The Old Catholics, or "Christian Catholics," of Switzerland elected Edward Herzog, formerly a priest at Olten, their bishop. He was consecrated by Bishop

Reinkens at Rheinfelden, Sept. 18, 1876, and resides at Berne. In 1880 he visited the U. S. as a guest of the General Convention of the Protestant Episcopal Church then in session at New York. The Old Catholics are most in sympathy with the Episcopal Church of England and the U. S., but still retain the mass and most of the doctrines and ceremonies of the Roman Church. The question of clerical celibacy nearly created a split among them. They have a theological faculty at Bonn and one at Berne. The movement now extends beyond Germany and Switzerland, but Pire Hyacinthe, the eloquent ex-prior of Notre-Dame, who has a small congregation of admiring followers in Paris, has recently declared himself an Old Catholic. The Old Catholics of Germany and Switzerland held a second international congress at Lure near Sept. 13-15, 1892, at which they resolved to publish an international theological quarterly review, to be edited by Prof. Michaud, of Berne. The Old Catholic congregation in Bonn is the most flourishing, though not very large, and celebrated in 1892 its twentieth anniversary, at which Bishop Reinkens and Prof. von Schulte delivered addresses. The movement seems to have almost spent itself. For the Old Catholic side, see Joh. Friedr. von Schulte, *Die Alt-katholischen Kirchen in Deutschland*, etc. (Gießen, 1887); Fr. Nippold, *Neuere Kirchengeschichte* (Berlin, 1900); *Proceedings of the Second International Old Catholic Congress* (Lancaster, 1893); *Revue internationale de théologie*, edited by E. Michaud. For a résumé of the Roman Catholic view of this schism, see Hergenroether, *Kirchengeschichte* (vol. iii., pp. 979-984).

PHILIP SCHULT.

Oldenburg, ől'den-boorch: grand duchy of North Germany. It consists of three distinct parts, viz.: Oldenburg proper, bordering N. on the German Ocean and surrounded on the other sides by Hanover; the principality of Lubeck, wholly inclosed by Holstein, the Baltic, and territory of the free city of Lubeck; and the principality of Birkenfeld, situated in Rhenish Prussia. Total area, 2,508 sq. miles. Pop. (1890) 354,963. Oldenburg proper is low and flat; large dikes have been erected along the shores of the ocean and the rivers Weser and Jahde. The soil is partly marshy, partly sandy, in some places covered with extensive forests, in others with heath. Agriculture and cattle-breeding are the chief occupations; of manufactures there are none. Oldenburg was established as an independent state, ruled by a count, at the end of the eleventh century. The family that established its power then has ruled ever since, giving, moreover, new dynasties to Russia, Denmark, and Sweden. In 1773 Oldenburg was made a duchy, and in 1815 a grand duchy. A constitution was given to the grand duchy Feb. 18, 1849, which, revised by a decree of Nov. 22, 1852, granted liberty of the press, trial by jury, and equality of all citizens in political and social matters. The legislative power is exercised by a *Landtag* or diet; the executive, by a responsible ministry under the grand duke.

Oldenburg: city of Germany; capital of the grand duchy of Oldenburg. It has several good educational institutions, museums, and scientific collections; a public library with 100,000 volumes, a fine ducal palace with beautiful gardens; two large and much-frequented cattle and horse fairs; and an active trade on the river Hunte, here navigable for small vessels. Pop. (1890) 21,646.

Old English: SEE ENGLISH LANGUAGE AND ENGLISH LITERATURE.

Old'ham: town: in the county of Lancashire, England; on the Medlock; 6 miles from Manchester (see map of England, ref. 7-G). In 1760 it consisted of only sixty houses, but the discovery of rich coal mines in its immediate vicinity occasioned the establishment of large cotton-factories, and soon it became one of the leading manufacturing towns of England. It has nearly 300 cotton-mills with over 12,000,000 spindles, which consume one-fifth of the total imports of cotton into England. Its other manufactures include velvets, silks, hats, cords, etc., besides great weaving-machine works. The parliamentary borough, which is larger than the municipal, returns two members. Pop. of former (1890) 146,716; of latter (1893) 136,469.

Oldha'mia [Mod. Lat., named from Dr. Oldham, late director of the Geological Survey of India]: a peculiar organism having a branching, plant-like form, thought by some to be a polyzoon, by others a vegetable; found in the Cambrian rocks of Ireland, and interesting as one of the first-known forms of life.

Old Light: SEE NEW LIGHT.

Old Man's Beard: SEE FRINGE-TREE.

Old Persian: SEE PERSIAN LANGUAGE.

Old Prussian Language: an extinct variety of the Lithuanian language. It was the language of the early inhabitants of the territory between the Deime, the Alle, and the Weichsel. Only the scantiest means of information concerning it have been handed down to us. This is attributable to the fact that the German orders, which in the thirteenth century had subdued the Prussians, after the bloody struggle forbade the use of the language, which was in consequence after the introduction of the Reformation into Prussia already so far repressed that even the kindly encouragement of Duke Albrecht, the first secular ruler of the province, could not avail to prevent its speedy extinction. From the period prior to the secularization of Prussia there is preserved but one record of the language, namely, the so-called *Elbing Vocabulary*, a manuscript dating from about 1400, which was, however, copied from an original belonging to the thirteenth century. This vocabulary contains 803 Prussian words with a German translation, and appears to have been prepared for the use of officials of the orders who acted as judges. The other sources of the Old Prussian are, with the exception of certain lesser materials and various names of places and persons, two translations differing in dialect of Luther's lesser catechism (Königsberg, 1545), and a translation of Luther's *Enchiridion* (Königsberg, 1561). These versions are unfortunately so imperfect and the orthography of the *Elbing Vocabulary* is so bad that all these texts yield little more than a caricature of the Old Prussian language, which was entirely extinct by the end of the seventeenth century. For the study of the Old Prussian we are limited almost exclusively to the works of G. H. F. Nesselmann: *Die Sprache der alten Preussen aus ihren Ueberresten erläutert* (Berlin, 1845); *Ein deutsch-preussisches Vocabularium* (Königsberg, 1868); *Thesaurus linguae prussicæ* (Berlin, 1873). These fail, however, to satisfy scientific needs. SEE LETTIC RACE. A. BEZZENBERGER.

Old Red Sandstone: an important geologic formation of Devonian age occurring in Scotland and Wales. The name was formerly applied also to one of the units of geologic chronology, but in that sense has been replaced by Devonian. This change accords with the general tendency in geologic nomenclature to avoid giving a chronologic meaning to petrographic terms, which can be actually descriptive only in restricted districts. The formation in Scotland has an estimated thickness of 6,000 to 20,000 feet, including shales, conglomerates, and volcanic tuffs, as well as the characteristic red sandstones. It is believed to have been laid down in inland lakes or seas, and is distinguished by its remarkable fish remains, which constitute a principal theme of Hugh Miller's classic works, *The Old Red Sandstone* and *Footprints of the Creator*. SEE DEVONIAN PERIOD, and Archibald Geikie's paper on *The Old Red Sandstone of Europe* in the *Transactions of the Royal Society of Edinburgh*, vol. xxviii. (1879). G. K. GILBERT.

Old-School Baptists: SEE ANTI-MISSION BAPTISTS.

Old Style: SEE CALENDAR.

Old Testament: SEE BIBLE.

Old Wife, or Old Squaw: a common name for the long-tailed duck (*Harelda glacialis*), an abundant and prettily marked species of the northern hemisphere generally, though most common along the coast. The breeding plumage is varied with black, white, and brown, and the two central tail-feathers of the male reach a length of 8 or 9 inches. For the fish of this name, see WRASSE. F. A. L.

Oleacin'idæ [Mod. Lat., from *Oleacina*, the name of one of the genera]: a family of terrestrial gasteropod molluscs of the order *Pulmonata*. The shell is spiral, and in most oblong and with a narrow aperture, but in some is depressed and heliciform, with a wide aperture. The family includes numerous species.

Olean: city (chartered 1893); Cattaraugus co., N. Y. (for location, see map of New York, ref. 6-(-); at the junction of the Allegheny river and Olean creek; on the Erie, the West. N. Y. and Pa., and the Cent. N. Y. and West. rail-ways; 69 miles E. S. E. of Buffalo. It is on the border of the largest hemlock lumber belt in the U. S., is close to the Pennsylvania oil-fields, and is the center of large lumber and tanning interests. It is also the eastern terminus of the Ohio pipe-line and the western terminus of a pipe-line

from the Pennsylvania oil-fields to the Atlantic seaboard, and contains one of the largest refineries of the Standard Oil Company, with immense storage tanks. There are 11 churches, 7 public-school buildings, public library, a commercial college, St. Mary's parochial school, 2 banks, 2 daily, a semi-weekly, 2 weekly, and 3 monthly periodicals, and a State armory. The city is lighted by electricity, and has natural gas for fuel and lighting, electric street-railway, 3 flour-mills, 4 foundries and machine-shops, railway-shops, 2 planing-mills, marble, glass, barrel, and lubricating works, and other industries. Pop. (1880) 3,036; (1890) 7,358; (1894) estimated with suburbs, 14,000. JAMES H. MCKEE.

Olean'der [Fr. *oléandre*; Ital. *oleandro*; Span. *elcandro*, under influence of *oleum* from Lat. **lorandrum*, itself a corruption, under influence of *laurus*, *lorus*, of *rhododendron* = Gr. *ροδοδενδρον*; *ρόδον*, rose + *δένδρον*, tree]: an evergreen shrub (*Nerium oleander*) of the family *Apocynaceae*, a native of warm parts of the Old World, and now extensively cultivated. In colder regions it thrives as an ornamental shrub, but requires protection from frost. Its flowers are usually of a rich-pale red, but are sometimes white. *N. odoratum*, the fragrant oleander, a native of India, is a more tender species, with sweet-scented flowers. The wood and all parts have a poisonous action resembling that of digitalis, best treated by a judicious use of stimulants.

Revised by L. H. BAILEY.

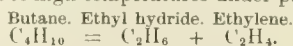
Olearos: See ANTIPAROS.

Oleas'ter [Lat., wild olive-tree, deriv. of *olea*, olive-tree]: a small tree (*Eleagnus angustifolia*) of the family *Eleagnaceae*, a native of warm regions in the Old World; is planted as an ornamental tree for its silvery foliage. Its flowers are exceedingly fragrant. Several other species of *Eleagnus* are cultivated for ornament, and one, the gumi of the Japanese (*E. longipes*), is now somewhat grown for the acid berries. L. H. B.

Ole Bull: See BULL, OLE BORNEMANN.

Olefiant Gas: See ETHYLENE.

O'lefines [deriv. of *olefiant*; Lat. *oleum*, oil + *-ficare*, make, produce]: hydrocarbons of the general formula C_nH_{2n} , homologous with ethylene, C_2H_4 , so called from their property of forming oily compounds with chlorine, like Dutch liquid, $C_2H_4Cl_2$. They are found among the products of destructive distillation, and may be formed by the exposure of paraffins to high temperatures under pressure; thus:



See ETHYLENE, HYDROCARBONS, and TAR.

O'leic Acid [*oleic* is from Lat. *oleum*, oil]: an acid (formula $C_{18}H_{34}O_2$), discovered in 1811 by Chevreul; the most important of the group of fatty acids of the general formula $C_nH_{2n-2}O_2$, set free by the saponification of olein, the fluid component of most oils and natural fats. It is obtained by treating olive oil, almond oil, or animal oils, by a caustic alkali, preferably by potash, decomposing the resulting soap by tartaric acid, and heating the fatty acid, after first washing it with water in the water-bath with half its weight of oxide of lead in fine powder for some hours. The oleate of lead, separated by ether and filtration from the stearate, is decomposed by dilute hydrochloric acid, and the ethereal solution of oleic acid is then separated from the acid-water, washed, and the ether distilled from it. Oleic acid is soluble in alcohol, and crystallizes from it on cooling in brilliant crystals which melt at 57° F. to a clear colorless oil. At 39° F. this fluid acid solidifies to a hard white crystalline mass, which expands as it cools. Oleic acid distills over unchanged in a vacuum, and is even soluble in strong sulphuric acid at ordinary temperatures without decomposition. It is without smell or taste when pure, and is insoluble in water. Alcohol and ether dissolve it in all proportions, and in solutions it reacts neutral. By air it is slowly oxidized at ordinary temperatures, but it rapidly absorbs oxygen when melted, becoming rancid both to smell and taste, and then develops a strong acid reaction. It dissolves the solid fats, and is itself dissolved by sodium chloride (as in bile), forming a soap with an acid reaction.

Very large quantities of crude and high-colored oleic acid are produced in the lime saponification of lard and tallow by Chevreul's method in the manufacture of stearin candles. The insoluble lime-soap formed in this process is decomposed by dilute sulphuric acid, and the cake of fatty acids which forms on the surface of the cooled mother-liquor holds the oleic acid entangled in the stearic and mar-

garic acids, from which it is in great part freed by filtration at 32° in the hydraulic press. This impure oleic acid, which is found in commerce under the name of *red oil*, yields pure oleic acid after separation from its lead-salt, after a second saponification with an alkali, and is salted out with sodium chloride mixed with sodium carbonate, by which means only can it be freed from the associated coloring-matters. At 66° F. the specific gravity of oleic acid is 0.898. Nitrous acid converts oleic acid into elaidic acid, an isomeric form of oleic acid, without forming a second decomposition product. Nitric acid acts on oleic acid with violence, evolving volatile acids of the general formula $C_nH_{2n}O_2$ —namely, acetic, butyric, propionic, caproic, etc.—and mixed acids of the general formula $C_nH_{2n-4}O_2$, such as suberic, pimelic, adipic, etc.; the number and proportion of these depending on the activity and duration of the reaction. With the metals oleic acid forms neutral oleates $M(C_{18}H_{33}O_2)$ or $M'(C_{18}H_{33}O_2)_2$, according to the equivalence of the metal. The neutral oleates of the alkali metals are soluble in water, and are not completely thrown down from solution, as are the stearates and palmitates, by the addition of another soluble salt. The acid oleates are liquid and insoluble in water. Absolute alcohol and ether dissolve the oleates in the cold, by which reaction they are distinguished and separable from the stearates and palmitates.

Revised by IRA REMSEN.

O'lein, or Ela'in [from Gr. *ἐλαιον*, oil]: that portion of oil or fat which remains liquid at ordinary temperatures; the oily principle of solid fats. It is of variable composition, but in all cases it consists of oleic acid, or of some acid homologous with the oleic, combined in various definite proportions with glycerin. Drying oils and volatile oils do not contain olein. The olein of commerce is chiefly a crude oleic acid prepared from palm oil in the British candle-factories. "Lard oil" is a similar product derived from lard in the U. S. Both are now chiefly used for oiling machinery. See OLEIC ACID.

Oleomargarine [Lat. *oleum*, oil + *margarine*]: See BUTTER, ARTIFICIAL; CHEESE, and MARGARINE.

Oler'iculture: that branch of horticulture which treats of the art and science of growing kitchen-garden vegetables. It is synonymous with the term vegetable-gardening. The strawberry is referred to olericulture in Europe, but in the U. S. to pomology; the melon to pomology in England, but in the U. S. to olericulture. *Truck-gardening*, or *trucking*, is a term applied to that style of vegetable-gardening which grows vegetables upon a somewhat large scale for strictly commercial purposes, in distinction from *farm-gardening* or *kitchen-gardening*, in which plants are grown for home use. *Market-gardening* is identical with *truck-gardening*, although the eleventh census of the U. S. separated them, using the latter term to designate the industry when "carried on in favored localities at a distance from market, water and rail transportation being necessary," while *market-gardening* is "conducted near local markets, the grower of vegetables using his own vehicle for transporting his products direct to either the retailer or consumer."

The truck-gardening interests of the U. S., as reported by the eleventh census, employed 534,440 acres of land in 1890. The most important trucking districts are the New England, the New York and Philadelphia, the peninsular, comprising the Delaware and Chesapeake peninsula, the Norfolk, the Southern Illinois, and the South Atlantic. The most notable single trucking center is Norfolk, Va., where light warm soil, the proximity of the Gulf Stream, and excellent water and rail transportation combine to afford the best natural conditions and economical market facilities. The truck-gardening interests of the U. S. have been greatly modified and extended by the introduction of simple and efficient forcing-houses. (See GREENHOUSE.) Such crops as tomatoes, cucumbers, radishes, lettuce, and others, are now grown with quite as much profit in winter as in summer. The largest acreage devoted to a single crop in the census year was 114,381 acres planted to watermelons; this was followed by 77,094 acres in cabbages, 56,162 in pease, and 37,970 in asparagus.

See Vilmorin-Andrieux's *Vegetable Garden* (English edition); Henderson's *Gardening for Profit*; Burr's *Field and Garden Vegetables of America*; Greiner's *How to Make the Garden Pay*. L. H. BAILEY.

Olga, SAINT: a patron saint of Russia, who in 903 became the wife of the Grand Duke Igor I. of Kieff. He was murdered 945, and Olga became regent in the name of their

son Sviatoslav. She punished the murderers cruelly and made a vigorous ruler. When Sviatoslav ended his minority (955) and ascended the throne, she retired to Constantinople, embraced Christianity and was baptized under the name of Helena. She returned to Russia, labored earnestly, but with indifferent success, to introduce Christianity—her son never accepted it—and died at Kieff in 969, aged about eighty years. Her day in the Russian calendar is July 11. See Castrenius, *Histoire de l'introduction du Christianisme sur le continent Russe, et la vie de Sainte Olga* (Paris, 1879). Revised by S. M. JACKSON.

Olib'anum [Late Lat., from Arab. *al*, the + *labān* (whence Gr. *λίβανος*, frankincense): a gum resin which exudes from the tree *Boswellia serrata*, which grows in Africa and India. It occurs in oblong or rounded laminae, opaque, of yellow or reddish color, dull and waxy on the fracture. It melts with difficulty and imperfectly when heated, and burns with a bright flame. It has a balsamic, resinous smell and an acrid bitter taste. Triturated with water, it forms a milky, imperfect solution. Alcohol dissolves nearly three-fourths of it. Braconnot (*Ann. Chim. Phys.* (2), lvi, 60) found 100 parts of it to yield 8 of volatile oil, 56 of resin, 30.8 of gum, and 5.2 of a glutinous body insoluble in water and alcohol, with some mineral matter. It is used for fumigation and in the preparation of plasters. It has been burned from antiquity in religious ceremonies. See BOSWELLIA, FRANKINCENSE, and *U. S. Disp.*; *Jahresb.*, 1858, 482; *Ann. Chem. u. Pharm.*, xxv, 306; *Zool. f. Chem.* (2), vii, 201.

Olifant River. or **Elephant River**: See LIMPOPO RIVER.

Olig'archy [from Gr. *ὀλιγαρχία*; *ὀλίγος*, few + *ἄρχειν*, rule]: a form of government in which the supreme power is vested in a small class of persons. It differs from aristocracy in the extent of the governing class, which in an aristocracy usually embraces the entire body of the nobles, while in an oligarchy a certain political clique or coterie has the controlling influence. Oligarchies have been among the most unjust and oppressive of governments, and for the most part have been short-lived.

Oligocene Period [*oligocene* is from Gr. *ὀλίγος*, small + *καινός*, new]: a division of geologic time succeeding the Eocene period and preceding the Neocene. In the classification of Cenozoic or Tertiary time by Lyell three divisions were recognized: Eocene (older), Miocene, and Pliocene. Subsequently it was found advantageous in classifying certain European formations to substitute two divisions for the Eocene, the name Eocene being retained for the older and Oligocene, proposed by Beyrich, being applied to the younger. In the nomenclature adopted by the U. S. Geological Survey for the geologic atlas of the U. S., the earlier use of Eocene is restored. See EOCENE PERIOD. G. K. G.

Oligochaeta [Mod. Lat., from Gr. *ὀλίγος*, few + *χάιτη*, bristle]: an order of Annelid worms, of which the earthworms may be taken as types. In all the elongate cylindrical body is without distinct head, without any distinct appendages, but with a few bristles on each segment, the remnants of the fleshy feet (parapodia) with many bristles occurring in other Annelids. These worms are hermaphrodite, and the young develop without a metamorphosis. Two divisions are usually recognized. The first is the *Terricolae*, or *EARTHWORMS* (*q. v.*), which live in moist earth; the second, the *Limicolae*, live in the ooze at the bottom of the water, but few occurring in the sea, the great majority being inhabitants of fresh water. Of the *Limicolae* there are many genera, which are grouped in five families. Little is known of the American forms. The genera of *Terricolae* are numerous. The student should consult Wilson's papers on the embryology (*Journal of Morphology*, i. and iii.) and the numerous papers on the anatomy and species, by Beddard and Benham, in the *Quarterly Journal of Microscopical Science* since 1885. J. S. KINGSLEY.

Olin'da: a town of the state of Pernambuco, Brazil; on a low promontory of the coast, about 9 miles N. of the city of Pernambuco, with which it is united by railway (see map of South America, ref. 4-H). It was the first settlement in Northern Brazil, having been founded in 1535; was long the capital of Pernambuco, and having been taken by the Dutch, was the capital of their colony in Brazil from 1630 to 1654. Until about 1710 it was the most important commercial city of the coast N. of Bahia. Recife, or Pernambuco, which had been a fishing village, gradually supplanted it as a trading center, and eventually became the political capital; but Olinda remained the see of the bishop.

It is now the residence of many wealthy Pernambucans, and is a favorite resort for bathing, etc. Its quaint old buildings, erected by the Portuguese and Dutch, are very interesting. Pop. (1891) about 9,000. HERBERT H. SMITH.

Oliphant, CAROLINA: See NAIKNE.

Oliphant, LAURENCE: traveler, author, and mystic; b. in England in 1829, son of Sir Anthony Oliphant, subsequently chief justice of Ceylon; went to Ceylon in his youth; visited Nepal in 1850; journeyed through Southern Russia and the Crimea, and in 1853 published *The Russian Shores of the Black Sea*; became private secretary to Lord Elgin, Governor-General of Canada; subsequently was superintendent of Indian affairs in Canada; published *The Trans-Caucasian Provinces the Proper Field of Operations for a Christian Army* (1855); accompanied the army of Omar Pasha to the region in question; wrote *The Trans-Caucasian Campaign of Omar Pasha* (1856); accompanied Lord Elgin as private secretary on his mission to China in 1857; wrote *A Narrative of the Earl of Elgin's Mission to China and Japan* (1860); was *chargé d'affaires* in Japan 1861; sat in Parliament for the Stirling burghs 1861-68; joined with his mother the semi-religious community established by Thomas L. Harris at Portland, Chautauqua co., N. Y.; became correspondent of *The Times* in Paris in 1870, and manager of the American interests of the Direct Cable Company; about 1875 settled at Haifa, Palestine, having interested himself in the project for colonizing Palestine with the Jews. D. at Twickenham, England, Dec. 23, 1888. Among his works were *The Land of Gilead* (1880); *Episodes in a Life of Adventure* (1887); *Scientific Religion* (1888); and the novels *Piccadilly* (1870); *Altiora Pelu* (1883); and *Masollam* (1886). See *Life* by Mrs. M. O. W. Oliphant (1891). Revised by H. A. BEERS.

Oliphant, MARGARET O. WILSON: NOVELIST; b. at Wallyford, near Musselburgh, Scotland, in 1828; has published over seventy books, including a large number of successful novels and other works of fiction, consisting chiefly of delineations of Scottish and English life and character, most of which have been republished in the U. S. Among them are *Passages in the Life of Mrs. Margaret Maitland* (1849); *Adam Graeme of Mossgray* (1852); *The Chronicles of Carlingford* (1863); *Salem Chapel*; *The Perpetual Curate* (1864); *The Minister's Wife* (1869); *A Rose in June* (1874); *Within the Precincts* (1879); *A Little Pilgrim: in the Unseen* (1882); *A Country Gentleman* (1887); *Sons and Daughters* (1890); *The Cuckoo in the Nest* (1893). She has written biographies of Edward Irving (1862), St. Francis of Assisi (1871), Count Montalembert (1872), Principal Tulloch (1888), Thomas Chalmers (1893), and others; *Historical Sketches of the Reign of George II.* (2 vols., 1869); *Royal Edinburgh* (1890); *The Literary History of England from 1790 to 1825* (1882); *The Victorian Age of English Literature* (1893). Revised by H. A. BEERS.

Oliphant, THOMAS LAURENCE KINGTON: biographer and philologist; b. near Bristol, England, Aug. 16, 1831; educated at Eton and Oxford; studied law at the Inner Temple; is author of *Life of the Emperor Frederick the Second* (1862); *Jacobite Lords of Gask* (1870); *Sources of Standard English* (1873); *Life of the Duc de Luynes* (1875); *Old and Middle English* (1878; 2d ed. 1893); *New English* (1886).

Olivares, Ñ-lée-vaa-rās, GASPARO DE GUZMAN, Count of: prime minister of Philip IV. of Spain; b. in Rome, Jan. 6, 1587, his father being at that time the Spanish ambassador at the papal court; studied at Salamanca; became influential in court circles as the trusted friend of the heir-apparent, who, on succeeding to the throne in 1621, made him Duke of San Lucar de Barrameda, and intrusted the administration to his direction. Under his ministry Spain was involved in wars with Portugal, France, and the Netherlands; the people were impoverished by the heavy taxes; revolts broke out in Catalonia and Andalusia, and Portugal secured her independence. The failure of his policy caused his dismissal from court, and having afterward published a work that gave offense to people in authority, he was banished to Toro, where he died July 22, 1645.

Olive [viâ O. Fr., from Lat. *olī'va*, *o'lea*, from Gr. *ἐλάφα*, olive-tree]: a tree of the genus *Olea* (*Olea europæa*). The olive-tree has been grown from the most ancient times, both in Europe and Asia Minor; both fruit and oil form important products of the Mediterranean region, where the bland "sweet" oil replaces butter and other animal fats for table and culinary use; while all over the world it is used for

salads as well as for medicinal purposes, in preference to all others. The pickled fruit also is in its home an article of food in common use, while elsewhere esteemed a table delicacy. The tree is a slow grower, but attains great size and age; some groves have an historic celebrity, and are preserved with scrupulous care. The wood is close-grained, hard, of a yellowish tint, and is much esteemed for carving and fine work generally. The small-fruited wild olive (*oleaster*) is of value only as a grafting stock for the improved varieties, of which over thirty are cultivated in Southern France alone, and many others in Spain and Italy, the three countries that chiefly supply the commercial demand. The olive has been extensively propagated in California, where the "mission olive" was early introduced by the Franciscan missionaries; and that State produces both excellent oil and pickled fruit. Attempts to introduce it into the Southern U. S. have not been successful, on account of the occasional severe changes and low temperatures occurring there. According to Humboldt, for the success of the olive the mean temperature of the coldest month should not fall below 41°5' F. or 5° C. Some varieties are much hardier than others, bear considerable frost, and require less heat to mature the fruit.

The tree is propagated either from twig cuttings, from sprouts of truncheons of old wood set in moist ground, or from gnarled woody buds (*novoli*) that form mostly near the base of the trunk. It begins to bear from the seventh to the ninth year, according to climate and varieties, some trees yielding crops alternate years, others annually. The crop increases up to the thirtieth year, when single trees, it is said, sometimes yield as much as 300 lb. of oil; but ordinarily 10 to 15 lb. per tree is accepted as a fair crop, corresponding to about 70 to 100 lb. of the fruit. While the tree is not very exacting as to soil, is not exhaustive, and is often seen doing well on stony slopes, it responds gratefully to fertile soil and liberal fertilization; the pomace from the oil-press is frequently the only return it receives for years, and the fact that the oil takes nothing from the soil accounts in part for the persistence of its production in the oldest countries. The color of the fruit when fully ripe (in November and December) is purple or purplish black; its shape varies from almost round to long-oval; the oil is contained (to the extent of 15 to 25 per cent. of the whole fruit) in the watery flesh, together with a bitter astringent principle, which renders the natural fruit uneatable, but belongs only to the juice, and can readily be extracted by weak lye. The hard pit varies much in size; the little oil contained in its kernel deteriorates that of the flesh, and is excluded from the best qualities when practicable. The best varieties for oil are not well suited for pickling; the pickling olives should be large, firm-fleshed, and have a small pit, like the "queen olive" of Spain.

For oil-making the fruit is not allowed to get fully ripe, as the oil would then be thick and rank-tasting; for the best quality the flesh must still be firm, the color golden to purplish only, and the fruit must be worked quickly after gathering. It is usually pulped in an edge-wheel crushing-mill of stone; but as this crushes the pits, improved tinned-iron mills in which this can be avoided are now being introduced. The highest quality, "virgin" oil, is that which flows from the crushed mass without pressing; its quantity is usually quite small, and it is not ordinarily found in commerce. The next best, the first quality of commerce, is obtained by pressing the cold pulp in round flat baskets or bags, made of such perfectly inodorous, strong materials as palm-leaves, esparto grass, bamboo, or (in California) canvas cloth; the oil being extremely liable to absorb any odors with which it may come in contact, the utmost cleanliness and exclusion of all damaged fruit must be carefully observed. After the first pressing, the pomace or press-cake is broken up, reground, and thinned with cold water; there follows a second pressing which yields a commoner quality of oil, used by the poorer classes of the population. A third, and occasionally a fourth pressing with hot water yields a still inferior oil, used for burning, lubrication, and soap-making.

The liquids flowing from the press are murky-looking emulsions of the watery juice with minute droplets of oil. They are usually allowed to settle in appropriate tanks, an operation which according to circumstances may require from a few weeks to several months, and during which the air is excluded as much as possible to avoid rancidity. The oil floating on top is dipped or drawn off, and if not perfectly limpid is filtered, so as to remove completely any of

the acrid juice that would render it unpalatable. Of late a more rapid process of separation, by means of a water-current in a settling-tank, has been introduced with great advantage.

The *pickled olive* is an important article of commerce, and in the olive-growing countries also an important part of the daily food. For home use the fruit is allowed to grow much riper than when intended for export, and is then more palatable and digestible, but more difficult to keep. In either case the acidity may be extracted slowly by water alone, frequently changed and then replaced by brine, together with laurel-leaves, coriander, fennel, etc., and sometimes vinegar, according to taste; but for export the fruit, when barely turning color and still quite hard, is steeped in caustic lye of varying strength (4 to 6 oz. to a gallon of water) for eight to ten or more hours, until the pit is readily detached from the flesh. The lye is then replaced by cold water, renewed daily, until the acidity is removed, and then by brine, which may or may not be flavored as above. Sometimes the fruit is also pitted, stuffed with capers, and preserved in fine oil.

The olive oil industry has suffered greatly from the adulteration (chiefly carried out at Marseilles) with cheaper oils, especially that of the peanut (*Arachis hypogaea*) and of cottonseed. The latter addition, if not too heavy, is difficult of detection by the taste, though easily shown by chemical reagents.

E. W. HILGARD.

Olive Family, or Olea'ceæ [*Oleaceæ* is Mod. Lat., named from *Olea*, the typical genus, from Lat. *o'lea*, from Gr. *ἐλαία*, olive-tree]: a family of dicotyledonous trees and shrubs, including about 300 species, mostly natives of warm, temperate, and tropical climates, the ash alone having a higher northern range. The leading character of the family is that of having regular gamopetalous or sometimes polypetalous flowers, with the parts of the calyx and corolla four and hypogynous, while the stamens are only two, and the ovary two-celled; but some are apetalous. The olive-tree is far the most important representative of the family, and next to it the ash-trees with their excellent tough timber, one species also yielding manna. Among the small trees or shrubs cultivated for ornament are lilacs, privet, fringe-tree, Forsythia, and jasmine.

Oliver, GEORGE, D. D.: clergyman and author; b. at Papplewick, England, Nov. 5, 1782; graduated at Cambridge 1803; took orders in the Church of England; became head master of King Edward's grammar school at Great Grimsby 1809; vicar of Scopwick 1831; incumbent of Wolverhampton 1834, and rector of South Hykeham, Lincolnshire, 1847; filled high posts in the Masonic order, and wrote several works upon Masonry which met with wide acceptance. Among them are *Historic Landmarks of Freemasonry*, *The History of Initiation*, *Antiquities of Freemasonry*, and *Institutions of Masonic Jurisprudence*. D. at Lincoln, Mar. 3, 1867.

Oliver, PETER, LL. D.: chief justice of Massachusetts; b. at Boston, Mass., Mar. 26, 1713; graduated at Harvard College 1730; held several offices in Plymouth County, and was appointed a justice of the Supreme Court Sept., 1756; became chief justice 1771; was impeached by the House of Representatives 1774 for refusing to subscribe an engagement to receive no pay or emolument except from the Assembly; accompanied the British troops on their retirement from Boston 1776; subsisted some years in England on a grant from the crown. D. at Birmingham, Oct. 13, 1791. He was author of various political writings and of some poems.

Olives, Mount of, or Mount Olivet, now **Jebel et-Târ** (mount of the rock): an eminence on the E. of Jerusalem, from which it is separated by the narrow valley of Jehoshaphat. It rises 2,693 feet above the level of the sea, and 100 feet above the most elevated part of Jerusalem. It forms the middle summit of a ridge of hills which to the N. expands into a large elevated table-land, but which here contracts and terminates in a row of three hills. The southernmost of these hills is now called the "Mountain of Offense," because Solomon there instituted the pagan worship for his concubines. The northern hill was the place where Titus encamped when he besieged Jerusalem. The middle summit is the proper Mount of Olives. At its foot, near the bridge over the brook of Kedron, lies the garden of Gethsemane. Its swelling sides are streaked with patches of bare rock between the olive groves, which are planted in terraces. The Church of the Ascension, built upon its

top by Helena, which was seen by Sir John Mandeville in 1327, has disappeared, and in its place is a small octagonal chapel within a paved court connected with a mosque. In the Old Testament, Mt. Olivet is first mentioned in connection with the flight of David from Absalom (2 Sam. xv, 30); next as the scene of the worship of Chemosh and Molech, set up by Solomon (1 Kings xi, 7), but destroyed by Josiah (2 Kings xxiii, 13); and finally as the place from which, by the order of Ezra, the people got the branches for the feast of tabernacles (Neh. viii, 15). In the New Testament the allusions are more numerous. "It is very prominent," Schaff says, *Through Bible Lands*, n. c., p. 272, "in the closing scenes of our Saviour's ministry. In Bethany, on the eastern slope of Olivet, he had his most intimate friends, Lazarus, Martha, and Mary, and performed his last and greatest miracle (Luke x, 38-42; John viii); from Mt. Olivet he made his triumphal entry into Jerusalem (Luke xix, 29-38); here he spent the nights intervening between the entry and his passion, and returned every morning to teach in the temple (Luke xxi, 37); descending from this mountain, he wept over the ungrateful city and foretold her fearful doom (Luke xxi, 41-44); to it he repaired on the night of his betrayal (John xviii, 1); from it he ascended to heaven to take possession of his throne (Luke xxiv, 50; Acts i, 12)." See also Tobler, *Silochquelle und d. Oelberg* (St. Gall, 1852).

Revised by S. M. JACKSON.

Olivet College: an institution of learning at Olivet, Mich.; founded in 1844. While not sectarian, it is more closely related to the Congregational denomination than to others. Its nine buildings, well placed in a charming spot, are well built and finely equipped. The musical department and the department of science are exceptionally well equipped. The yearly attendance is about 300. The value of the college property and endowment is about \$300,000.

WILLARD G. SERRY.

Oliv'idæ [Mod. Lat., named from *Oli'va*, the typical genus, from Lat. *oli'va*, olive (see OLIVE), named from its olive shape]: a family of Gasteropod molluscs, with elongate oval shells, the outer surface polished and frequently brightly colored. The spire is short, the mouth elongate, its inner lip obliquely plaited. The species of Olives are numerous (over 100), and are arranged among several genera. Their beauty makes them great favorites with collectors.

Olivier, ô-lé-vi-ä', JUSTE DANIEL: poet; b. at Eysins, canton of Vaud, Switzerland, Oct. 18, 1807. He showed an early inclination to letters, and at eighteen won a prize in the poetical competition at Lausanne. In 1830 he published his first volume of poems, *Poèmes suisses*; this was followed by *L'Amour* (1834); *L'Éducation* (1833); and *Les Deux Vies* (1835). About 1842 he became involved in political difficulties, left his professorship in Lausanne, and went to Paris, where he lived most of the rest of his life. D. in Geneva, Jan. 7, 1876. Later poetical works are *Les Chansons lausannoises* (1847); *Dernières Chansons*; *Théâtre de société, fantaisies dramatiques* (1870). He also wrote a number of works in prose: *La Cantate de Vaud* (2 vols., 1837-41); *Études d'histoire nationale* (1842); *Mouvement intellectuel de la Suisse* (1845).

A. G. CANNFIELD.

Olivine: See CHRYSOLITE.

Ollier, ô-li-ä', LOUIS XAVIER ÉDOUARD LÉOPOLD, M. D.: surgeon; b. in Lyons, France, in 1825; graduated M. D. at the School of Medicine, Paris, in 1857; settled in Lyons; appointed surgeon to the Hôtel Dieu and professor in the surgical clinic; paid special attention to the surgical pathology of bones and joints, and his researches on these subjects are highly esteemed by the medical profession. His principal works are *Traité expérimental et clinique de la régénération des os et de la production artificielle du tissu osseux* (Paris, 1867); *Traité des résections* (Paris, 1885-89).

S. T. ARMSTRONG.

Ollivier', ÉMILE: statesman; b. at Marseilles, France, July 2, 1825; studied law, and began to practice as an advocate at Paris in 1847. In 1848 he was sent as commissary-general to Marseilles to pacify the city, and shortly after he was appointed prefect, but in 1849 returned to his business in Paris. In 1857 he was elected a member of the Legislative Assembly, and made himself conspicuous by his courageous and eloquent opposition to the government of Napoleon III. Gradually, however, the emperor succeeded in winning him over to his side, and he was generally considered a political renegade, when on Jan. 2, 1870, he became Napoleon's prime minister. He was president of the cabinet when the war was

declared against Prussia, but he retired Aug. 9, after the first reverses of the French arms. He was elected to the Academy Apr. 7, 1870. He was a candidate for election to the Chamber in 1876, in 1877, and in 1885, but was defeated on each occasion. He has published, among other works, *Discours et Liberté* (1867); *La République* (1869); *Projet de loi sur l'enseignement* (1875); *L'Église et l'État* (1876); *Leçon* (1878); *M. Thiers à l'Assemblée* (1879); *L'Histoire* (1880); *Nouveau manuel de droit ecclésiastique français* (1885); and *1789 et 1889* (1890).

Revised by F. M. C. 1891.

Olmedo, José Joaquín, de: poet; b. in Guayaquil, Ecuador, May 20, 1780; d. there Feb. 19, 1847. Educated at Quito and Lima, he received the degree of doctor from the university of the latter city in 1805. He taught law for a time in the university, then began practice as an advocate in Guayaquil. In 1810 he went to Spain as a deputy to the famous Cortes of Cadiz, remaining in the mother-country until 1814. Returning to America, he was a member of the so-called Junta de Gobierno of Guayaquil (1820), and of the Constitutional Assembly of Peru (1823). He was one of the Peruvian deputation to seek military aid of Bolívar; and was sent by the latter as minister plenipotentiary to London, where he became a warm friend of Andrés Bello. Returning home in 1828 he was a member of the constitutional convention of Riobamba, which finally separated Ecuador from Colombia (1830). Elected successively vice-president of Ecuador and governor of the department of Guayas, he presided over the national convention of Ambato in 1835. In 1845 he headed the successful revolution against Gen. Flores, and directed the provisional government; but was defeated in his candidature for the presidency. It is, however, as a poet that he will be longest remembered, having in spite of the small amount of his production an indisputable claim to a foremost place in Spanish-American letters. His poetic manner is that of Quintana, too rhetorical for the taste of the present; and the title often given him, the South-American Pindar, indicates both his excellences and his defects. Few poets, nevertheless, are more widely read by Spanish-Americans. There is no good complete edition of his works. The most important are to be found in the *América Poética* of Gutierrez (Valparaíso, 1846). These should be supplemented by the *Poesías inéditas de Olmedo*, edited by D. Manuel Corpancho in 1861. See also Herrera, *Apuntes biográficos de D. J. J. Olmedo* (Quito, 1887).

A. R. MARSH.

Olmsted, DENISON, LL. D.: scientist; b. at East Hartford, Conn., June 18, 1791; graduated at Yale 1813; was a college tutor 1815-17; became in 1817 professor of chemistry, mineralogy, and geology, and executed what is believed to have been the first State geological survey in the U. S. (report published 1824-25); became in 1825 Professor of Mathematics in Yale College, and in 1836 Professor of Astronomy and Natural Philosophy; published in 1831, 1832, and 1842 text-books on natural philosophy, several works on astronomy for schools, and a number of biographical memoirs; made important observations on hail, on meteors, the aurora borealis, etc.; his conclusions regarding the latter phenomenon are in vol. viii. of the *Smithsonian Contributions*. D. at New Haven, Conn., May 13, 1859.

Olmsted, FREDERICK LAW, M. A.: landscape architect; b. in Hartford, Conn., Apr. 26, 1822; studied civil engineering, and later pursued scientific studies at Yale College. He was then for two years a working student of agriculture, and afterward seven years a farmer and horticulturist upon his own land. In 1853 and 1854 he made a study of the economical conditions of the slave States, traveling a distance of more than 4,000 miles on horseback. In the spring of 1857 he was appointed superintendent of the preparatory work of the projected Central Park of New York. In 1858, in association with Calvert Vaux, he devised a plan for this park, which was selected as the most satisfactory of thirty-three plans submitted in competition. After the adoption of the plan the designers were employed to carry it out. At the outbreak of the civil war in 1861 he was appointed by President Lincoln a member of the National Sanitary Commission, and organized and managed its executive business. He spent the period 1863-65 on the Pacific slope, serving as chairman of the California State commission, taking the custody of the Yosemite and Mariposa reservations, ceded to the State by Congress as public parks. From 1865 to 1872 he engaged in New York in the general practice of landscape architecture; in 1872 served for a time as presi-

dent and treasurer of the park commission of New York; in 1876 moved to Boston. He has been employed upon upward of eighty public recreation-grounds, among the more important of which are the public parks of New York, Brooklyn, Boston, Bridgeport, Trenton, Montreal, Buffalo, Chicago, Milwaukee, Louisville, and Kansas City. He is the designer of the grounds of the Capitol at Washington; also of the general scheme for the restoration and preservation of the natural scenery of Niagara Falls, and, in association with Mr. Vaux, of the plan now being carried out by the State of New York for this purpose. Mr. Olmsted is the author of the following works: *Walks and Talks of an American Farmer in England*, first published in 1852; it has been several times reprinted; *A Journey in the Seaboard Slave States* (1856); *A Journey in Texas* (1857); *A Journey in the Back Country* (1861). Translations of *A Journey in Texas* have been published in Paris and Leipzig.

Olmütz: town; in the province of Moravia, Austria; on the March; 129 miles N. N. E. of Vienna (see map of Austria-Hungary, ref. 3-F). It is strongly fortified, and was the place of imprisonment of La Fayette. It is the see of an archbishop. It has a well-attended university, two military academies, a polytechnic school, manufactures of linens, cloths, and porcelain, and a large trade in grain and cattle. Pop. (1890) 19,761.

Olney: city; capital of Richland co., Ill. (for location, see map of Illinois, ref. 9-G); on the Balt. and Ohio S. W., and the Peoria, Dec. and Evans. railways; 31 miles W. of Vincennes, 117 miles E. of St. Louis, Mo. It is an important shipping point and trade center, is engaged in manufacturing, and has a public library (founded in 1886), a national bank with capital of \$50,000, a private bank, and four weekly newspapers. Pop. (1880) 3,512; (1890) 3,831.

Olney, JESSE, A. M.: educator; b. at Union, Tolland co., Conn., Oct. 12, 1798; taught at Whitesborough and Binghamton, N. Y., and for twelve years in the Hartford Grammar School, where he introduced the method, now generally adopted, of separating geography from astronomy, and beginning the former study by familiarizing the pupil with the description and surroundings of his own town, county, and State, advancing thence to national and foreign geography. He published a number of school books that had an enormous circulation, including a *Geography and Atlas* (1829) and *The National Preceptor* (1831). He served ten terms in the Connecticut Legislature, where he was an active worker in behalf of educational interests, and was elected State comptroller of public accounts in 1867. D. at Stratford, Conn., July 30, 1872.

Olonez': government of European Russia, S. W. of the government of Archangel; around the Lake of Onega. Area, 57,439 sq. miles. The ground is low, flat, and marshy, containing many large lakes, and covered with immense forests. Rye, hemp, and flax are produced; marble and slate are found; but timber and furs are almost the only articles exported. Pop. (1890) 352,600. Capital, Petrozavodsk.

Olozaga, ô-lô'thüa-gää, SALUSTIANO: statesman; b. at Logroño, Spain, in 1803; educated for the bar; elected to the Cortes 1833; reporter of the constitutional commission 1837, when he insisted on the retention of the senate; proposed and carried laws providing for electoral reform, the suppression of monasteries, the abolition of ecclesiastical tithes, and a general amnesty; was ambassador to France in 1840, formed the cabinet in 1843 after the fall of Lopez, but could not maintain himself against the intrigues of Narvaez, and fled to Portugal and thence to England; aided in establishing the constitution of 1855, and was again sent as ambassador to Paris. On the triumph of O'Donnell he retired from public life, but continued to reside in France, where he again represented his Government at the French court. He was president of the Cortes Mar., 1869, and Apr., 1871. D. at Enghien, France, Sept. 26, 1873.

Olshausen, ôls'how-zen, HERMANN: Bible commentator; b. at Oldesloe, Holstein, Aug. 21, 1796; studied theology at Kiel and Berlin, and was appointed professor in 1827 at Königsberg and in 1834 at Erlangen, where he died Sept. 4, 1839. His *Biblischer Commentar über sämtliche Schriften des neuen Testaments* appeared at Königsberg, 1830, sqq., and was finished by his friends after his death; translated into English for Clark's Foreign Theological Library, and a revised edition of it (by A. C. Kendrick, D. D.) published in New York (6 vols.) in 1856-58. He defended the alle-

gorical and typical methods, while not neglecting the grammatical and historical. Revised by S. M. JACKSON.

Olsson, ôl'sün, OLOF, D. D.: theologian; b. in Vermland, Sweden, Mar. 31, 1841; educated at Upsala and Leipzig, ordained 1863; emigrated to the U. S. 1869. His first pastorate was in MacPherson co., Kan., during which he was a member of the Legislature of the State; became Professor of Theology in Augustana Seminary, Rock Island, Ill., 1876-88; pastor Woodhull, Ill., 1889. He was recalled to Augustana College and Seminary, becoming president of the institution in 1891. H. E. J.

Olymp'ia (in Gr. Ὀλυμπία): a plain in Elis, Peloponnesus, on the banks of the Alpheus, where the Olympian games were held, containing the Altis or sacred grove, which was said to have been inclosed by Hercules, and which contained the temple of the Olympian Zeus, with his statue by Phidias, and many other public buildings. Connected with the Altis were the stadium and the hippodrome. (See OLYMPIAN GAMES.) At the time of the Elder Pliny (23-79 A. D.) about 3,000 statues were standing; now the space is occupied with grain-fields, with a few scattered ruins. See Flasch's article *Olympia* in Baumeister's *Denkmäler* for the history of Olympia and the results of excavations made on the site by the German Government. See also the official work *Ausgrabungen von Olympia* (Berlin, 1875-81), and Boetticher, *Olympia, das Fest und seine Stätte* (Berlin, 1883). J. R. S. STERRETT.

Olympia: city (settled in 1847, incorporated in 1859); capital of the State of Washington and of Thurston County (for location, see map of Washington, ref. 5-C); on Des Chutes river, Budd's inlet (the southern extremity of Puget Sound), and the Northern Pacific and the Port Townsend Southern railways; 36 miles S. W. of Tacoma, 121 miles N. of Portland, Ore. It is in a timber, coal, iron, sandstone, and copper region; is laid out with broad and regular streets; has direct steamship communication with the principal points on the sound and the Pacific coast; and contains water, sewerage, electric-light, and street-railway services. A bridge 520 feet long connects it with Turnwater, on the opposite side of the river, and another, 2,030 feet long, connects it with the west shore of the inlet. The city derives exceptional power for manufacturing from the river, which has three falls with a total descent of 85 feet in a distance of 1,500 feet, and was improved by the construction of a dam in 1890. Its principal manufactures are connected with the lumber industry, and include the only plant in the country for making water-pipe from yellow fir. There are 7 churches, 2 academies, State library with over 16,000 volumes, a public library, hospital, several secret society halls, 2 national banks with combined capital of \$200,000, a State bank with capital of \$60,000, and a daily and 3 weekly newspapers. The assessed valuation in 1893 was \$3,437,096, and the total debt on Feb. 1, 1894, was \$279,237. Pop. (1880) 1,232; (1890) 4,698; (1894) estimated, 10,000.

EDITOR OF "TRIBUNE."

Olym'piad [from Lat. *Olym'pias* = Gr. Ὀλυμπιάς, Ὀλυμπιάδος, Olympiad, deriv. of τὰ Ὀλύμπια, the Olympian games]: the period of four years between any two successive celebrations of the Olympian games. The Olympiad was early adopted as an era for the recording of the dates of events. The Olympiads were designated by numbers, the first being reckoned from the victory of Corcebus in the foot-race, B. C. 776; or, again, they took the name of the principal victor in the next previous Olympian games. Events are recorded as having happened in such and such an Olympiad, or in such a year of a certain Olympiad. To reduce Olympiads to dates according to our reckoning subtract 1 from the number of the Olympiad, multiply by 4, add the number in the Olympiad minus 1, and then subtract from 776. When the date is after Christ proceed as before, but add the full number of the Olympiad and subtract therefrom 776. The 293d Olympiad, which was the last (Ol. 293^d), ended in 394 A. D. See GREEK GAMES.

Revised by J. R. S. STERRETT.

Olympian Games: the greatest national Greek festival. It was held quadrennially in honor of Zeus, in Olympia in Elis, Greece, and lasted five days, beginning just after the summer solstice. It is chiefly famous for its athletic contests and chariot-races. From the remotest antiquity Olympia was consecrated to religious rites, and there for centuries the Greeks lavished their wealth and their marvelous artistic skill in the erection of temples and shrines. They brought

thither, also, once in four years, the best they had in the way of physical development, and gradually contests of strength, endurance, and skill became the most prominent feature of the festivals. At the eastern end of the plain a level course, the stadium, was laid out in yielding sand, 600 Olympian feet (about 625 feet) in length, and for many years the contests were foot-races in a straight line along the stadium. Only free-born Greeks of unblemished reputation, who had trained during a prescribed period in a Greek gymnasium, were permitted to enter. Lots were drawn for position, and at the feet of the statue of Zeus each contestant swore a solemn oath to race fairly. The prize was a wreath of olive branches cut with a golden knife by a lad whose parents were still living from the sacred wild olive-tree in Olympia. The wreaths were placed on a table at the feet of the statue of Zeus in the temple. The victor, his head encircled with a fillet of wool, was crowned with the wreath and a palm-branch was placed in his hand. The name of the victor, of his father, and of his birthplace was proclaimed by a herald. To win the olive wreath was considered the highest possible honor. The victor could erect a monument in the sacred grove, and in some instances he was permitted to erect a statue of himself. Beginning with the fifteenth Olympiad, in addition to the original stadium race, a double race was run—that is, the course to the end of the stadium and back to the starting-place. Some Olympiads later there was a long-distance race twelve times around the stadium. In the eighteenth Olympiad the pentathlon was added. This was a combination contest consisting of running, jumping, disk-throwing, spear-throwing, and wrestling. Five Olympiads later boxing was added, and in the twenty-fifth chariot-races and the pankration, or combined wrestling and boxing match. The contests were originally confined to men, but gradually boys were admitted to the lighter ones, and at the 145th they were admitted to the severest of all, the pankration. By a truce established in the ninth century B. C., under the protection of Sparta, all competitors and spectators of Greek descent could attend the festivals unmolested even in time of war. Pilgrims from all the Greek cities and from the most distant colonies thronged to the games. Here poets and orators found appreciative audiences, sculptors found patrons, tradesmen sold their wares. The importance of the festivals diminished after the Peloponnesian war, although they were continued long after the Roman conquest. See the article **GRECIAN GAMES**.

See Curtius, *Olympia*; Bütticher, *Olympia, Das Fest und seine Stätte*; Laloux and Monceaux, *Restauration d'Olympie*. B. B. HOLMES.

Olym'pus [= Lat. = Gr. Ὀλύμπος], Mod. **Elymbo**: a lofty range of mountains which separated Thessaly from Macedonia. Their sides are clad with beautiful forests, but the tops are covered with snow for nine months of the year. The highest peak rises 9,754 feet, and on its broad, cloud-veiled summit stood, according to the oldest myths of Greece, the palace of Zeus and the other gods. Later, the abode of the gods was moved by a more refined sentiment to the celestial spheres, but Mt. Olympus still retained its charm for the imagination. See Heuzey, *Le Mont Olympe et l'Académie* (Paris, 1869); Barth, *Reise durch das Innere der Europäischen Türkei*; Tozer, *The Highlands of Turkey* (London, 1869), ii. Revised by J. R. S. STERRETT.

Olyn'thus (in Gr. Ὀλύνθος), now *Ato Mamus*: an ancient city of Macedonia; on the Thracian Gulf: was at different periods dependent on Athens or Sparta, acquired great wealth from its excellent commercial position, but was taken in 347 by Philip of Macedonia, who sold the inhabitants as slaves and destroyed its buildings. See Vömel, *De Olynthi situ* (Frankfort, 1829). J. R. S. S.

Omaha: city (laid out in 1854, incorporated in 1859); capital of Douglas co., Neb.; on the Missouri river, and the Burlington Route, the Chi., Rock Is. and Pac., the Chi., St. P. and Om., the Fremont, Elk. and Mo. Valley, the Mo. Pac., the Chi., Mil. and St. P., the Chicago and Northwestern, the Omaha and St. L., and the Union Pac. railways; opposite Council Bluffs, Ia.; 476 miles N. by W. of St. Louis, 490 miles W. of Chicago (for location, see map of Nebraska, ref. 10-H). The city is built on a plateau about 80 feet above the river, is laid out with wide streets, of which more than 60 miles are paved, is lighted with gas and electricity, and has improved water and sewerage plants and electric and cable street-railways. The river is here crossed by three bridges—one of steel, built by the Union Pacific Railroad

Company, 66 feet above low water, cost \$1,500,000; one of iron, connecting the city with Council Bluffs, for wagon and street-railway use; and one of steel, for steam-railway use, with the longest drawbridge in the world, between East Omaha and Council Bluffs, built by the East Omaha Land Company, cost \$1,000,000. The city has laid out four magnificent parks on the N. W. and S., containing upward of 700 acres and connected by boulevards. The city contains 70 churches, viz.: Presbyterian, 15; Methodist Episcopal, 15; Congregational, 12; Roman Catholic, 9; Baptist, 8; Protestant Episcopal, 7; Christian, 2; Unitarian and Latter-day Saints, 1 each. There are 57 buildings used for public-school purposes, and public-school property valued at over \$1,200,000. The institutions for higher education include Creighton College (Roman Catholic), two medical colleges, Brownell Hall (Protestant Episcopal), Academy of the Sacred Heart (Roman Catholic), and St. Catharine's Academy (Roman Catholic). There are six libraries of various kinds, containing an aggregate of over 50,000 volumes—the City Free Library, with upward of 40,000 volumes, occupies a beautiful building. The State Institute for the Deaf and Dumb is located in the city. In 1894 the city had 9 national banks with combined capital of \$4,150,000, 5 State banks with capital of \$317,500, 3 savings-banks, and an incorporated bank, and 4 daily, 28 weekly, 3 semi-monthly, and 11 monthly periodicals. Omaha, by reason of its railway and river connections, is the distributing center of a large area of country. It has a wholesale business of over \$50,000,000 per annum, and it pays the Federal Government in internal revenue taxes over \$7,000,000 annually. The machine, car-building, and repair-shops of the Union Pacific Railroad are here, and the city has extensive smelting and refining works, packing-houses, breweries, and boiler-works. The census returns of 1890 showed that 626 manufacturing establishments (representing 77 industries) reported. These had a combined capital of \$15,626,169, employed 7,533 persons, paid \$4,797,482 for wages and \$27,779,394 for materials, and had products valued at \$38,961,523. Omaha is the headquarters of the U. S. army Department of the Platte. Pop. (1880) 30,518; (1890) 140,452.—**SOUTH OMAHA**: city (founded in 1885); Douglas co., Neb.; on the Burlington Route, the Chi., St. P., Minn. and Om., the Fremont, Elk. and Mo. Valley, the Mo. Pac., and the Union Pac. railways; 4 miles from Omaha. It is the third largest meat-packing city in the U. S., and has extensive stock-yards and four large packing and rendering plants. The city contains 5 churches, 7 public-school buildings, public-school property valued at over \$250,000, 3 national banks with combined capital of \$400,000, 2 State banks with capital of \$37,500, several hotels, a handsome exchange building, a public park, and 4 daily newspapers. Pop. (1890) 8,062.

Revised by FRANK A. FITZPATRICK.

Omahas: See SIOUAN INDIANS.

Oman: a territory comprising the southeast portion of the Arabian peninsula. It has a coast-line of about 1,500 miles along the Persian Gulf, the Gulf of Oman, and the Arabian Sea. It contains eight badly defined districts or states, of which Muscat is the most important. The inhabitants, though professedly Mussulmans, are less intolerant than those of Western Arabia, and preserve ideas and customs derived from their original fire-worship. It was formerly a part of a powerful and extensive Arabic state or imamat, which consisted of Arabic, Persian, and African territories, but which in 1854, at the death of the Imam Said Seid, was divided between his two sons, one receiving the African territories, and the other the Asiatic territory, with Muscat for its capital. Oman now consists of a low, hot, but, if well watered, very fertile coast-land, producing cotton, sugar, rice, maize, watermelons, and bananas. Behind this coast-land rises a mountainous region consisting of bare and naked ranges inclosing beautiful and fertile valleys, where the coffee-tree grows, and figs, almonds, grapes, oranges, lemons, walnuts, and apples. On the inner slope of these mountains lies a row of oases, mostly inhabited by Bedouins, and behind the oases stretch the Arabian deserts. The area is 82,000 sq. miles and the population estimated at 1,500,000, but the authority of the sultan does not extend far outside his capital, Muscat. The state is practically under British protection. Revised by M. W. HARRINGTON.

Öman, VIKTOR EMANUEL, Ph. D.: poet, philologist, and publicist; b. in Sweden in 1833; studied at Lund and graduated at Jena in 1859. He has been chiefly engaged in newspaper work as contributor to and editor of the journals *At-*

lehanda för Folket and *Nerikes All-handa*, both published in Örebro, Sweden. His original literary productions are two small volumes of poems, *Lyriska blad* (1857 and 1868) and the poetic tale *Riddar Herbert och Jungfru Hilde* (1866). Öman has shown himself a fine translator in his reproduction in Swedish of Milton's *Paradise Lost* and Euripides's *Medea*, besides some of the masterpieces of Russian, Polish, Magyar, and Hindu poetry. In the philological field he has produced a *Lärobok i engelska språket* (Manual of the English Language, 1867) and *Svensk-engelsk Hand-dorobok* (Swedish-English Dictionary, 1872; 2d ed. 1881), which have now been made antiquated by more recent and complete works.

P. GROTH.

O'mar, ABU HAFSAH IBN UL KHATTAB: the second Caliph of the Mussulmans; b. about 581. At first a bitter opponent of the Prophet, he was suddenly converted to Islam (617), and was ever afterward its zealous apostle. In 634 he was elected to succeed Abubekir. Considering the title of caliph, "successor," too exalted to be borne by one who did not come immediately after Mohammed, he assumed the title Emir ul Muniminn, "Commander of the Believers," which had been solemnly decreed him and which the caliphs have borne ever since. In 635 he adopted the HEJIRA (q. v.) as the beginning of the Mussulman era. Wholly devoted to the interests of his faith, by his great administrative and military talents he was the real founder of the vast Arabian empire. In 637 Syria and Palestine were conquered, and the mosque of Omar built at Jerusalem on the site of Solomon's temple. Egypt was subdued 639-641 and Persia in 642. In 640 the union of the Arabian tribes was completed, they for the first time being brought together in one religion under one chief. Omar was exceedingly simple in his habits, economical, and shrewd, a fanatic, yet tolerant of others, and generally fair and impartial. Nevertheless, an act of injustice provoked the resentment of a Persian slave, by whom he was stabbed to death (644). He was buried near the Prophet.

E. A. GROSVENOR.

Omar Khayyām: Persian poet; renowned as mathematician, astronomer, and philosopher. His full name is given as Ghiās uddin Abul Fath Omar bin Ibrahim al-Khayyām; the epithet Khayyām (tent-maker) is presumably due to his father's calling, or to his own occupation before he was in position to devote himself to literary and scientific work. Omar Khayyām was a native of Naishāpūr in Khorassan, and he flourished in the latter part of the eleventh and beginning of the twelfth century. According to tradition, his death took place in the year A. D. 1123 (A. H. 517), but there is ground for believing that it may possibly have occurred some twenty years earlier, as his collegiate friend and companion in years, the celebrated Vizir Nizām ul Mulk of Tūs, is stated to have been born A. D. 1017 (A. H. 408). An interesting story is preserved regarding Omar's first steps in the attainment of fortune, but there is not space for it here. A generous annuity provided for him through the favor of his friend at court, the Vizir Nizām ul Mulk, gave him the means and requisite leisure for pursuing his mathematical and astronomical researches; his work in Arabic on algebra, *Aljabr u al Mukabileh*, enjoyed the reputation of being a standard for several centuries. Merit raised him to an appointment as astronomer royal to the Sultan Malikshāh A. D. 1074, and under this monarch's patronage Omar Khayyām was instrumental in instituting a reform of the Persian calendar and introducing the new reckoning of the Jalālīan era, the so-called *Tarikh i Jalālī* or *Malikshāhī* from the reigning sultan, Jallāluddīn Malikshāh. It dates from Mar. 15, 1074 (10th Ramazān, 471 A. H.).

Greater even than his scientific fame is the renown which his philosophic poetry in the Lucretian or Voltairean vein won for him. It is by his *Rubā'iyāt*, or *Quatrains*, that he is most generally known. Some 500 of these rhyming four-line stanzas are attributed to his pen; they breathe a spirit of free-thinking and often enough approach atheism and scoffing; at times the tone is mystical, and again metaphysical and pessimistic; sometimes the verses pulse with a warm rhapsodical beat and a thoroughly human touch; always they are characterized by a vigorous and poetic imagination. Many of the *rubā'is* which pass under Omar Khayyām's name are doubtless not really his, but there is difficulty in deciding, as there is no single uniform recension that can be adopted as exclusive authority, and the numerous manuscripts differ considerably in the number of quatrains they contain. At Naishāpūr the tomb of Omar is shown to travelers; it rests beneath the shadow of blossom-

ing fruit-trees, and the spirit of the astronomer-poet's own prophecy is therefore fulfilled, that his grave should be situated where the wind should shower roses upon it.

BIBLIOGRAPHY.—An edition and translation of Omar Khayyām's mathematical work, based on the Leyden and Paris copies, was brought out by Woepcke, *L'algebre d'Omar Alkhayyāmī* (Paris, 1851). For the poet's life and works, consult Rien, *Catalogue of Persian Manuscripts in the British Museum*, ii., p. 546, and Garcin de Tassy, *Note sur les Rubā'iyāt de Omar Khayyām* (Paris, 1857). Editions of the quatrains have appeared at Lucknow, Calcutta, Paris, and London. Among English translations is the well-known rendering into English verse by E. Fitzgerald (London, 1859, 1872, 1879; Boston, 1887), and one by E. H. Whinfield which gives also the Persian text (Trübner, London, 1883; 2d ed. translation 1893); there is likewise a prose-rendering by J. H. McCarthy (Nutt, London, 1889). A French version accompanying the Persian text was published by Nicolas (Paris, 1867). Translations of the *Rubā'iyāt* have been made in a number of other modern languages, which bears witness to the popularity of Omar's writings also in later times and among foreign peoples.

A. V. WILLIAMS JACKSON.

Omar Pasha: soldier; b. at Plaski, in Croatia, in 1806; son of an Austrian officer. He studied at the military school of Thurm and served in an Austrian frontier regiment, but in 1833 for some unknown reason escaped to Bosnia, embraced Islam, and changed his name, Michael Lattas, to Omar. Soon he became tutor to the sons of Hussein Pasha. Going to Constantinople he was appointed a teacher in the military school, married a wealthy Ottoman lady, and was appointed writing-master to Abd-ul Medjid, the heir-apparent. On his pupil's accession he was rapidly promoted. He was sent as military governor to the Lebanon, was made a pasha, and assisted in suppressing rebellions in Bosnia and Kurdistan. During the dual occupation of the Danubian provinces (now Roumania) by Russia and the Ottoman empire, he commanded the Ottoman troops, whom he raised to a high degree of efficiency. In the Crimean war, as commander on the Danube, he several times defeated the Russians and forced them to raise the siege of Silistria. His attempt to relieve Kars was a failure. After the war he was governor of Bagdad, but, having been accused of mal-administration, he was removed and banished to Kharput in 1859. He was restored and sent to Bosnia in 1861 and to Crete in 1867 to put down rebellions. For a time he was Minister of War (1869), and continued a member of the imperial Council till his death Apr. 18, 1871. He was the ablest general that the Ottomans have possessed during the nineteenth century.

E. A. GROSVENOR.

Ombay, or **Allor**: an island of the Malay Archipelago, Solor group, N. of Timor; in lat. 8° 5' to 8° 28' S. and lon. 123° 43' to 125° 15' E. It is 65 miles long, 12 miles broad, high, volcanic, and inhabited by savage tribes of a mixed Negro and Malay origin. At Allor the Dutch have a settlement and carry on some trade in wax, edible birds'-nests, and pepper. Pop. estimated at 194,000.

Omen [from Lat. *o'men*, sign, omen < Old Lat. *osmen*; possibly connected with *augeo*, *auxilium*, *auctor*, in the sense of "authorization"; or possibly with *auscultare*, *auris*, in sense of "something heard"]; among the ancient Romans, a sign by which the gods were believed to indicate their favor or opposition to any proposed public or private action. The omens were publicly observed by the magistrates, assisted by haruspices and augurs, the former observing signs of the first, the latter of secondary importance. In the time of Cicero, and even before it, the whole matter of taking omens, of divining, soothsaying, and the like, had fallen into disrepute among the intelligent, but with the vulgar these arts were still of importance up to the time of the later empire.

Omentum [Mod. Lat. = Lat., adipose membrane, espec. the caul]; the membranous reflections of the peritoneum extending between certain abdominal organs and distinguished as the *great omentum*, a quadruple fold protecting the small intestine; the *gastro-hepatic omentum*, a double fold extending from the liver to the stomach; and the *gastro-splenic*, a double fold extending from the great pouch of the stomach to the spleen.

Omish: See MENNONITES.

Ommiades, *ō-mī'yādz*, or **Ommiades**: the first hereditary dynasty of caliphs, so named from their ancestor Om-

moaviab, a remote kinsman of Mohammed. Moaviab, son of the Koneish chieftain, Abu Sophian, and former secretary of the Prophet, governor of Syria since 640, opposed in arms the succession of Ali (655). The latter being murdered (661), Moaviab, already master of Arabia, Egypt, and Syria, succeeded to the throne despite the opposition of the family of Ali. He made Damascus the capital of the Mussulman empire, rendered the succession hereditary though hitherto elective, and was followed by thirteen princes of his family. Under Moaviab I., Samarkand, Tunis, and Tripoli were subdued, and Kairouan, the "metropolis of African Mussulmanism," founded, but his troops were defeated in a seven years' siege of Constantinople (672-79). His son and successor, Yezid I., reigned three years, caring for little except dissipation. Moaviab II. and Mervan I. were both poisoned soon after accession. Abdul Malek I. conquered Irak and Persia from the partisans of the dead Ali, crushed all internal opposition, and captured Carthage (704). The reign of Walid I. (705-715) was in every way the most brilliant of the Ommyiade rule. His general Hassan subdued the Moors and accomplished their enthusiastic conversion to Islam, and Tarik defeated the Visigoths, and with Mousa subdued the entire Peninsula of Spain as far as the Bay of Biscay. Meanwhile in the East Tartary was subjugated and the Mussulman arms carried victoriously to India. The next two caliphs were Suleiman I., a zealous and incapable prince, and Omar II., famous for his ascetic virtues. Under the latter France was invaded (719) and Constantinople again besieged in vain (717-719). Yezid II. was succeeded by Hashem I., whose general, Abderrahman, captured Nimes in France (730), but was utterly defeated at the decisive battle of Tours by Charles Martel (732). Walid II. was feeble and contemptible. Yezid III., Ibrahim I., and Mervan II., altogether reigned six years; Mervan II. was deposed (750) by Abul Abbas the Bloody, founder of the Abasside dynasty. The surviving Ommyiades were all butchered save two, one of whom, Abderrahman I., founded the Ommyiade caliphate of Cordova in Spain (755), where his family reigned till 1031. The universal caliphate of the Ommyiades had lasted eighty-nine years. Notwithstanding the general intellectual and military brilliancy of their reign, it was disastrous for Islam. They represented the worldly and ambitious element, in opposition to the simple faith and practices of earlier days, and by the civil wars they fomented or occasioned, and even by their foreign conquests, rendered dismemberment of the Mussulman empire inevitable. E. A. GROSVENOR.

Omnibus: See CARRIAGES.

Omniscience [Lat. *omnis*, all + *scire*, know]: an attribute of God, in consequence of which he knows of all that has been, all that is, and all that shall be. In its last phase, as FOREKNOWLEDGE (*q. v.*), it has occasioned several very subtle theological distinctions.

Omsk: capital of the government of Omsk, Siberia; at the confluence of the Om and the Irtisch (see map of Asia, ref. 3-E). It contains military schools, hospitals, manufactories, and mining works, and is the residence of the governor-general. Its fortress, constructed in 1766, is the strongest in Western Siberia. Pop. (1890) 54,721, exclusive of the garrison, which numbers 6,000. E. A. G.

On (Egypt. *Än*; Gr. *Heliopolis*): the name applied by the Hebrews (Gen. xli. 45, 50; xlii. 20) to the famous city of the sun, HELIOPOLIS (*q. v.*), which was also known by them as Beth-Shemesh, House of the Sun (Jer. xliii. 13), of which Heliopolis is simply a translation. The same Hebrew letters that spell On when differently vocalized give *Aven* (Ezek. xxx. 17), which thus becomes, erroneously, a second Hebrew name of Heliopolis. C. R. G.

Onia, òn-yäa, PEDRO, de; poet; b. at Los Confines, on the Biobio river, Chili, about 1565. He studied at the University of San Marcos in Lima, and passed most of his life in that city, where he was *fiscal* of the audience. His best known work is the epic *Arauco domado* (1st ed., Lima, 1596). It relates to the Araucanian wars, and is an evident imitation of Ercilla's *Araucana*; though inferior to the latter in poetical merit, it has considerable historical value. Ona also published *Tumbador de Lima* (1609); *Epitaphio de Cumbria* (1639), etc. D. at Lima about 1640. H. H. S.

On'ager: a species of wild ass, *Equus onager*, or *E. hemippus* inhabiting the plains of Central Asia. It is reddish in summer, gray in winter, with a streak of black along the center of the back, crossed by a second bar over the shoulders.

Onate, òn-yat-ät, JEAN, de; settler of New Mexico; b. at Guadalupe, Mexico, about 1555. He was a man of wealth and position, son of the founder of Guadalupe, and married to a granddaughter of the conqueror Cortés. His proposition to conquer and colonize the region N. of the Rio Grande was first accepted by the Viceroy Velasco in 1595; but delays ensued because Velasco's successor, Monterey, refused to give him full powers as governor. The objections were finally overcome, and Onate left Zacatecas Jan. 20, 1598, with 130 soldiers, a large force of Indians, 83 wagons, and 7,000 cattle. On Apr. 20 the expedition reached the Rio Grande, probably at El Paso del Norte. Onate crossed, and after some exploration founded San Juan, the first capital of New Mexico, in August. During the first year there were several conflicts with the Pueblo and other Indians, who were finally defeated; subsequently the colony prospered greatly. In 1599 and again in 1604 Onate explored portions of Arizona, following the Gila river to the sea in the latter year. There is evidence that he ceased to be governor about 1608, but the date of his death is unknown. Some accounts say that he led an expedition eastward in 1611. HERBERT H. SMITH.

Onawa: town; capital of Monona co., Ia. (for location, see map of Iowa, ref. 4-D); on the Sioux City and Pac., the Chi. and N. W., and the Green Bay, Winona and St. P. railways; 37 miles S. by E. of Sioux City. It is in an agricultural and stock-raising region, and has a public library (1867), a State bank with capital of \$50,000, and three weekly newspapers. Pop. (1880) 882; (1890) 1,358; (1895) 1,675.

Onchidium, òn-kid'i-üm [Mod. Lat., incorrectly formed from Gr. *ὄγκος*, angle]: a genus of slug-like pulmonate molluscs, noticeable chiefly from the fact that one of its Indian species has the whole dorsal surface covered with eyes formed on the vertebrate type. This species lives on the shore between tide-marks, and the eyes are supposed to enable it to escape the fishes which feed upon it.

Oncken, JOHANN GERHARD: missionary; b. at Varel, Oldenburg, Germany, about 1800; was in early life a domestic servant; lived for a time in England, where he became a member of an Independent church; opened a bookstore at Hamburg as agent of the Edinburgh Bible Society and the Lower Saxony Tract Society; organized a Baptist church, of which he became pastor 1834; was appointed a missionary of the American Baptist Convention 1835; visited many parts of Germany, Austria, Switzerland, and Denmark, preaching, baptizing, distributing the Scriptures, and founding churches; was several times imprisoned; edited religious journals in English and German; visited the U. S. in 1852 and in 1865. D. at Zurich, Switzerland, Jan. 2, 1884.

One'ga: a large lake in the government of Olonetz in Western Russia. Next to Lake Ladoga, it is the largest lake of Europe, covering an area of 4,830 sq. miles. It is connected with the Volga and the Dwina by canals, and communicates with Lake Ladoga by the Sweer. It abounds in fish. Onega is also the name of a river of Northern Russia not connected with the lake, but occupying the basin next E.; also of a town near the mouth of this river, and of the great bay of the White Sea into which this river empties. Revised by M. W. HARRINGTON.

Oneida, ò-nī-da: village; Madison co., N. Y. (for location, see map of New York, ref. 4-G); on the N. Y. Cent. and Hudson River and the N. Y., Ont. and W. railways; 26 miles E. of Syracuse. It is in an agricultural and hop-growing region, and contains a union school, 2 national banks with combined capital of \$165,000, a State bank with capital of \$50,000, a savings-bank, a private bank, several large manufactories, and 2 semi-weekly and 2 weekly periodicals. Pop. (1880) 1,649; (1890) 6,083.

Oneida Community: a society of religious communists, consisting of about 300 members, formerly established on Oneida creek, Madison co., N. Y. At the time of its dissolution in 1881 it owned a fine estate of 650 acres, also a commodious mansion, and several mills and manufactories. A smaller branch society was located at Wallingford, Conn.

History. The founder of this Community was JOHN HUMPHREY and the circle of believers he had gathered around him at Putney, Vt., devoted themselves at first exclusively to the development and publication of their religious views, and had no thought of becoming a community; but their intimacy of relationship and unity of faith

gradually led them to adopt the communistic manner of life. In 1846 they began the experiment of complex marriage, but this step gave such offense to their neighbors that the little Community was compelled to disband. In the following spring, however, in response to the invitation of another community, which had recently been started under the influence of the Putney school, the members of the latter were once more united on the banks of the Oneida creek. Here they were allowed to carry out their communistic views for nearly thirty years with comparative freedom from molestation. During the first seven or eight years of its existence poverty and apostasy several times brought the Community to the verge of failure; but by 1855 the members had become disciplined by hardship and labor, and a number of lucrative business enterprises had been started, the most important of which were the manufacture of game-traps and the packing of fruits and vegetables. As the project of maintaining an expensive publishing branch at Brooklyn, N. Y., had in the meantime, after three years' trial, been abandoned, the Community soon found itself settled upon a firm financial basis. During the next twenty years the Oneida Community formed a conspicuous feature in the social life of the U. S., and its prosperity, both domestic and financial, was unquestioned. Education was always one of the leading objects of the Community, and an opportunity for intellectual culture was afforded every member. The paper which for more than forty years was published as the organ of the society was a constant channel for thought and literary effort. Soon after 1873 the troubles began which led to its dissolution. The men and women who were admitted to membership after the prosperity of the Community had been assured were by no means so whole-hearted in their devotion to the cause of Christian communism as were those who had joined in the face of poverty and disgrace. Furthermore, some of the leaders among the young people had already begun to lose their faith in the religious principles which lay at the foundation of the Community polity, and consequently Noyes was, to a large extent, deprived of their support in the series of trials upon which the Community was about to enter. In the spring of 1879 the clergy of New York State convened at Syracuse for the purpose of initiating judicial and legislative proceedings against the Oneida Community, and in August of that year Noyes, who had withdrawn to Canada in consequence of threatened arrest, perceiving that it would be inexpedient to hold out further against the public sentiment of the State, wrote a letter to the Community proposing that the obnoxious social features of the institution be abandoned. This proposition was acceded to with scarcely a dissenting voice, and was carried out in good faith. The entire dissolution of the Community soon followed. On Jan. 1, 1881, the property was divided, and the members were incorporated under the laws of New York State as a joint-stock company, in which capacity they have since carried on the business of the old Community. The peace and equity which prevailed in the division of the Community estate may be largely ascribed to the influence of Noyes.

Religion.—In 1834, when the religious movement which culminated in the Oneida Community was started at New Haven, Noyes and his followers were called Perfectionists, in consequence of their belief that salvation from sin was attainable in this life; but soon other varieties of Perfectionists sprung up, whose doctrines and tendencies differed widely from those of the New Haven brethren, and the name ceased to be distinctive. The principal theological doctrine of Noyes and of the Oneida communists was that the second coming of Christ is already past, having taken place about the year 70 A. D. in connection with the destruction of Jerusalem by the Romans; and from this they argued that the primitive Church is now alive and accessible, and that it is able, by virtue of its own victory over sin and death, to accord the same victory to every true seeker after righteousness. They looked forward to a third coming of Christ at the end of the "times of the Gentiles," and expected that the final and general judgment of the world would then take place. In regard to the Godhead Noyes maintained that it consisted of two beings, the Father and the Son, whose relation to each other was analogous to that of man and woman. He taught that the devil had existed and sinned from eternity, and that God is in no way responsible for evil. In his doctrines concerning baptism, regeneration, and the functions of law and grace, Noyes was a close follower of St. Paul. In fact, his entire theological system was based largely on St. Paul's writings.

Social Organization.—All property in the Oneida Community was held in common, and the education and subsistence afforded to the members was considered a just equivalent for their labor. Hence no accounts were kept between the members, except such as might be kept between the members of any ordinary family. For government and discipline the Oneida communists relied chiefly upon the power of their religion, but for the better application of that power they devised a system of public censorship called by them "mutual criticism," which was found to work admirably as a substitute for the laws and penalties of ordinary society.

The social organization embraced also a scheme of "pan-tagamy," or complex marriage, which has often been wrongly confused with the practices of "free-lovers" and other licentious persons. In every essential particular wherein marriage morality differs from prostitution, viz., in respect to sacredness and permanence of union, care and provision for women and children, and the exclusion of irresponsible connections, the Oneida Community stood on the side of marriage. The mortality among the children born under this system between the years 1869 and 1878 was less than one-third that of the corresponding mortality in the U. S.

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G. W. NOYES.

Oneida Lake: a body of water in Oneida, Oswego, Madison, and Onondaga cos., N. Y.; 20 miles long and 6 miles wide. Its surface is 369 feet above the sea. It abounds in fish. It formerly, with its outlet, Oneida river, was the channel of an important navigation, but it is superseded by railways. The river is a deep, sluggish, tortuous stream, 18 miles long, with low banks. It falls into Oswego river.

Oneidas: See IROQUOIAN INDIANS.

Oneon'ta: village (settled in 1786, first schoolhouse built in 1790, first mill started in 1795, first church built in 1816); Otsego co., N. Y. (for location, see map of New York, ref. 5-H); on the Susquehanna river, and the Del. and Hudson Railroad; 60 miles N. E. of Binghamton, 82 miles W. by S. of Albany. It is the seat of a State normal school (burned and rebuilt at a cost of \$175,000 in 1894); has 7 churches, a State armory, a public library with over 4,000 volumes, 2 national banks, and a daily, a monthly, and 3 weekly newspapers, and contains the repair, car, and machine shops of the Del. and Hudson Railroad, 3 planing-mills, 2 foundries, 2 grain elevators, knitting-mill, and sash and door, piano, cigar, and shirt factories. Pop. (1880) 3,002; (1890) 6,272; (1894) estimated with suburbs, over 8,000.

EDITOR OF "HERALD."

Onesan'der [= Lat. = Gr. Ὀνήσανδρος]: a Platonic philosopher under Nero; the author of a *Στρατηγικὸς λόγος*, dedicated to Quintus Veranius, consul in 49 A. D., which treats of the duties of a commander, and the style of which is based on that of Xenophon. The work was first published in a Latin translation, often reprinted; the first edition of the Greek text was by N. Rigaltius (Paris, 1599); best editions by Schwebel (Nuremberg, 1762, fol.) and A. Köchly (Leipzig, 1860).

B. L. G.

Onion [from Fr. *ognon*, *oignon* < Lat. *u'nio*, *unio'nis*, a single large pearl, an onion, liter., unity, oneness (whence Eng. *union*), deriv. of *u'nus*, one]: a cultivated biennial herb and its bulbous foot, the latter composed of leaf-elements in a thickened condition; the *Allium cepa*, a plant of the order *Liliaceæ*, cultivated in Egypt and Asia from immemorial time, and thence introduced into nearly all civilized countries. The onion differs from the garlic especially in having the elements of its bulb disposed in concentric layers and not in separate cloves. Among the marked types are the potato onion, grown from off-set bulbs growing near the root, and the top onion, produced from similar bulbs growing at the top of the flower-stalk. Ordinary onions are raised in the first season from seed, or in the second year from the small *sets* or incompletely grown bulbs of the previous year's crop. The onion has an aromatic sulphur oil containing allyl. The bulb is highly nutritious. The crop requires a fertile soil, and clean culture, and as it is very



hardy it should be sown early. In medicine it is a stimulating expectorant, valued in domestic practice, especially in diseases of children. Revised by L. H. BAILEY.

Onomas'ticon: See DICTIONARY.

Onomatopœ'ia [Gr. *ὀνοματοποιία*, the creating of a name; *ὄνομα*, name + *ποιεῖν*, make]: the formation or modification of a word in imitation of a sound. The simplest and clearest cases of onomatopœia are contained in words which are direct names of sounds, as *hon-hon*, *ding-dong*, *bang*, *bar-wow*, *moan*, *con*, *baat*. Individual cases in which such words come to serve as verbs and nouns are undeniable; as *buzz*, *chuck*, *chuckle*, *hiss*, but they are so likely to become then conventional, and therefore to submit to the regular phonetic laws of the language, that it is necessary carefully to distinguish between words that are actively onomatopœic and such as are only historically so. For instance, the verb *cackle* was doubtless in its origin imitative, but comparison with M. Eng. *cakelen* and Low Germ. *käkeln* shows that it can not be wholly the result of recent imitative action. It is often impossible to determine whether such correspondences may not be due to independent imitative action in the separate languages; thus *boom*, *bum*, *bumble-bee*, *hum*, *hum-bli-bee*; cf. Germ. *hummeln*, *hummeln*, *summen* (also M. H. Germ.), *hummel* (O. H. Germ. *humbal*), "humble-bee," M. Eng. *humblebee*, Dutch *hommel*, etc. Words of this sort are generally so near their imitative source as to be continually subject to renewal. Such readaptation of historical material is distinctly an act of language-creation, and may well serve to illustrate the original processes in the generation of language; cf. differentiations like *crack*:*crash*, *cluck*:*clash*, *smack*:*smash*. The historical name of the *cuckoo*, O. Eng. *gēac* > M. Eng. *geke* (cf. dial. *gowk*): Germ. *gauch* < M. H. Germ. *gouch*: O. N. *gaukr*, has yielded in English to the more expressive *cuckoo*, older *cuccu*, which probably represents the Fr. *cucu*, *coucou*, and in Germ. *kuckuck*, a loan-word from Dutch *cuccūc*. Probably the French and perhaps the Dutch form is imitative, but in the light of forms in other languages, e. g. Gr. *κόκυξ*, Lat. *cuculus*, it is practically impossible to tell where borrowing leaves off and where direct imitation of sound begins. The material collected in the writings of Hensleigh Wedgwood, e. g. in the introduction to his *Dictionary of English Etymology* (3d ed. 1878), is confused and uncritical; the best introduction to the subject will be found in Paul, *Principles of the History of Language* (2d ed. 1886), chap. ix.

BENJ. IDE WHEELER.

Onondaga Indians: See IROQUOIAN INDIANS.

Onondaga Lake: a body of water in Onondaga co., N. Y. It is 5 miles long, 1 mile wide, and has a maximum depth of 65 feet, but its southern part is very shallow. Its waters are stagnant, and their level is 361 feet above tide. They flow into Seneca river. The lake has a natural puddling of marl, which keeps the brine of the Onondaga limestone from its waters. The lake was probably formed by the dissolving out of salt rock, and the subsequent falling in of the roof of the cavern thus formed.

Onosander: same as ONESANDER (q. v.).

Ontario (formerly UPPER CANADA): the wealthiest and most populous province of the Canadian Dominion. It received its present name in 1867, when it joined Quebec (formerly Lower Canada) and the two chief Maritime Provinces, New Brunswick and Nova Scotia, in the political union of the British North American provinces. It embraces an area of 222,000 sq. miles (2,350 water surface), extending from E. to W. fully 1,200 miles, i. e. between the meridians 74° and 95° W. of Greenwich, and N. and S. nearly 700 miles, or approximately from 42° to 53° N. lat. The older and more settled portions of the province, which date from 1791, are those which lie immediately N. of Lakes Erie and Ontario. As the country was opened up and the western waterways were utilized for commerce, settlement gradually took possession of undefined areas in a northwesterly direction. This territorial expansion was facilitated by the acquisition in 1868 of the vast area which for two centuries had owned the sway of the Hudson Bay Company. The northern and western limits of Ontario were without precise determination until 1878, when arbitrators, at the instance of the Dominion, in agreement with the provincial governments, made an award, which after a time was accepted by all parties interested, and settled the precise boundaries of the province. These are, on the E. and N. E., the Ottawa river, the Province of Quebec, and a line separating Ontario from

the Northeast Territory, running N. to Hudson Bay from Lake Temiscaming, close to the meridian 79° W.; on the N. and N. W., Hudson Bay, the waterways of the Albany river, Lake Joseph, and Lac Seul, and the English river to a point of intersection with the meridian line drawn from the northwest angle of the Lake of the Woods, on the U. S. boundary; on the S. W. and S., Rainy and Pigeon rivers, Lakes Superior, Huron, St. Clair, Erie, and Ontario, with their connecting waterways (the St. Mary, St. Clair, Detroit, and Niagara rivers), and the St. Lawrence.

Physical Features.—The physical conformation of the older organized sections of the province has little to distinguish it. Nowhere do the elevations exceed 1,000 feet. The Niagara escarpment extends from the Blue Mountains, on Nottawasaga Bay, to the Niagara river, and there is a slight elevation trending S. E. from the Georgian Bay to the St. Lawrence, thence into the State of New York. N. of this hydrographical basin of the St. Lawrence the aspect of the province is bolder and more rugged. Here the Laurentian Hills, trending northwestward, cross the province, though reduced now to a hummocky plateau, locally termed the Height of Land. This ancient ridge parts the waterways N. into Hudson Bay, E. into the Ottawa, and W. into Lakes Nepigon and Superior. Among the many interior lakes besides Nepigon, which is situate N. of Lake Superior, are Lakes Nipissing, Muskoka, and Simcoe, all E. of Georgian Bay.

Geology.—Geologically, Ontario partakes of the characteristics which belong to the area extending from the Atlantic coast to Lake Superior. It is composed almost entirely of rocks belonging to the Archæan and Palæozoic divisions. Throughout the later geological ages these rocks have remained exempt from important disturbance, but have been subjected to prolonged processes of denudation, so that the more resistant rocks form the higher points. E. of Kingston and Ottawa the surface is based on horizontal beds of Silurian rocks, generally limestones, and S. of a line drawn from Kingston to the northern part of Georgian Bay it is based on rocks of the Palæozoic age, but the series include strata as high as those of the Devonian period. The mineral-bearing area, which extends from Georgian Bay to Lake Winnipeg and northward, consists of Laurentian gneissic and granitic rocks, within which are many areas of plutonic and volcanic rocks, and of metamorphic slate of Huronian age. Overlying these occur the sedimentary and volcanic rocks of the Animike, Nepigon, and Keewanian group, whose nearly horizontal stratification contrasts sharply with the almost vertical older rocks upon which and against which they rest. In the upper Ottawa valley the lower and middle divisions of the Laurentides are overlaid unconformably by continuous and perfectly conformable series of sedimentary strata of the Cambro-Silurian system. Some of the clays abound in nodules holding remains of the seal, fishes, insects, shells, and plants. The great Huronian belt runs across the country from S. W. to N. E., and includes crystalline schists, breccias, conglomerates, argillites, and syenites, traversed by diabase dikes remarkable for their length.

Climate.—The summers are warm and the winters cold; but the cold is extreme only in the uninhabited northern portion, while even there the rigor is moderated by the snowfall and the absence of blizzards. In the populous parts of the province the cold is pleasant and bracing, while the snow is of much service to the lumberman as well as to the farmer. Of the length of the winters there is much popular misconception outside the province. Sometimes there is a late spring, but the average winter in the Ontario peninsula is not more than three months long. At Toronto the "close" season for navigation is usually from Dec. 15 to Mar. 15. The following table indicates the extremes of the provincial climate in widely separate sections:

PLACES.	Latitude.	Longitude.	Elevation above the sea.	MEAN TEMPERATURE.	
				Summer (July).	Winter (Jan.).
Godsburch (Lake Huron)	43-45	81-43	228	67.5	21.0
Port Arthur (head of Lake Superior)	48-27	89-12	611	58.0	10.0
Ottawa (Ottawa river)	45-26	75-42	300	65.3	18.0
Toronto (Lake Ontario)	43-39	79-23	336	64.0	24.6

Note.—The summer temperatures are taken from the months of July, August, and September, and those of the winter from December, February, and March.

The precipitation (rain and snow) for the year 1892 in three of the above places was as follows: Port Arthur, rain 16.06, snow 26.8 inches—total, 18.74; Ottawa, rain 23.10, snow 106.0—total, 33.70 inches; Toronto, rain 25.28, snow 42.2—total, 29.50 inches.

Soil and Products.—Over 100,000 sq. miles is still in forest, though in the older districts the woodland is chiefly young or second-growth timber—spruce, maple, and pine. Of the 23,000,000 acres of occupied and assessed land, about one-half is cleared, over 8,000,000 acres are woodland, and nearly 3,000,000 acres are marshes. Of the cleared land, 8,000,000 acres are under crop, 2,500,000 acres are in pasture, and nearly 200,000 acres are devoted to orchards and gardens. The soil and the climate admit of the cultivation of nearly all the useful food grains and roots, and of many marketable fruits. The following figures give the area and yield (in bushels) of the chief grain and root crops, and the hay yield (in tons) for the year 1893. The average yield for the years 1882-93 inclusive is appended:

CROPS.	1893. AVERAGE YIELD FOR 1882-93.			
	Acres.	Yield.	Per year.	Per acre.
Fall wheat	913,954	17,545,248	18,219,174	20 0
Spring wheat	356,721	4,186,063	8,442,203	15 2
Barley	467,315	9,806,088	17,964,493	25 7
Oats	1,936,644	58,584,529	58,954,051	34 6
Peas	738,741	14,168,955	13,979,163	20 4
Potatoes	142,601	12,911,212	17,800,655	115 9
Turnips	136,604	56,975,335	45,860,817	418 0
Hay and clover.	2,766,894	4,963,557	3,364,644	1 43

The fruit crop for all but the hardier fruits is somewhat precarious, except in the Niagara district, where the peach is grown to fair perfection. Apples are usually a fine and profitable crop throughout the older parts of the province, as are cherries and plums, while strawberries, grapes, and small fruits are raised in great abundance in the Lake Erie and Lake Ontario counties. The forests and woodlands have contributed considerably to the exports of the province, besides affording material for some of its important industries. Now they are chiefly valuable to the crown for the revenue derived from timber dues and the rents accruing from leases to lumbermen. Where the timber limits are sold outright, the revenues will in future years shrink in value.

Mineral Resources.—The mineral wealth of Ontario is large, though economic conditions have hitherto not been favorable to its development. The chief exports of mineral ore have been to the U. S., and the duties imposed by that country have largely handicapped the industry. The area richest in minerals is that stretching from Sudbury district, in the neighborhood of Lake Nipissing, W. to Port Arthur, at the head of Lake Superior, and on to the Lake of the Woods. Within this region are gold, silver, copper, nickel, iron, galena, plumbago, and zinc ore, mica and apatite, besides large deposits of granite, marble, and freestone. W. of Port Arthur is an argentiferous region of great richness. Many of the central and eastern counties also are rich in most of the metals named, and also in phosphates and other mineral fertilizers. In the western peninsula are salt, petroleum, gypsum, and materials for building, including large deposits of clays for terra-cotta and pressed brick. The value of the mineral products of the province for 1893, exclusive of the yield from the precious metals, was about \$6,000,000, one-third of which was expended for labor. Of this amount, \$2,700,000 represents the value of the building-stone mined during the year, including rubble, lime, cement, pottery, brick, and tile. A like amount represents the value of salt, petroleum, and natural gas. Nickel and copper were mined to the value of \$570,000. The yield of gold and silver was trifling, silver-mining having been practically abandoned, in consequence of the general depreciation of the metal, while the gold-mining engaged in was mainly of a testing and prospecting character.

Live Stock.—Ontario has paid special attention to the breeding of carriage and saddle horses, and care for the sanitary condition of cattle has enabled shippers to command good prices in Great Britain, as well as to save themselves the annoyance of embargoes. The total value of the live stock in the province in 1892 was estimated at \$117,500,000, while sales within the year amounted to \$32,500,000. The total value represents 688,814 horses, 2,029,140 cattle, 996,974 hogs, 1,850,473 sheep, and 7,078,973 turkeys, geese, and other fowl. The wool trade increases steadily,

the total clip for 1892 amounting to over 5,500,000 lb., the average weight per fleece in the Lake Ontario counties reaching 6.22 lb. The cheese and butter industries show a like advance. Bee-culture is also a growing industry, and honey has become a considerable source of revenue.

Population (including races and religion).—The population of Ontario in 1891 was 2,114,321, or more than half that of the Dominion W. of the Maritime Provinces. Of this number 1,708,702 are native born, 329,037 are British subjects (chiefly English, Scotch, and Irish), while 23,440 were born in Germany, and 42,702 in the U. S. The increase in population since 1881 has been slight, the province having lost heavily by emigration to the U. S. and the Canadian Northwest. Classified by religions, there were 647,518 Methodists, 452,712 Presbyterians, 385,999 members of the Church of England, 358,300 Roman Catholics, 96,969 Baptists, 45,029 Lutherans, 16,879 Congregationalists, and 10,320 members of the Salvation Army.

Divisions.—Ontario is for municipal purposes divided into 42 counties and 6 provisional districts. The former are comprised within the older organized sections of the province; the latter (Muskoka, Parry Sound, Nipissing, Algoma, Thunder Bay, and Rainy River) extend northward from the northern provisional counties to the prairie Province of Manitoba. Ninety-two electoral divisions return each a member in the Provincial Legislature, which consists of but one Chamber.

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* Ref.	Pop. 1891.	Pop. 1891.	COUNTY-TOWNS.	Pop. 1891.
Brant	5-D	33,869	36,445	Brantford	12,753
Bruce	3-C	65,218	64,603	Walkerton	3,061
Carleton	2-H	64,103	77,630	Ottawa	44,154
Dufferin	4-D	22,093	22,311	Orangeville	2,962
Dundas	2-I	20,598	20,132	Cornwall †	6,790
Durham	4-E	36,265	32,427	Port Hope	5,042
Elgin	5-B	42,361	43,377	St. Thomas	10,366
Essex	6-A	46,962	55,340	Sandwich	1,352
Frontenac	3-G	42,384	47,009	Kingston	19,264
Glenarry	2-I	22,231	22,447	Cornwall †	6,790
Grey	3-C	70,539	71,214	Owen Sound	7,497
Haldimand	5-D	24,980	23,440	Cayuga	822
Haliburton	2-E	5,911	6,350	Minden	1,182
Halton	4-D	21,919	21,982	Milton	1,450
Hastings	3-F	55,061	59,084	Belleville	9,914
Huron	4-B	76,526	66,781	Goderich	3,339
Kent	6-B	54,310	58,904	Chatham	9,052
Lambton	5-B	52,034	57,925	Sarnia	6,693
Lanark	2-H	33,975	37,725	Perth	3,136
Leeds and Grenville	3-H	61,175	60,888	Brockville	8,793
Lennox and Addington	3-G	26,484	24,750	Napanee	3,433
Lincoln	5-D	31,573	30,079	St. Catharines	9,170
Madison	5-B	93,081	92,344	London	31,977
Norfolk	5-C	33,527	30,992	Simcoe	2,674
Northumberland	3-F	41,123	38,035	Cobourg	4,829
Ontario	3-E	48,812	45,355	Whitby	2,786
Oxford	5-C	50,159	49,849	Woodstock	8,612
Peel	4-D	26,175	24,871	Brampton	3,252
Perth	4-C	53,693	51,716	Stratford	9,501
Peterborough	3-F	30,472	34,597	Peterboro	9,717
Prescott	1-I	22,857	24,173	L'Orignal	1,002
Prince Edward	3-G	21,044	18,889	Pictou	3,287
Renfrew	1-G	38,166	46,976	Pembroke	4,401
Russell	2-I	13,080	18,289	Russell	3,918
Simcoe	3-D	74,803	82,727	Barrie	5,550
Stormont	2-E	23,198	27,156	Cornwall †	6,790
Victoria	3-E	39,655	32,991	Lindsay	6,081
Waterloo	4-C	43,740	50,464	Berlin	7,425
Welland	5-E	31,771	30,631	Welland	2,035
Wellington	4-C	64,632	59,371	Guelph	10,539
Westworth	5-D	66,952	77,114	Hamilton	48,980
York	4-D	153,113	245,101	Toronto	181,220
DISTRICTS.				CHIEF TOWNS.	
Algoma †				Sault Ste. Marie	2,567
Rainy River †	6 H	24,014	41,856	Rat Portage	1,806
Thunder Bay †				Port Arthur	2,698
Muskoka †	2 D	14,391	17,651	Bracebridge	1,419
Nipissing †	1-E	2,090	13,163	North Bay	1,937
Parry Sound †	1 D	12,813	19,167	Parry Sound	1,982
Totals		1,926,922	2,214,321		

* Reference for location of counties, see map of Ontario.

† Provisional districts with county organizations.

‡ Cornwall, in Stormont Co., is the county-town for the three counties of Dundas, Glenarry, and Stormont.

Cities.—The population of the 12 cities in 1891 was as follows: Toronto, 181,220; Hamilton, 48,980; Ottawa, 44,154; London, 31,977; Kingston, 19,264; Brantford, 12,753; Guelph, 10,539; St. Thomas, 10,366; Windsor, 10,322; Belleville, 9,914; Stratford, 9,501; St. Catharines, 9,170.

Government.—The administration of provincial affairs is

intrusted to an executive and a legislative assembly, which together form the parliament of the province, with a lieutenant-governor, who is advised by a cabinet, composed of eight members. Toronto is the seat of the Provincial Government. The Executive Council comprises the Attorney-General (Premier), Commissioner of Crown Lands, Commissioner of Public Works, Minister of Education, Minister of Agriculture, Treasurer, Secretary, and Registrar, and another cabinet officer without portfolio. The Legislature has by law a duration of four years, unless sooner dissolved by the lieutenant-governor. It is governed by the constitutional principles which guide the Federal Government and parliament at Ottawa, and has exclusive jurisdiction in questions relating to property and civil rights, education, municipal government, and all other matters of local concern. Matters of a general character are under the jurisdiction of the Dominion authority and parliament, in the latter of which Ontario is represented by 24 members in the Senate, appointed by the crown, and by 92 members in the Commons, elected by the people. The higher legal machinery of the province is grouped under the Supreme Court of Judicature for Ontario. This court is divided into two branches—the court of appeal and the high court of justice. The latter is again subdivided into the three divisions—queen's bench, chancery, and common pleas courts. The judges are appointed by the Dominion Government. Toronto is the seat of the higher courts.

Education.—In 1891, of the adult population of the province only 3.83 per cent. were unable to read and 5.20 per cent. were unable to write. Though separate schools continue to be recognized and aided by the province, the educational system is in the main unsectarian, and the public schools are free to all. The chief source of the school maintenance is local taxation, aided by Government grants from the public chest. In 1892 the province expended over \$4,000,000 upon public schools alone. These were 5,889 in number, with an enrollment of 485,670 and an average attendance of 253,830. In charge of these schools there were 8,480 teachers (5,710 female and 2,770 male), the average salary being \$297 for the former and \$421 for the latter. Of Roman Catholic (separate) schools, there were in 1892 312, with 37,466 pupils and 662 teachers. Besides the public schools, the province maintains 128 high schools, of which 35 are collegiate institutes, employing in both 522 highly qualified teachers, with a registered enrollment of 22,837 pupils and an average attendance of 13,448. There are also 69 teachers' institutes, 2 well-appointed normal schools (one in Toronto and one in Ottawa), besides a number of city and county model schools, a school of pedagogy, a provincial agricultural college and experimental farm, and a school of practical science. In addition to all these the province gives aid to a number of industrial schools and eleemosynary institutions, and maintains schools for the blind and the deaf and dumb. It also gives legislative aid to mechanics' institutes, free public libraries, and art schools. The entire school system is under the administration of a department of the Provincial Government, at the head of which is the Minister of Education. School boards, under the supervision of the provincial department, are intrusted with the local administration.

At the head of the educational system of the province stands the national institution, Toronto University and College. This institution has dual functions, viz.: (1) An examining and degree-conferring body, governed under the crown by a board of trustees, senate, and convocation; and (2) a teaching body, directed by a university council, composed of the president and professorial staff. Since 1850 it has been undenominational and has attracted toward it, under the University Federation Act, a number of theological colleges, schools of medicine, of science, of music, agriculture, dental surgery, and pharmacy, which take advantage of its comprehensive art course, laboratory work, etc. The affiliating denominational colleges are Victoria University (Methodist), Knox College (Presbyterian), St. Michael's College (Roman Catholic), Wycliffe College, and Huron College (Episcopalian).

The other colleges of the province are Queen's University, Kingston (Presbyterian); McMaster University, Toronto (Baptist); Trinity University, Toronto (Episcopalian); Woodstock College (Baptist), Alma College, St. Thomas; Albert College, Belleville; and Upper Canada College, Toronto. The last named, an old historic residential school for boys, was founded by Sir John Colborne in 1829 upon the model of the great public schools of England.

Railways and Canals.—The province has been liberal in its subventions for the construction and equipment of local railways. The total railway mileage of Canada in operation in 1893 was 15,020 miles, about half of which run through Ontario. The characteristics of the vast inland navigation of Canada have necessitated canals over many of its waterways. The Dominion Government has undertaken the construction of a new canal on the St. Mary river, to give access to Canadian traffic in its passage in and out of Lake Superior. The existing canals of the St. Lawrence system, which lie almost wholly within the province, are over 70 miles in length; the total height directly overcome by locks is 533 feet. The available depth, with the exception of that in the Welland Canal, is (1894) limited to 9 feet. The Murray Canal connects the Bay of Quinte and Lake Ontario. The Rideau Canal, which connects the Ottawa river with Lake Ontario, was undertaken at an early period for military purposes. The U. S. has reciprocal privileges over the Canadian canal system, and utilizes it largely as against the privilege Canada enjoys in the railway bonding system over U. S. territory.

Finance.—Ontario, unlike the other provinces of the Dominion, has no debt, if we except subventions to local railways to the extent of \$1,401,598, a liability which has a period of forty years for its redemption. What debt she had, as a partner with Quebec in the old Province of Canada, was assumed by the Dominion at confederation. Under the arrangement by which the province entered the union, Ontario receives an annual subsidy from the Federal Government of \$1,196,873, and had in 1893 a surplus of assets over liabilities presently payable of \$6,135,480. The indebtedness of the municipalities amounted in 1890 to nearly \$50,000,000, with assets slightly in advance of this sum.

Commerce and Business Interests.—So far as can be known, the trade of the province for the year 1893 was as follows: Exports, \$33,850,873; imports, \$48,243,756; duty paid on the latter, \$8,661,581. (These figures can be only approximately correct, since much of the provincial export and import trade passes through the ports of Montreal, Quebec, and Halifax, and no separate record is kept of it.) The two chief customers of the province are the U. S. and Great Britain. There are 76 loan, building, and investment companies, with a subscribed capital of over \$80,000,000, doing business in Ontario. Of the 39 banks making returns to the Federal Government on Jan. 1, 1893, 10 had their headquarters in Ontario. At that date the total liabilities of the 39 banks amounted to \$217,195,975, and the total assets to \$302,696,715. The crisis in banking and commercial circles in the U. S. in 1893 was little felt in Ontario, owing to the conservative efforts put forth by Canadian banking and monetary men to strengthen their financial resources and act cautiously with regard to credits. Ontario has a large export and domestic trade in manufactures of all kinds, including agricultural implements, machinery, edged tools, musical instruments, sewing-machines, besides woolen goods, tweeds, cottons, undressed furs, leather goods, woodenware manufactures, etc.

History.—Canada, even long after the conquest, had but a mere fringe of settlement along the St. Lawrence and the Bay of Fundy. Adventurous spirits, however, had probed the waterways to the far West and the region that, after the passing of the Constitutional Act of 1791, was to become a new colony of the crown, as yet an almost unbroken wilderness. The close of the Revolutionary war brought bands of Loyalists into the country, and these located themselves partly in Acadia in the E., and partly along the upper St. Lawrence and about the mouth of the Niagara river in the W. To give the western-settling Loyalists a country and a home, the British Government divided Canada into two provinces, Western or Upper Canada being set off from the old French province on the St. Lawrence, the Ottawa river forming a rough dividing-line. Gen. Simcoe, an old Revolutionary campaigner, was sent out as lieutenant-governor, and established his seat of Upper Canada government for a time at Niagara, where the first parliament of the province met, and afterward at York, which subsequently resumed its old Indian name of Toronto. Toronto was founded in 1793, and has since, with an occasional brief interruption, been the provincial capital. The war of 1812 bore hardly upon the fortunes of the province, and it was also hindered by its long battle against the paternalism of the mother-country, or rather against the tyranny of a bureaucratic colonial executive, which stood in the way of progress and the attainment of responsible government. The union of

the two Canadas, which occurred in 1841, proved unfortunate, for to the strife of political factions was added a war of races which made legislation impossible and brought about political deadlock. The solvent was confederation, which took place in 1867, and made Upper Canada (now Ontario) a self-governed province of the Dominion. Territorial expansion brought advancement, not only political and economical, but intellectual and social as well.

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G. MERCER ADAM.

Ontario, Lake: the easternmost and smallest of the Great Lakes drained by the St. Lawrence. Its area, as determined from the maps of the U. S. Lake Survey, is 7,104 sq. miles; another estimate from the same data gave an area of 7,240 sq. miles. The hydrographic basin, including the lake surface, has an area of 30,790 sq. miles. The mean elevation of the surface of the lake is 247 feet above sea-level, and 326 feet lower than the surface of Lake Erie. The maximum depth is 738 feet. The lake is 190 miles long and 55 miles wide. Its discharge is estimated at 300,000 cubic feet per second. As is the case with all large lakes, it is subject to fluctuation of level, due to annual variation in rainfall and evaporation, to secular climatic changes which are irregular both in amount and in time, to changes in the direction and force of the wind, and to variations in atmospheric pressure. The amount of these various oscillations have not been studied in Lake Ontario, but are believed to have a mean range of 5 or 6 feet, with the exception of local changes due to strong winds, which may be 10 or 15 feet. Lake Ontario is connected with Lake Erie by the Welland Canal and with Montreal by the St. Lawrence, which can be descended by steamers, the return being accomplished by means of a series of canals. The lake seldom freezes except near the shore, and is the highway of an extensive commerce. For a sketch of the later geological history of the Great Lakes, see ST. LAWRENCE RIVER.

I. C. RUSSELL.

Ontogeny [from Gr. *ὄν*, *ontos*, being + *γεν-*, produce]: a term introduced by Haeckel, and now in general use, for the development of the individual, as opposed to phylogeny or the development of the race. See MORPHOLOGY and EVOLUTION.

Ontology [Gr. *τὰ ὄντα*, the things that exist (neut. plur. of *ὄν*, *ontos*, pres. partic. of *εἶναι*, be) + *λόγος*, reason, discourse]: the science of being in general or of the essence of things. It is sometimes identified with metaphysics, but usually is made one of its divisions, and co-ordinate with rational psychology, cosmology, and theology, according to the nomenclature of Wolf, who established this fourfold division of metaphysics. The Aristotelians and the Scholastics treated under physics the problems of rational cosmology, and under metaphysics those of ontology. Aristotle called the latter (metaphysics) *πρώτη φιλοσοφία*, and included under it also theology. His *De Anima*, or at least the portions of the third book that treat of reason (*νοῦς*), may be regarded as the first work (and as still the best, according to some) on rational psychology, but psychology was generally classed among the natural sciences by his followers. Logic, however, as treating of the mere forms of thought, should belong under rational psychology, and be contrasted with ontology, which treats of real being and of the essence of things: (a) of being, as quality, quantity, infinite and finite, etc.; (b) of essence, as identity and difference, form and matter, ground and sequence, noumenon and phenomenon, cause and effect, substance and attribute, possibility and necessity, and similar relations. The general problem of ontology is to find the highest principle, or that which is true in and for itself—the Absolute. Inasmuch as psychology, with the problem of certitude, has come to the front rank in modern philosophy, it has happened that the latest systems of ontology, notably those of Germany since Kant, have striven to unite ontology with psychology, and thus create an ontological logic which should give the *a priori* laws and conditions of thought and being. Kant's work was negative in this respect, and denied the possibility of

knowing things in themselves, hence of all ontology; it confined all *a priori* knowledge to the forms of the mind, and made all objects of knowledge subjective and phenomenal; but since he included among these subjective forms of the mind such universal, logical conditions of existence as time and space, quality, quantity, relation, and mode—these categories being the *a priori* conditions of existence for us—it was possible to construct a science of ontology within the subjective or psychological province. In fact, no room was left for the possibility of objective being outside of mind. Hence arose the systems of Schelling and Hegel and their followers, whose ontology is based on psychology. See PHILOSOPHY, HISTORY OF.

WILLIAM T. HARRIS.

Onychophora [Mod. Lat., from Gr. *ὄνυξ*, *onychos*, claw + *φορῆς*, bearing]: a group of animals, containing the single genus *Peripatus*, of very doubtful position. First described as a mollusc, it was later transferred to the worms, and upon the discovery by Moseley (1875) of the existence of tracheæ it was elevated to a class—*Protracheata*—and regarded as the ancestor of all true insects. The genus *Peripatus* occurs in South and Central America, in the West Indies, at the Cape of Good Hope, and in Australia and New Zealand, a distribution which indicates great antiquity. The animal, which has a length of an inch or two, has a worm- or caterpillar-like body, with distinct head and a varying number of pairs of fleshy feet, each terminated with a double claw. On the head are a pair of eyes, a pair of antennæ, and a pair of horny jaws. The greatest interest pertains to its internal structure. The nervous system consists of two widely separated cords connected by the brain in front and a supra-intestinal loop behind and numerous cross bands in the body. The alimentary canal is straight; respiration is effected by numerous bunches of tubular air-tubes (tracheæ) scattered over the surface. Instead of the excretory tubes (*vasa Malpighii*) of ordinary insects, excretory products are removed by means of segmentally arranged nephridia like those of Annelids. The animals live in decaying wood, and for protection secrete an enormous amount of slime from a pair of slime glands opening on either side of the mouth. The young are born alive, but the different forms present great differences in their development. As will be seen, in some features the *Onychophora* resemble the true insects (Hexapods), while in others they present features not found elsewhere outside of the group of Annelids. For a general account of anatomy, development, and classification, see Sedgwick, *Quarterly Journal Micros. Science* (1885-88).

J. S. KINGSLEY.

Onychoteuthidæ [Mod. Lat., named from *Onychoteuthis*, the typical genus; Gr. *ὄνυξ*, *onychos*, claw + *τεῦθίς*, cuttlefish, squid]: a family of cuttlefishes (Cephalopods), embracing some of the squid, in which the eye has a sinus above and the water bathes the lens. On the New England coast, N. of Cape Cod, one member of the family, *Ommastrephes illicebrosa*, is the most abundant squid, and is caught in large quantities as bait for codfish.

Onyx, *ō'nix* [= Lat. = Gr., a veined gem, liter., finger-nail]: a variety of chalcedonic quartz, composed of parallel layers of chalcedony of some shade of brown, green, red, or other color alternating with layers of white. When the red is a rich brownish-red chalcedony (*sard*) and the white bands pure and translucent, the variety is known as *sardonyx*; when quartz and gray chalcedony are in combination, *chalcedonyx*; when the ground is black and the bands are very thin and grayish white, *onicolo*. The varieties of onyx were highly prized by the ancients for the manufacture of cameos, one of which, said to be the largest known, measuring 11 inches by 9, is preserved in the Museo Borbonico at Naples; other great cameos are at Vienna, in the British Museum, and in the Bibliothèque Nationale, Paris. Onyx is now much used in jewelry, but nearly all modern onyx is the result of artificial staining or dyeing. *Mexican onyx*, so called, is like aragonite, being essentially a carbonate of calcium containing small quantities of iron and manganese, to the distribution of which are due the beautiful variegated colors for which the stone is so much admired. Its hardness is 3, its specific gravity 2.9. It is formed on the floors of caves, being the result of a deposition of calcareous waters, either cold or hot, between the successive layers of which the iron and manganese is deposited. It was used by the ancient Mexicans, who carved it into masks, idols, and a variety of objects, but was first brought to general notice at the Centennial Exposition at Philadelphia in 1876, where a magnificent series of specimens was shown by the Mexican commission.

On account of the softness of the material it can be readily carved with a knife, and at Puebla and other places in Mexico is extensively worked into trays, crucifixes, inkstands, fruit, fish, and other natural objects, many of the latter being copied with remarkable skill in the representation both of form and color. The so-called *mosaic agate* is, properly speaking, a ruined aragonite, the original material having been broken up into irregular pieces and recemented by a secondary deposition of Mexican onyx. See AGATE and CHALCEDONY.

Revised by G. F. KUNZ.

Oölite [Gr. *ὄον*, egg + *λίθος*, stone, modified by confusion with ending *-ite*]: See LIMESTONE.

Oöphore: See FERNWORTS.

Oosterzee, ȯs'ter-zā, JAN JACOB, van: theologian; b. at Rotterdam, Holland, Apr. 17, 1817; studied theology at Utrecht, and after holding prominent pastorates he became professor there in 1862. D. while on a visit at Wiesbaden, July 29, 1882. He led the evangelical party in Holland. Of his numerous writings several have been translated into English, among which are *The Image of Christ as represented in Scripture* (3 vols., 1855-61; London, 1874); *Theology of the New Testament* (1867; London, 1870); *Christian Dogmatics* (1870-72; London, 1874); *Year of Salvation* (1874); *Moses* (1876); *Practical Theology* (1878).

Revised by S. M. JACKSON.

Opah: See KINGFISH.

Opal [from Fr. *opale*; Lat. *opalus*, from Gr. *ὀπάλλιος*, opal]: a gem consisting of natural silica and containing some water, sometimes up to 11 per cent. It is never crystallized, but always amorphous, with a marked conchoidal fracture. Several varieties are recognized, of which *precious* or *noble opal* is the most highly prized. Its value arises from its remarkable and exquisite play of colors. The general aspect is whitish or milky, and the opalescence consists of countless gleams of many-colored light or "fire." A more transparent variety, with broader reflections of color—red, yellow, blue, green, or violet—is more brilliant, though less highly valued as a gem, and is known as *fire-opal* or *girasol*. Black opals are almost invariably the result of an artificial staining of a poor white opal. The name *lechosos* is given to those showing much green light, and *zeasite* to those that have much red. The noble and the fire opal are the only kinds used in jewelry. Other varieties of various colors, but lacking the opalescence, are *common opal* (translucent), *semi-opal* (nearly opaque), and *wood-opal* or *opalized wood*, which is formed by the replacement of wood by silica in solution, and sometimes occurs in considerable amount in the form of fossil tree-trunks, etc., like agatized and jasperized wood. Opal occurs in igneous rocks—amygdaloidal, trachytic, and porphyritic—and the wood-opals, etc., in regions of hot siliceous springs derived from volcanic rocks. The finest noble opal has been mined for a long time in trachyte near Dubnik, Hungary, and of late abundantly in a jaspery ironstone on the Barecoo river in Queensland, Australia, and near Wilcannia, New South Wales; also in amygdaloid near Colfax, almost on the State line of Washington and Idaho. Mexico and Honduras yield very fine fire-opal in trachytic rock, also the Queensland locality above named, and Oregon. See HYALITE. GEORGE F. KUNZ.

Opeli'ka: city; capital of Lee co., Ala. (for location, see map of Alabama, ref. 5-12); on the Cent. of Ga. and the West. of Ala. railways; 28 miles N. W. of Columbus, 66 miles E. N. E. of Montgomery. It is in a grain and cotton-growing region, annually handles large quantities of cotton, dry goods, and groceries, has several large cotton-warehouses, flour-mills, and other industrial establishments, and contains a national bank with capital of \$75,000, a State bank with capital of \$100,000, and a daily and a weekly newspaper. Pop. (1880) 3,245; (1890) 3,703.

Opelousas: town; capital of St. Landry parish, La. (for location, see map of Louisiana, ref. 10-D); on the S. Pacific Railroad; 45 miles W. by N. of Baton Rouge. It is in a cotton, rice, corn, and stock raising region, and contains the Academy of the Immaculate Conception (Roman Catholic), a State bank with capital of \$50,000, and three weekly newspapers. Pop. (1880) 1,676; (1890) 1,572.

Opera [= Ital., liter., work, composition < Lat. *o'pera*, neut. plur. of *opus*, work]: a drama which is sung with accompaniment of instrumental music. Dramas occasionally interspersed with songs to familiar airs are called *vaudevilles*; dramas occasionally accompanied by instrumental music are called *melodramas*. On its dramatic side the form of the

opera does not differ widely from that of the spoken drama. Inasmuch, however, as it is to be sung, the text of an opera, the *libretto*, must be of much smaller extent than that of an ordinary drama.

It is on its musical side that the opera presents its most clearly marked peculiarities of form. There are, or at least were until the time of Wagner, several sharply distinguished forms which serve to make up the vocal part of the composition. The chief of these are the recitative, aria, duet, trio, and chorus. The recitative is the least elaborated musical form of the opera, and is designed for the more rapid prose passages of the dialogue, as opposed to the finished lyrical parts. It is not, strictly speaking, melody at all, but the voice moves through a few notes only, including frequent chromatic intervals, and having little unity of key or tonality. Moreover, there is no clear division of time, such as is secured by the division into bars, but the series of notes proceeds with abruptly changing movement, divided merely by a few strongly accented resting-points. The aria is a theme for a solo voice, being a complete melodic subject, and having divisions of strophe, verse, etc. Duets and trios (*duetti*, *terzetti*) are combinations of two or three voices in a complete melodic subject. In addition to these there are the ensemble pieces, in which all the principal actors and singers (commonly from four to six in number) unite in some harmonized strain. The finale is an example of an ensemble movement. Lastly, there is the full mass of harmonized voices as given in the chorus. In this the several parts are each rendered by a number of voices, supplied by a band of subsidiary actors specially set apart for this purpose. The instrumental part of operatic music requires a large orchestra to render it adequately.

The opera is pre-eminently a modern art, being developed, as might be expected, later than the simple forms of modern music itself. It grew up in Italy at the beginning of the seventeenth century, during the period of the Renaissance, and when polyphonic music had pretty well exhausted its resources, and a basis had been laid by Palestrina for our present system of harmony. It was in Florence, about the year 1600, that the first opera appeared. Certain patrons of art set themselves in the spirit of the Renaissance to rediscover the vocal music of the Greek drama, and by the help of certain singers and composers, among whom were Caccini and Peri, they invented recitative as the nearest representative of Greek dramatic intonation. This first opera, the earliest known example of which is a piece entitled *Eurydice*, composed by Peri, consisted of recitative, or, as the Italians called it, *aria parlante*, choruses, a few duets and trios, together with instrumental prelude and interludes. This early recitative has more of equal-time division than our present mode. For fifty years this opera remained the luxury of nobles, being performed only before courts during special festivities; after that it gradually became a popular entertainment. The instrumental part of the opera was greatly improved by Monteverde, who added the overture (*toccatà*). Later in the century the melody of the aria was enriched by two composers named Cavalli and Cesti. It was indeed in connection with the opera that our modern style of melody developed itself. Before the invention of this new form of art music had consisted almost exclusively of skillful combinations of distinct themes in intricate contrapuntal arrangements, with little regard to harmony and no thought of a single ruling melody. The opera, by stimulating solo-singing and by reviving a taste for the beauties of popular melody, supplied the necessary incentive for the elaboration of sweet-sounding and finished melodic themes. In the following (the seventeenth) century A. Scarlatti clearly marked off the aria from the recitative, and gave it the triple division which it retained for nearly a century. The later Italian operas—namely, the works of Piccini, Paisiello, and Cimarosa—do not display any great change of style. In the works of Verdi, however, covering as they do a period of many years, we find a marvelous progress and development. (See VERDI.) Later, a young composer named Pietro Mascagni attracted the attention of the world as the representative of young Italy, plainly showing the influence of Wagner. His first great success was with the one-act opera *Cavalleria Rusticana* (Rustic Chivalry, 1890).

In France the earliest operas, those of Lulli (end of the seventeenth century) and of Rameau (beginning of the eighteenth century) were little more than imitations of the Italian style. The basis of French opera was laid by Gluck (1773-87), who set himself to rectify the evils of the existing Italian opera by confining the exercises of the vocal art

within due limits, and by bringing into greater prominence the dramatic character of opera. He shortened the aria-form, expunged the numerous bravura passages with which it was laden, and reduced the number of airs in the opera by elevating the recitative to a higher rank, rendering it richer in a musical aspect and more impressive dramatically. Gluck also greatly improved the quality of the operatic chorus, making it a more conspicuous element of the opera, and added to the instrumental part, seeking to bring it into closer unity with the dramatic subject. The French classic opera ("grand opera") after Gluck scarcely fulfills the expectations raised by such an admirable foundation; but it must be admitted that the French school has always been faithful to the teaching of Gluck in seeking to do justice to the dramatic claims of opera. The French recitative is characterized by great energy and freedom of movement, and admirably adapted to dramatic effect. Among those composers who have written solely or mainly for the French stage are Méhul, Cherubini, Spontini, Meyerbeer, Rossini, Gounod, and Thomas. Perhaps, however, it is in the lighter style of opera that the French have excelled. The early vaudeville, which is the forerunner of the *opéra bouffe*, was light, graceful, and piquant. Rousseau's *Le Devin de Village* is a good example of this genre. The first composer of the *opéra comique*, strictly so called, was A. F. Boieldieu. Other writers of this lighter style of French opera are Hérold, Halévy, Auber, Adam, and Offenbach. The modern French opera composers, Massenet, Saint-Saëns, Bizet, etc., are really to be classified with the modern German school, so far as the harmonic treatment of their various works is concerned, and also their modes of orchestration.

In Germany, until the rise of Wagner, the opera was marked by less of national originality than in France. Keiser did little more than carry out Italian traditions, and Mozart was the first great opera-writer in Germany. He united Italian sweetness of melody with German richness and depth of harmony, and his operatic music, as pure music, has never been equaled. Passing by Beethoven's *Fidelio*, we find that the German opera after Mozart sank for a while to a low ebb. The one worthy attempt to raise its character came from the romanticists—namely, Spohr, Weber, and Marschner—who sought to give a national tone to German opera by taking half-legendary subjects from early German history. To Weber especially will remain the glory of having first founded a distinct German operatic style. Wagner is distinctively the successor of Weber in more than one sense. See WAGNER, WILHELM RICHARD.

Revised by DUDLEY BUCK.

Ophid'ia: an order of reptiles containing the serpents, characterized by the large number of vertebrae, numerous ribs, and absence of sternum. Fore limbs are never present, but in a few species the hind legs are present as mere rudiments. See SERPENTS.

Ophidi'idæ [Mod. Lat., named from *Ophi'dium*, the typical genus, from Gr. *ὄφις*, dimin. of *ὄφης*, serpent]: a family of telecephalous fishes belonging to the sub-order *Acanthopteri*, and distinguishable from all others by a peculiar modification and position of the ventral fins. The body is more or less elongated, almost eel-shaped, with the tail long, the scales small and partly imbedded, the head moderate, the teeth small, mostly villiform, the dorsal and anal fins low, united with the caudal, without spiny rays; ventral fins inserted at the chin, having each the form of a bifid filament. The species are mostly small in size, and several occur in deep water.

Revised by D. S. JORDAN.

Ophiocephal'idæ [Mod. Lat., named from *Ophiocephalus*, the typical genus; Gr. *ὄφης*, serpent + *κεφαλή*, head]: a family of telecephalous fishes of the sub-order *Acanthopteri*, distinguished by a peculiar union of characters. The body is elongated and anteriorly subcylindrical; the scales of moderate size; the lateral line with an abrupt curve; the head depressed, oval above, and covered with shield-like scales, the general appearance being that of a mullet; dorsal and anal fins long, and without spines; caudal round, separated from the dorsal and anal; ventrals thoracic (and composed of one simple but partly articulated and five branched rays) or absent. The skeleton has numerous (fifty-two to sixty-one) vertebrae; the caudals are provided with ribs, the abdominal cavity being continued to below the caudal portion; four gills are developed, but no pseudo-branchiae; a cavity accessory to the gill-cavity is developed, in which water is retained, but no super-branchial organ is present; pyloric appendages may be either present (two in

number) or absent. The family is composed of fresh-water fishes peculiar to Southern and Southeastern Asia. Above thirty species are known. The peculiar accessory gill-cavity contains a supply of water, which serves to keep moist the gills of the fish for a long time after being taken out of water. The species are therefore well adapted to withstand prolonged deprivation from that element.

Revised by D. S. JORDAN.

O'phir [cf. Sanskr. *Abhira*, name of a people anciently found on the lower Indus]: the name (in Gen. x. 29) of the eleventh of the thirteen sons of Joktan, all of whom appear to have settled in Arabia; also the name of a place or region famous in the commercial history of the Hebrews, from which, or perhaps only by way of which, came gold, almugwood, and precious stones (1 Kings x. 11). The voyage thither and back, or perhaps the voyage which only took Ophir in its way, required three years (1 Kings x. 22). Ophir can hardly have been a general name for remote southern countries, nor can it have been any such far-off place as Peru, but should be looked for either in Africa (Bruce, Robertson, Petermann), or in India (Vitringer, Reland, Ritter, Ewald), or, more probably, in Arabia (Michaelis, Niebuhr, Forster, Knobel, Kalisch). See A. Soetbeer, *Das Goldland Ofir* (Berlin, 1880). Revised by S. M. JACKSON.

Ophites, ὄφίς [from Gr. *ὄφης*, serpent], or **Serpent-worshippers**: a sect of Gnostics who joined the worship of the serpent to the general characteristics of the faith and practice of other Gnostics. They honored the serpent because he tempted Eve to eat of the forbidden fruit—an act which they believed to be highly advantageous to the human race. They kissed the serpent and fed it with the Eucharistic bread; but others rejected Christianity, and honored Cain, Judas Iscariot, and other wicked personages. It has been supposed that the sect was of Jewish origin, but the sharp antithesis which they set between Judaism and Christianity, and the copious element they evidently had drawn from Greek philosophy, seem to indicate a pagan origin. Their speculations have a certain resemblance to the mythologies of Babylon (the seven-headed serpent) and Persia.

Ophitic Structure: See DIABASE.

Ophiuroi'dea [Gr. *ὄφης*, snake + *οὐρά*, tail + suff. *-oid*, like]: a class of ECHINODERMATA (*q. v.*), embracing those forms popularly known as "brittle stars" or "serpent stars." The Ophiurans differ from the other starfishes (Asteroidea), among other features, in having a well-marked central disk from which radiate the long and nearly cylindrical arms. These latter are flexible, and are far more rapidly moved than are those of the true starfishes. In the true serpent stars (Ophiurae) they are simple, but in the "basket fishes" (Euryalae) they are branched many times, so that when incurled the whole animal quite closely simulates a shallow basket. Less conspicuous but equally important differences are the total absence of a vent and the inclusion of the ambulacral plates on the inside of the arms, the small tube feet projecting upon the sides. The Ophiurans are all marine, and live creeping about among the "roots" of the seaweeds, etc. A few bring forth living young, but most species lay eggs, and the young when hatched bear not the slightest resemblance to the adults. These young, known as *plutei*, at first swim freely, but later they become quiescent, and undergo a metamorphosis which results in the assumption of the adult form. See for the species Lyman, *Ophiuridae and Astrophytidæ* (Cambridge, 1864); for development, Apostolides, *Archives de Zoologie Expérimentale*, x. (1882).

J. S. KINGSLEY.

Ophthal'mia [Mod. Lat. = Lat. = Gr. *ὀφθαλμία*, deriv. of *ὀφθαλμός*, eye]: a term which should be restricted to inflammations of the conjunctiva—i. e. the membrane lining the eyelids and covering the exposed surface of the eyeball. It is synonymous with conjunctivitis, and is divided into *simple* or *catarrhal*, *purulent*, *membranous*, *phlyctenular*, and *granular ophthalmia*.

Catarrhal ophthalmia (catarrhal or muco-purulent conjunctivitis) is the mildest form of inflammation of the conjunctiva. It may be caused by over-use of the eyes, by the contact of irritating substances, by riding in the wind, and by "catching cold," or it may be associated with certain diseases, as nasal catarrh, bronchitis, typhoid fever, rheumatism, and especially measles and scarlet fever. The symptoms are inability to use the eyes, a feeling of a foreign body in the eye, and the development of a secretion, at first mucous and afterward muco-purulent, which gums the eyelids

together. The eyeballs look very red, and upon exerting the eyelids their lining membrane is found to be still more reddened, and to have a somewhat velvety appearance. Usually there is not much dread of light. This affection does not imperil the eyesight if properly treated. The disease is commonest in warm and changeable weather, and, if the secretion is free, is markedly contagious. Some of the special varieties of it are distinctly epidemic; one, often occurring in the spring and fall, should be known as epidemic conjunctival catarrh, but is vulgarly called "pink eye." Mild cases of catarrhal ophthalmia should be treated by removing the cause, washing the eyelids and eyes frequently with soap and water, and keeping the discharge cleaned away with some mild collyrium; an excellent one is a solution of common table salt in the proportion of a teaspoonful to the pint. Boracic acid and borax are much used for the same purpose. In the severe types very decided treatment may be necessary, especially the application of strong astringents like nitrate of silver.

Purulent ophthalmia is a very dangerous disease. It is customary to describe it under two forms, as it occurs in the new-born, *ophthalmia neonatorum*, and in adults, *gonorrheal ophthalmia*. The ophthalmia of new-born infants generally begins about the third day after birth, at first as a simple conjunctivitis, but rapidly develops into a violent inflammation, characterized by the free secretion of thick pus, which is exceedingly contagious, swelling of the conjunctiva, and great pressure upon the blood-vessels supplying nutrition to the cornea, which often becomes ulcerated, causing permanent loss of sight. An inflammation of this kind is due to contagion occurring either during the birth or immediately after it. The active principle of this contagion is a micro-organism which was originally discovered by Neisser, and is called the *gonococcus* of Neisser. When a similar inflammation occurs in adults it is also due to contagion carried to the eye by soiled fingers which have been in contact with a discharge in which these micro-organisms exist. In infants generally both eyes are affected; in adults usually the right eye, although the left very often also becomes involved. Only the most vigorous and active treatment will save such eyes from destruction. This consists, in brief, of iced compresses, frequent irrigation of the inflamed eye with a mild antiseptic fluid, at the proper time painting the swollen conjunctiva with nitrate of silver solution, and of the use of atropine and eserine to combat the corneal involvement. Not a moment's delay should take place in turning over cases of this kind to the hands of a competent physician, because eyesight may most rapidly be destroyed. *Prophylactic measures* should be exercised immediately after the birth of the child. The chief method is the one known as Cr  de's method, which consists in careful cleansing of the eye immediately after birth, and dropping into it a 2-per-cent. solution of nitrate of silver. This should never be omitted if there is the least suspicion of contagion, and in large institutions should be adopted as the routine practice. It has been the means of saving thousands of eyes.

Membranous ophthalmia is a violent inflammation of the conjunctiva, in which a false membrane forms upon its surface. It is most often seen in connection with diphtheria, and is almost sure to mar the sight of the eye. Very active treatment of the character already described is necessary, except that nitrate of silver is not so efficacious as in other cases.

Phlyctenular ophthalmia is an inflammation of the conjunctiva which is characterized by great dread of light, and, in addition to the ordinary symptoms of conjunctivitis, the formation of minute blisters, or pimples, which scatter themselves over the conjunctiva, or are arranged around the margin of the cornea. It generally occurs in scrofulous children, and is often seen in connection with measles. It is brought about by errors of diet, and in a great majority of cases is associated with disease of the nose—for example, catarrh. In addition to mild antiseptic eye-lotions, and occasionally atropine, constitutional measures should be adopted, especially the use of iron, arsenic, and cod-liver oil. It is a troublesome affection, and often relapses, and as the little pimples break down and form ulcers, they leave scars on the cornea which disturb the visual acuity.

Granular ophthalmia. See GRANULAR LIDS.

The occurrence of catarrhal, purulent, or granular ophthalmia in a school, reformatory, or other public institution, among children or adults, is often due to ignorance or carelessness on the part of the attendants, and should be subjected to rigid inquiry and the evil corrected. Many scores

of children contract eye diseases, which ultimately result in hopeless blindness, in the schools and reformatories of large cities. Over-crowding and insufficient provisions for isolating initial cases are mainly to be blamed for this result.

G. E. DE SCHWEINER.

Ophthalmology [from Gr. *ὀφθαλμός*, eye + *λόγος*, discourse, reason; the science of the eye, including its anatomy, functions, diseases, and treatment. See EYE, OPHTHALMIA, OPHTHALMOSCOPE, etc.

Ophthalmoscope [Gr. *ὀφθαλμός*, eye + *σκοπεῖν*, to view, to observe]: an instrument for examining the interior of the eye; invented by Heinrich Helmholtz, Professor of Physics in the University of Königsberg in 1851. The discovery of the principles upon which this invention was based was the result of close observation, careful experiment, and mathematical calculation. "Its origin," says Zander (*The Ophthalmoscope*, 1864), "may be traced to successive endeavors to solve two problems—the first being why the eyes of men and animals sometimes shine with a reddish luster; and the second, why the interior of an eye more usually appears dark." Owing to the fact that the portion of light passing into the eye, which is reflected from its inner surface, is so reflected that it emerges in the same direction, ordinarily no illumination from the bottom of the eye is visible, and consequently no image is seen. Helmholtz employed an instrument, consisting of three pieces of plane glass, from which the reflection was made at an angle of 56°, set in a frame and open behind, where the observer placed his eye. Ruete, in 1852, used a mirror with a hole in the center of it, and a convex glass to obtain an aerial image. An important modification was made by a mechanic named Rekoss, who adjusted to it what is called the Rekoss disk. The latest improvements have consisted principally in modifications of this disk, and in adding to the number of lenses it originally contained.

Description of the Instrument.—The ophthalmoscope, in its simplest form, consists of a small circular mirror with a central perforation. Liebreich's instrument is a concave mirror of 8 inches focal length, with a central perforation about a line in diameter, mounted on a handle about 6 inches long. If we place back of this mirror a Rekoss disk, its margin set with numerous convex and concave lenses of suitable focal lengths, and so made to revolve that each of these lenses may be readily brought opposite to the central hole in the mirror, we have an ophthalmoscope of the most approved pattern. Among the most useful patterns of the instrument, now ordinarily used and sometimes called "refraction ophthalmoscopes," the one constructed by Loring is the most serviceable.

Uses.—In examining the eye with the ophthalmoscope, the interior of the organ is illuminated by reflecting through the pupil, by means of the ophthalmoscopic mirror, the rays from a strong light placed a little behind and to one side of the patient's head, in such a position that the light falls upon his temple, but not upon the eye. If the observer thus illuminates the eye, resting the rim of the ophthalmoscope against his brow and looking through the hole in its center, the pupil of the illuminated eye will appear red. This is the reddish reflex from the bottom of the eye. Let the observer now approach to within an inch, or less, of the eye he is examining, keeping the red reflex in view, and (there being no error of refraction or exercise of accommodation in either the observed or the observing eye) he will distinctly see a small portion of the fundus under an enlargement of some fifteen diameters. This is called the *direct* method, and the image seen is called the *virtual erect* or upright image. If the observer places his eye at a distance of 12 or 15 inches from the observed eye, and, having obtained the red reflex, interposes a 2-inch double convex lens at a little less than its focal distance from the eye, he will see a much larger portion of the fundus than by the method already described, but much less magnified, the enlargement being only about four diameters. This is called the *indirect* method, and the image seen is the *real*, inverted, aerial image. By these methods we may examine the crystalline lens, the vitreous humor, the optic nerve, the retina, and the choroid, and any deviation from a condition of health may be readily detected. The optical condition of an eye may also be determined by means of the ophthalmoscope, independently of the statements of the patient. This is of great advantage in examining the eyes of young children, as well as eyes that are partially or totally blind. In examining the interior of the eye for the causes of its pathology

of vision, we frequently find appearances which lead to the detection of grave diseases of other important structures, as, for instance, the kidneys, heart, blood, brain, and spinal cord. Anomalies of refraction are also frequently discovered by means of the ophthalmoscope which would otherwise remain undetected, and by a suitable combination of spherical and cylindrical glasses good sight is restored.

Much light may be thrown by the ophthalmoscope upon the diagnosis of cases of tumor of the brain and of inflammatory changes at the base of the brain; but many of the statements of those who profess to solve questions of insanity by the use of the ophthalmoscope, as a method of ascertaining the vascular condition of the brain, are entirely destitute of scientific basis. Ophthalmoscopic examination finds its greatest field of usefulness, independently of purely ocular affections, in the study of diseases of the nervous system, but is important in many general diseases as a diagnostic agent. See *The Ophthalmoscope* (by Zander), already quoted.

Revised by G. E. DE SCHWEINITZ.

O'pie, JOHN: painter; b. at St. Agnes, near Truro, England, in May, 1761; gave proofs of artistic talent in childhood which attracted the attention of Dr. Wolcott, of Truro ("Peter Pindar"), by whom he was taken to London; acquired fame by his skill in portraiture; received from the leading members of the nobility more commissions than he could execute; devoted himself successfully to severe study to correct the defects of his earlier style of painting, which were now sufficiently obvious; produced several admired historical pictures; became Professor of Painting at the Royal Academy 1806, and began a series of lectures Mar., 1807, but died in London before completing the first course, Apr. 9, 1807. Four *Lectures* were published, with a memoir by his widow, in 1809. His best-known pictures are the *Murder of David Rizzio* and his own portrait in the Dulwich Gallery, but other historical pictures are known by the engravings in *Boydell's Shakespeare*. Besides his lectures, he published a *Life of Reynolds* and a letter on *The Cultivation of the Fine Arts in England*.—His second wife, AMELIA ALDERSON OPIE, whom he married in 1798 (b. at Norwich, Nov. 12, 1769), acquired a great reputation by her delineations of English home-life in a series of novels; joined the Society of Friends after she became a widow. D. at Norwich, Dec. 2, 1853.

Revised by RUSSELL STURGIS.

Opisthobranchia'ta [Mod. Lat., from Gr. *ὀπισθεν*, behind + *βράγχια*, gills]: an order of molluscs in which the gills, when present, are behind the heart. See GASTEROPODA.

Opisthoc'omi [Mod. Lat., named from *Opisthocornus*, the typical genus, from Gr. *ὀπισθοκόμος*, wearing the hair long behind, in allusion to the flaring crest]: an order of birds containing but a single family, *Opisthocornidae*, represented by a single species, the anomalous Hoatzin (*Opisthocornus cristatus*. (See HOATZIN.)) The skull resembles that of gallinaceous birds, especially in the imperfect development of the maxillo-palatines. The sternum is much cut away in front; the furcula ankyloses with the manubrium below, and with the coracoids above. There is an enormous, muscular crop, divided by a partial constriction. The bird has affinities with the pigeons and *Gallinæ*, and in some points approaches the plain-eaters, *Musophagidæ*. The order corresponds to Huxley's *Heteromorphæ*. F. A. L.

Opistho'mi [Mod. Lat.; Gr. *ὀπισθεν*, behind + *ὤμος*, shoulder]: an order of fishes of the sub-class of teleosts, distinguished by the separation of the shoulder-girdle or scapular arch from the head, and its consequent posterior position, whence the name. The skull has its several bones developed in nearly the same manner as the ordinary spiny-rayed fishes; the supraoccipital projects forward between the parietals; the jaws are normally developed, the maxillary arch being bounded above by the premaxillary, and at the sides by the supramaxillary bones; a distinct symplectic bone exists; the branchial apparatus is complete, the superior branchial and pharyngeal bones ossified, four superior pharyngeals, three basal branchials, and a pair of inferior pharyngeals being developed; the scapular arch is entirely dis severed from the connection exemplified in most fishes, and (in some cases at least) is connected with the anterior vertebra; the mesocoracoid is absent; no interclavicles are developed; the ventral fins either abdominal (the pubic bones being far removed from the scapular arch) or wanting. The order is represented by two families, *Mastacembelidæ* and *Notacanthidæ*. It is not certain, however, that these two families are closely related, or even that they belong to the same order.

Revised by D. S. JORDAN.

Opitz, MARTIN: poet; b. at Bunzlau, Silesia, Dec. 23, 1597; studied at Frankfurt-on-the-Oder and Heidelberg, but at the outbreak of the Thirty Years' war went to Holland, and thence to Denmark. In 1621 he returned to Silesia and lived in various positions as teacher, private secretary, diplomatic agent, and historiographer at the courts of several influential princes; was knighted by the Emperor Ferdinand in 1628, and died of the plague at Danzig, Aug. 20, 1639. Though mediocre as a poet he marks an important epoch in the history of German literature, and for more than a century he was called the "father of German poetry." This great influence on the literature of Germany he attained chiefly by his theoretical and critical writings, of which his *Aristarchus sive de contemptu Linguae Teutonice* (1617) and his *Buch von der deutschen Poeterey* (1624) are the most important. The rules he laid down in the latter book concerning the proper use of the language of poetry, and especially concerning the metrical system, practically guided the development of modern German poetry up to the classical period. The highly developed metrical art of the thirteenth century having degenerated in the course of time, Opitz's discovery that accentuation and not quantity constituted the essential feature of German verse-structure was all the more important. He had a high conception of the poet's vocation, the final aim of which appeared to him in the attainment of fame and immortality, and for more than a century his ideal of the poet inspired his followers and admirers. The head of the so-called first Silesian school of poets, he fought for the honor and purity of German language and literature as a true patriot in the midst of the devastation wrought by the Thirty Years' war, and by pointing to the ancients as the greatest literary models he inaugurated that epoch in German literature which culminated in the classic era of the eighteenth century. See K. Weinhold, *Martin Opitz von Boberfeld* (1862); Palm, *Beiträge zur Gesch. der d. Literatur des 16 und 17 Jahrhunderts* (1877); Borinski, *Die Poetik der Renaissance* (1886); Witkowski, *Aristarchus und Buch v. d. d. Poeterey* (1888); W. Scherer, *Kleine Schriften*, ii., 375; K. Burdach, in *Forschungen zur deutschen Philologie* (1894).

JULIUS GOEBEL.

Opium [= Lat. from Gr. *ὀπιον*, poppy-juice, dimin. of *ὀπός*, juice, sap]: a concrete juice obtained from the unripe capsules of the poppy (*Papaver somniferum*). Opium has been known as a drug from a remote period, distinct accounts of its collection as a branch of industry in Asia Minor being found in the writings of Dioscorides, about the year 77 B. C. From the countries bordering on the Mediterranean the use of opium was carried East through Asia, probably by the Arabians. Though the poppy is naturalized as a garden flower in Europe and America, yet opium is produced as an article of commerce only in India, Persia, Egypt, and Asia Minor. It is obtained by making a shallow horizontal incision in the unripe poppy-head a few days after the fall of the petals. This is done in the afternoon, and the milky juice that oozes from the cuts is scraped off next morning and made into lumps of varying size, ranging in weight from an ounce to several pounds. Good Turkey opium is a hard, tenacious solid of compact texture and a reddish-brown or fawn color. It has a strong, peculiar odor and a rather bitter, somewhat acrid, taste. Its medicinal virtues reside in certain alkaloids, of which *morphine* is the most important, as it occurs in greatest quantity and most perfectly represents the properties of the crude drug. This alkaloid was discovered by Sertürner, an apothecary in Hanover, in 1816. It exists in opium combined with a peculiar acid called *meconic*, and in good Turkey opium is found in the proportion of from 12 to 15 per cent. Pure *morphine* exists in small, colorless, shining crystals, inodorous, but of a bitter taste. It is almost wholly insoluble in water, but its salts are readily soluble, and hence are used in medicine in preference to the pure alkaloid. The acetate, sulphate, and hydrochlorate are official in the *United States Pharmacopœia*. The other alkaloids of opium known to affect the human system are *codeine*, *narceine*, *narcotine*, and *papaverine*, but twelve besides these have been obtained from the drug, although they seem to be only chemical and physiological curiosities. *Thebaine*, for instance, produces in the lower animals violent tetanic convulsions, and *cryptopine* wild delirium with dilated pupils. Besides these sixteen alkaloids, a neutral principle, *meconine* or *opianyl*, and pectine, albumen, mucilage, sugar, and wax are all constituents of opium.

The effects of opium upon the animal system are as complex as the composition of the drug. In general its influence falls upon the nervous system, the symptoms being all functional nerve-disturbances, and these prove by their peculiar character that, in kind, the opium influence is a conjoint irritation and paralysis. The resultant clinical effect varies in different parts of the nervous system, and also is modified by circumstances of dose, individual idiosyncrasy, temperament, habit, etc. The symptoms produced by opium under ordinary circumstances are as follows: With a small dose there is experienced relief from any feelings of discomfort that may be present at the time of taking. In the Asiatic, physical fatigue, mental exhaustion or distress, small pains and aches, hunger, etc., all tend to disappear, leaving a feeling of general comfort, calm, and peace; but this frequently is not seen in the European, who often experiences from the first the secondary symptoms, which are some little tendency to loss of appetite, coated tongue, slight headache, and constipation. With larger quantities the feeling of relief from discomfort is speedily succeeded by the characteristic feature of opium narcosis—namely, a conscious intellectual dullness, accompanied by a drowsiness, which upon every opportunity casts the subject into a state of unconsciousness analogous to ordinary sleep in very many respects, but differing from it in certain others. When thus affected the perceptive cerebral centers are blunted, and a pre-existing severe pain will not be so acutely felt. After a number of hours the patient awakes to a feeling of general misery, with disordered stomach, dry coated tongue, headache, and constipated bowels. Indeed, under the opium influence all the natural secretions, save that of the skin, tend to diminish. As a result of idiosyncrasy, many persons of very "nervous" temperament, instead of experiencing the ordinary effects, are thrown by opium into a state of morbid wakefulness with excessive agitation, their minds being filled with horrible imaginings; so great is the distress experienced that persons thus affected will endure almost any pain rather than seek relief from opium. Others, of highly imaginative temperament, like the Orientals, pass into a beatific state of mind, with pleasing fancies and visions of delicious and gorgeous imagery, as so graphically described by De Quincey; but with Europeans or Americans these tempting effects are rarely produced, simple progressive stupefaction being the whole expression of the cerebral influence of the drug. Still others, especially children, manifest a strong convulsive tendency which may even culminate in severe general convulsions, with tetanic rigidity of the whole body. In some of the lower animals, as in frogs, tetanus is the normal expression of the opium influence, because the effect on the spinal cord is stimulant and the spinal cord of the frog dominates his brain, whereas the reverse holds true in man. Intolerable itching of the whole skin, vomiting, syncope, are other abnormal effects of opium occurring in certain individuals. The influence of bodily state and habit upon the effects of the drug is astonishing. In severe pain, in the prostration from great loss of blood, and other morbid states, the relation between dose and effect changes so that quantities fatal in health may produce no more than a mild influence. Precisely the same result follows the habitual taking of opium, and confirmed opium-eaters often take in a day enough to kill ten or twenty ordinary persons. Of the alkaloids, the effects of morphine differ only in minor points from those of crude opium, and those of narceine and codeine also conform to the same general type. Narcotine causes many of the disagreeable after-effects of opium-taking.

Large doses of opium or morphine may be fatal, though many circumstances conspire to make the effects exceedingly uncertain, such as vomiting or non-absorption of the whole quantity taken. Enormous draughts of opiates, administered with deadly intent, are therefore often recovered from; generally 4 grains of opium or their equivalent are reckoned as a dangerous quantity, and 5 grains have killed. The salts of morphine are estimated as four times more powerful than the same quantity of opium. The prominent symptoms of opium-poisoning are deep coma, with flushed or pale and ghastly face, contracted pupils, slow, stertorous breathing, and slow, full pulse. Death occurs from stoppage of breathing through paralysis of the respiratory center in the medulla oblongata. The treatment, after evacuation of the poison left in the stomach through emetics or the stomach-pump, is especially directed toward keeping up the breathing. The patient is aroused by any means, however rough, such as the cold douche,

forced walking, shouting at the patient, and beating him with whips. If he can swallow, hot black coffee is given freely. If in spite of all means he sinks into coma and respiration begins to fail, artificial breathing and hypodermic injections of strychnine (a powerful excitant of respiration) are cautiously employed. No case should be given up till actual death.

In India, besides its use as a mere luxury, the drug is much employed in non-narcotic doses simply to sustain the strength in lieu of food and sleep during hard physical work. As to its value or otherwise in this respect there has been much discussion and difference of opinion, and the Indian Government in 1893 appointed a commission to inquire into the matter. In China opium is consumed to an enormous extent by all classes, the mode of taking it being to smoke an aqueous extract in a peculiarly formed pipe. Opium-smoking began in China in the latter half of the seventeenth century, and, in spite of all the Government's efforts to prevent it, rapidly spread till it may now be called a national practice. China thus consumes nine-tenths of all the opium exported from India, besides a considerable quantity from Asia Minor, and the whole of that produced within her own dominions. In medicine opium and morphine fulfill a variety of purposes, some of which could hardly be divined from the effects of the drug on the healthy system. These may be summarized as the support of life, and invigoration and maintenance of the heart's action in circumstances of great prostration and where ordinary food can not be digested; the cure or relief of pain, spasm, and general nervous irritability; the induction of sleep; repression of excessive secretion, as in diarrhoea; and curative influence of an unknown character in certain inflammatory diseases. In the fulfillment of most of these indications the induction of the physiological narcotic effects of opium is both unnecessary and harmful. The pharmaceutical preparations of opium are very numerous: the two most familiar are *laudanum*, a simple tincture of opium, of which 13 minims (about 25 drops) is the equivalent of a grain of opium; and *paregoric*, a camphorated tincture, compounded of opium, camphor, benzoic acid, oil of anise, honey, and dilute alcohol. Half a fluid ounce of this tincture represents very nearly a grain of opium. The salts of morphine are also very largely used, and their administration in solution by hypodermic injection has in certain circumstances advantages over opiates given by the mouth.

Revised by H. A. HARE.

Opobalsamum: See MECCA BALSAM.

Opodel'doe [cf. Gr. *ὀπός*, juice, sap]: the common name of the "camphorated soap liniment" of the *United States Pharmacopœia* of 1850. It is compounded of common soap, camphor, oil of rosemary, oil of origanum, and alcohol. When cold it has the consistence of a soft ointment. It is essentially the same as the "soap liniment" of the present *Pharmacopœia*, and may be used as an anodyne and gentle rubefacient application in sprains, bruises, etc.

Opop'anax [= Lat. = Gr. *ὀπονάρις*; *ὀπός*, juice, sap; *πάναξ*, a kind of plant (cf. *παναχῆς*, all-healing)]: the inspissated juice of the *Pastinaca opopanax*, a plant closely resembling the common parsnip. It is a fetid gum resin, resembling assafœtida in its powers, but much feebler. It has a very limited use in medicine. The best comes from the Levant.

Opor'to: city of Portugal; capital of the province of Minho; situated on both sides of the Douro, 3 miles from its mouth; 174 miles N. by E. by rail from Lisbon (see map of Spain and Portugal, ref. 14-A). Entrance into the Douro is difficult on account of a shifting sandbank in its mouth, and the river is subject to extraordinary and dangerous freshets, but at Oporto it forms an excellent harbor, lined with elegant quays and crossed by many beautiful bridges. Oporto is one of the most picturesque cities in the world, built on a steep acclivity, which it climbs through terraces covered with strikingly colored houses. Some of the streets are narrow, crooked, dirty, and so steep that no carriage can pass through them, but others are broad, airy, clean, and lined with magnificent houses. Among the buildings the cathedral, the Gothic Church of Cedofeita (originally founded in 559), the bishop's palace, and the Hospital of St. Anthony are most noticeable. Oporto possesses a polytechnic academy, a medical school, two picture-galleries, and a library with 200,000 volumes and 9,400 MSS. There are manufactures of gold and silver ware, glass, pottery, leather, linen, woolen, silk, and cotton fabrics, and tanning, brewing, distilling, cork-cutting, and sugar-refining are

carried on; but Oporto derives its chief importance from its commerce. It is the center of trade for a large part of Portugal. The annual value of its imports amounts to about \$9,000,000, and that of its exports to over \$17,000,000. Its trade is chiefly with England and Brazil, and the principal article of exportation is wine, the so-called port wine, red and white, of which by far the largest and best portion is exported to Great Britain. Pop. (1878) 105,838.

Opossum (Amer. Ind. name): any animal of the family *Didelphidæ*, a group of marsupial mammals peculiar to



Opossum.

finds itself from the branch of a tree by its tail. It is very prolific, producing from six to fifteen at a birth, which, as soon as born, are put by the mother into her pouch, where they remain attached to the nipple until they are able to move about. In winter, if the climate is cold, the opossum becomes sluggish, but not torpid like the marmot. There are numerous South American species, some of them with no pouch.

Revised by F. A. LUCAS.

Op'peln: town of Prussia, in the province of Silesia; on the Oder; 51 miles S. E. of Breslau (see map of German Empire, ref. 5-1). It has some manufactures of linen, leather, pottery, and tiles, and an important trade in timber and cattle. Oppeln was formerly the residence of the Dukes of Silesia, whose castle stands on an island in the Oder. Pop. (1890) 19,206.

Oppenheim, HERMANN, M. D.: physician and author; b. at Warburg, Westphalia, Prussia, Jan. 1, 1858; educated at Göttingen, Bonn, and Berlin; was head physician and temporary director of the Neue Klinik der Charité in Berlin 1883-91. Among his published works are numerous contributions to the *Archiv für Psychiatrie* (from 1885 on); *Beiträge zur Pathologie der multiplen Neuritis und Alkohollähmung* (*Zeitschrift für Klinische Medizin*, 1886); *Die traumatischen Neurosen* (1889; 2d ed. 1892); *Zur Kenntniss der syphilitischen Erkrankungen des centralen Nervensystems* (Berlin, 1890). S. T. ARMSTRONG.

Op'pert, JULES: Orientalist; b. July 9, 1825, at Hamburg, of Jewish parentage; studied first law at Heidelberg, then Oriental languages at Bonn and Berlin, where in 1847 he published *Das Lautsystem des Altpersischen*; was appointed Professor in German at the lyceum of Laval in 1848, and at that of Rheims in 1850; accompanied the scientific expedition to Mesopotamia, sent out in 1851 by the French Government, and was appointed Professor in Sanskrit at the schools of the national library in 1857, and 1874 Professor of Assyriology in the Collège de France. In 1881

he was elected member of the Académie des Inscriptions. His principal works are *Les Inscriptions des Achéménides* (1852); *L'Expédition scientifique de France en Mésopotamie* (1859-64); *Grande Inscription du Palais de Khorsabad* (1863); *Éléments de la grammaire assyrienne* (1860; 2d ed. 1868); *Rapports de l'Égypte et de l'Assyrie* (1868); *Documents juridiques de la Chaldée* (1875); *Le peuple et la langue des Mèdes* (1879); *La chronologie de la Genèse* (1879); *L'ambre jaune chez les Assyriens* (1880); *Études sumériennes* (1881).

Revised by BENJ. IDE WHEELER.

Oppia'nus (Gr. Ὀππιάδης): poet; b. at Anazarbus, in Cilicia; flourished under Marcus Aurelius, and composed a didactic poem on fishing, *Ἀλιευτικά*, in five books. The versification is smooth, the style ornate. Another poem on hunting (*Κυνηγητικά*) was long ascribed to this Oppianus, but the style is dry and the versification halting, and it is generally believed to be the production of a later poet of the same name. The works of Oppianus have been edited by J. G. Schneider (Leipzig, 1813) and F. S. Lehrs (Paris, 1846). B. L. G.

Op'pius, GAIUS: an intimate friend of Julius Cæsar, who intrusted to him and Balbus the management of affairs while he was absent in Spain. He was the author of lives of Cæsar, Cassius, Scipio Africanus the elder, which are only known to us through citations. The *Bellum Alexandrinum* has also been attributed to him, and by Niebuhr the *Bellum Africanum*, a view now abandoned. M. W.

Oppolzer, THEODOR, von: astronomer; b. at Prague, Austria, Oct. 26, 1841; d. Dec. 26, 1886. He took an active part in geodetic measurements, but is best known as the author of a great work in two volumes entitled *Bahnbestimmung der Planeten und Cometen* (1870-80). It is the standard work of the nineteenth century on theoretical astronomy. Of more popular interest is his *Canon der Finsternisse*, published by the Vienna Academy of Sciences in 1887, and containing tables of all total and annular eclipses of the sun visible in the northern hemisphere from 1200 B. C. to A. D. 2160, with charts showing the path of the shadow or annulus for each eclipse. S. NEWCOMB.

Optatia'nus, PUBLILIUS OPTATIANUS PORPHYRIUS or PORPHYRIUS: a Latin poet of the fourth century, perhaps of African birth, who, while in exile about the year 325, addressed a panegyric to the Emperor Constantine, by which he secured his recall. The collection is prefaced by a letter of the emperor to the author and the author's reply. The poems, twenty-eight in number, while prosodically not very faulty, show a great decline in taste, and are chiefly remarkable for their artificiality, including acrostics, telestichs, hexameter-squares (with as many verses as there are letters in each verse), and other whimsical forms. They have been edited by L. Mueller (Leipzig, 1877). M. WARREN.

Optative Mood: See SYNTAX.

Optics [from Gr. ὀπτικά, neut. plur. of ὀπτικός, optic, pertaining to sight. Cf. ὄψις, sight, and ὄπαια, I have seen]: the science which treats of the phenomena of light. The subject is usually treated from two points of view. 1. The laws and properties of light, as ascertained by observation, may, by applying the principles of pure geometry, be employed to explain the phenomena. 2. A definite theory having been adopted in regard to the nature of the luminiferous medium, the phenomena may be expounded as the necessary consequences of their assumed physical cause. The present article will be confined to a brief history of optical discovery.

A notion was for a very long time prevalent among the ancients that vision is effected by means of rays proceeding from the eye to the object. This idea is not found in Aristotle, but it was introduced into the school of Plato, and continued to be received for many centuries. The elementary phenomena of reflection and refraction suggest a natural division of the science of optics into two principal branches; and this distinction is made by the earliest systematic writer on the subject whose works have descended to us. This was Euclid, supposed to have been the geometrician of that name, who lived about 300 years before our era. The general laws which govern the reflection of light, being comparatively easy of detection, were stated by him with tolerable correctness; but what he has written on refraction is of little value. Ptolemy, the astronomer of Alexandria, who was born about the year 70 of our era, attempted to discover the law of refraction by experiment. His apparatus was ingenious, and was not different in principle from that which has been employed by Silbermann,

Soleil, and others, in our own time, for the same purpose. He measured the angles of refraction corresponding to various angles of incidence, between 0° and 90°, for both water and glass, and left his measurements recorded in his *System of Optics*. We may judge of the degree of accuracy attained by him by comparing the indices of refraction deducible from his determinations with those of the same bodies fixed with severe exactness by modern observers. The ascertained index of refraction for water is 1.33582. If we make a computation of its value from the measured angles of Ptolemy, we find a mean of 1.30147; but if we take his measurements at the incidence of 50°, where the relative variations of the angles of incidence and refraction are most marked and most easily measured, we obtain 1.33555, which is exceedingly near the truth. As an astronomer, Ptolemy noticed the effect of atmospheric refraction upon the apparent positions of the heavenly bodies; and he recognized the fact, which others after him disputed, that the displacement is always in a vertical plane, and also that it attains its maximum in the horizon and is zero in the zenith. About the beginning of the seventeenth century Galileo, Jansen, and Metius invented the telescope independently, and Galileo by its means made important astronomical discoveries. Shortly afterward Kepler explained how to find the focal lengths of lenses, and gave the true theory of the telescope; he also made experiments on the nature of colors, and showed that the images formed on the retina of the eye are inverted.

It was impossible, however, that optical science should make any important progress so long as the law which determines the path of a ray in passing from one medium to another remained unknown. Willebrord Snellius, Professor of Mathematics at Leyden, who died in 1626, left behind him manuscripts, among which was contained a statement of the law in question. It was first published by Descartes, eleven years after the death of Snellius. It is therefore frequently referred to as the law of Descartes. See REFRACTION.

The next important step in the progress of optical discovery, after the detection of the general law of refraction, was made by Newton, who in 1672 communicated to the Royal Society the experimental researches by which he established the compound nature of light and the unequal refrangibility of its component rays. This phenomenon of the separation of the component colors of light by refraction has been called DISPERSION (*q. v.*).

The dispersion of light by refraction furnishes an easy explanation of the interesting natural phenomenon of the rainbow. This beautiful meteor had before Newton's time been the subject of many unsatisfactory speculations; and though De Dominis, as early as 1611, had conceived a true theory of the manner of formation of the inner bow, he had not been able to account for its colors. Newton's discovery furnished the necessary supplement to the theory. See RAINBOW.

In 1665 there was published at Bologna a posthumous work by Francis Maria Grimaldi, an Italian Jesuit, in which were for the first time described certain phenomena now familiar under the name of DIFFRACTION (*q. v.*). They were carefully studied by Newton and others, and have occupied a prominent place in all the discussions which have since arisen in regard to the nature of light.

In 1669 the attention of the scientific world was called to a case of new and extraordinary refraction observed to take place in crystals of carbonate of calcium—a species of refraction which, from the circumstance of its dividing an incident beam into two beams entirely distinct, or of presenting two images of any object seen through the crystal, has been called double refraction. (See REFRACTION, DOUBLE). The first publication on this subject was made by Erasmus Bartholinus, a physician of Copenhagen, who gave to the mineral the name of Iceland spar, from the circumstance that his specimens had been obtained from that island. The phenomenon was more fully explained by Huygens, who also originated the undulatory theory of LIGHT (*q. v.*). Soon after his announcement of the compound nature of light, Sir Isaac Newton made public the results of his investigations in regard to the colors exhibited by *thin plates* of transparent substances. (See THIN PLATES, COLORS OF.) These investigations, together with many improvements of the telescope, and his corpuscular theory of the propagation of light completed Newton's contributions to the science.

The next important step in the progress of optical science was the discovery of the progressive propagation of light

and the determination of its velocity. Dominic Cassini suggested that certain irregularities in the observations of the first satellite of Jupiter could be accounted for by supposing that light took an appreciable time to travel from Jupiter to the earth. He seems, however, to have abandoned the idea, but Römer followed it up with perseverance and conclusively established its truth. See LIGHT.

The next discovery of importance was made near the close of the eighteenth century by Dr. Wollaston in his observations upon the prismatic spectrum. He discovered that by employing a pencil of light very narrow in the direction of the plane of refraction, but broad parallel to the axis of the prism, several well-defined dark straight lines could be distinguished crossing the spectrum at right angles, and maintaining invariably the same positions relatively to the colors. See SPECTRUM.

In the year 1808 the French Academy of Sciences proposed the problem of the double refraction of light as the subject of a prize to be awarded two years thereafter. The successful competitor for this prize was Malus. To him is also due the polarization of light by reflection.

In the year 1811 Arago communicated to the Academy of Sciences of Paris one of the most remarkable and beautiful discoveries which has ever been made in the history of optics. Upon examining thin plates of certain transparent crystals, such as mica, selenite, or quartz, by means of transmitted polarized light, he found that when the light was received upon the eye through a prism formed of Iceland spar the richest conceivable colors made their appearance, which were complementary to each other in the two images, and which varied in intensity with the azimuth of the laminae or of the prism. (See POLARIZATION OF LIGHT.) When a birefringent prism was employed as an analyzer, the two images seen were constantly complementary in color, and as the analyzer was turned they ascended in tint, in the order of Newton's scale, from red to violet. Biot in subsequent experiments discovered that in some crystals the ascent of the tints in the scale is produced by a right-hand rotation (the ordinary direction of a screw), and in others by a left-hand rotation. These classes of crystals have been distinguished by the names right-handed and left-handed crystals, or *dextrogyre* and *levogyre*. The peculiar kind of polarization produced by quartz has on this account been called *rotatory polarization*.

In the year 1815 Biot discovered that many liquids possess the power of rotatory polarization—a discovery which was independently made by Seebeck. Arago early made the discovery that the light which comes to us from the atmosphere is polarized. Brewster also made investigations concerning the double refraction of crystals. He discovered that the great majority of non-isotropic substances are doubly refracting, and are in general biaxial—that is, have two axes. (See CRYSTALLOGRAPHY AND MINERALOGY.) The determination of the undulations in such bodies, or the form of their "wave surface" was, approximately at least, effected by Fresnel, one of the latter's most brilliant discoveries. It led to Sir William Hamilton's prediction of the two species of conical refraction, which was experimentally verified by Lloyd and others, viz.: in one case a single ray passing through a plate of a biaxial crystal comes out as a hollow cone; in the other case a single ray which falls upon the plate is transformed into a cone inside the crystal, and comes out as a hollow cylinder. Fresnel also discovered that glass and other simply refracting bodies are rendered doubly refracting when in a state of strain; and Clerk Maxwell showed that shearing stress applied to viscous liquids renders them temporarily doubly refracting.

For an account of the present state of the science, see Preston's *Theory of Light* (1890); also Tait's *Light*, Glazebrook's *Physical Optics* (1883), and Basset's *Physical Optics* (1892).

Revised by R. A. ROBERTS.

Optima'tes and Popula'res [*optimates* is Lat., deriv. of *optimus*, best; *populares* is Lat., deriv. of *populus*, people]; political parties at Rome in the last century of the republic. The optimates, "adherents of the best men," consisted for the most part of patrician and senatorial families. The guiding principle of this party was a conservative clinging to the senatorial government, which had made Rome great. The opposition of the democratic party, the *populares*, was first seriously felt in the time of the GRACCHI (*q. v.*), and after a century of struggle the power of the optimates was finally broken by the first triumvirate (60 B. C.).

G. L. HARRISON.

Optimism [from Lat. *optimus*, best]: the doctrine that the world is the best possible, or that evil is only relative and contingent, being incident to the evolution of good—that good is substantial, evil only temporary. It is the philosophical counterpart to the religious doctrine of an overruling Providence that educes good out of evil. The divine purpose in creation is held to be the bringing of good into existence where nothing existed before, and the replacing of the imperfect by the more perfect; in general, it is to change chaos to a cosmos, and make it reflect the attributes of God. Creation, evolution, or change of any sort, involves contrast and the manifestation of two principles. Hence the passive principle (chaos), which is eliminated by the activity of the good, is manifested or made apparent by the same activity that annuls it. Without the activity of creation the passive or negative principle (chaos or mere potentiality) would remain a pure zero, and be neither good nor evil. In all the stages of the realization of good, from the lowest to the highest, there is contrast, and hence the phenomenon of evil; but evil or the relatively imperfect exists only as the battle-field upon which it receives defeat from the victorious higher good. This is the view *sub specie aeternitatis*, as Spinoza called it. Of course, any partial view, taking its point of observation from some one imperfect being, would see in the destruction of that being the triumph of evil rather than of good, and evil might seem predominant in the world. The optimistic theory is consistent only with theism, perhaps only with Christian theism. It finds place in the theory that God creates the world from nothing (chaos or pure space) and makes it in some sort his manifestation or self-revelation. Opposed to this is the emanation-theory characteristic of Oriental thinking, in which the Absolute is an abstract unity devoid of attributes, impersonal, and above multiplicity, and all creating is removal from unity toward multiplicity, and hence evil; it is a lapse from the Absolute, and finite existence is therefore altogether a mistake, or perhaps even a punishment for sin in a former state. This is called "pessimism." The return of all finite to the infinite through absorption or annihilation is regarded as the desirable end: Nature is not a conflict of good and evil, but altogether evil. Still, even in this theory, the good is the only true being; for all creation is held to be *maya* or illusion of the senses and intellect. The religion of the emanation-theory lays chief stress on ascetic renunciation with a view to reabsorption into the Absolute. Even destruction of consciousness and individuality is regarded as blessedness. "The conclusive, incontrovertible, one only knowledge, is that neither I am, nor is aught mine, nor do I exist," says the *Sankhya Karika*. In contrast with this, European thought quite generally embraces optimism. From the doctrine of Plato, that God is the absolute good, and "the Good possesses not envy, and on this account has made the world most similar to itself," down to the doctrine of Hegel, that all nature and history are the celebration of God's personality, optimism accompanies the doctrine which makes man a free, progressive, immortal spirit transcending nature, and nature to be the theater best fitted for his development. The Christian philosophers have variously expanded this doctrine. St. Augustine explains that evil is only contingent, or incident to finitude in its different degrees of imperfection, and that it exists only as an adjunct of the good; "as a painting with dark colors is beautiful when seen as a whole, so the sum of things when seen with one glance is good." St. Anselm adopted the same view, and asserted that the fall of man rendered him capable of attaining higher good. We should say that the fall renders possible the development of free individuality, hence makes possible independent reflection of the divine. St. Thomas Aquinas likewise: "The infinite manifoldness in the objects of nature is requisite in order to display God's infinite perfection; evil is only the privation of perfect actuality incident to the mere participation in the divine." Malebranche says that God has used everywhere the simplest means to realize his purposes, and accordingly has admitted the fewest evils possible into the world. Leibnitz, who is the best-known defender of optimism, distinguished three kinds of evil: (a) metaphysical, owing to the finiteness of things: this is unavoidable; (b) physical evil or pain, which is conditional good, being a monitor to warn us against error; (c) moral evil or wickedness, for which man alone is responsible, being incident to freedom, which is his highest gift. "God, therefore, out of the infinite number of possible worlds which he saw, chose the one which is actually the best." WILLIAM T. HARRIS.

Opzoomer, op'zō-mer, CORNELIS WILLEM: philosopher and jurist; b. at Rotterdam, Holland, Sept. 20, 1821; studied jurisprudence at Leyden, and attracted, even while a young student, much attention by his *Letter to Da Costa* and *Examination of the Annals of Dutch Theology*, in which he attacked the so-called orthodox dogma; was appointed Professor of Philosophy at the University of Utrecht in 1846, and acted as a leader in all movements of reform and progress in politics, religion, and science. His principal works are *Wetenschap en Wijsbegeerte* (1857); *Het Wezen der Kennis* (1863; 2d ed. 1867); *De Godsdienst* (1864).

Oracle [viā O. Fr. from Lat. *ora'culum*, oracle, deriv. of *ora're*, pray]: a term applied to answers given by the ancient Egyptian and Greek deities when solemnly consulted by their votaries, and also to the places where they spoke. Oracles spoke in different ways—in some cases through a human being, who uttered words of inspiration (e. g. at the oracle of Apollo at Delphi); in others by signs, which the priests watched and interpreted (e. g. at the oracle of Zeus at Dodona); then by dreams, as in the temples of Asclepius; and lastly by calling up the shades of the dead, as when Odysseus consulted the shade of Teiresias (*Od.*, xi.). The ancients consulted oracles on all important affairs, whether public or private. If, as often happened, an enterprise failed even though the gods had seemed to favor it, the oracles still lost no credit, for their answers were so ambiguous that it was no easy matter to interpret them clearly.

Revised by J. R. S. STERRETT.

O'ran: department of Algeria; bounded N. by the Mediterranean, E. by the department of Algiers, S. by the desert, and W. by Morocco. Area, 44,616 sq. miles. Large tracts of this province are cultivated with the utmost care, and wheat, maize, cotton, and wine are grown with great success. The climate is hot, but healthful. Pop. (1891) 942,066.

Revised by C. C. ADAMS.

Oran: seaport of Algeria; capital of the department of Oran; on the Mediterranean (see map of Africa, ref. 1-C). It is strongly fortified. The streets of the European district are broad and airy, the houses spacious and elegant, and the promenades beautiful. Its harbor is naturally poor, but has been greatly improved, and large quantities of French cotton goods, hardware, wine, and wheat are here exchanged for gold-dust, ivory, ostrich feathers, gums, etc. Pop. (1891) 67,681.

Revised by C. C. ADAMS.

Orange [= Fr. from Arab. *nāranj*, orange]: the fruit of many varieties of the genus *Citrus*. The botany of the genus is much confused, but it is now held that the oranges of the U. S. represent but two species, the common type, *Citrus aurantium*, and the mandarin or kid-glove type, *C. nobilis*. The bitter or Seville orange is a form of *C. aurantium*. *Citrus* is a genus formerly placed in the family *Aurantaceae*, but now included in *Rutaceae*. It embraces trees and shrubs, all exotic, and unable to endure the climate of the Northern States. In the extreme southern parts of the U. S. the orange is productive. The foliage is fragrant, and the flowers are pure-white, odorous, and beautiful. Wherever known throughout the world they are regarded as the appropriate ornaments of a bride. These flowers have from twenty to sixty or more stamens, sometimes in sets, and have one style. There are from four to eight, usually five, petals. The filaments of the stamens are more or less united, and the ovary many-celled, with a prominent disk at the base. The fruit is a juicy and luscious berry with a leathery rind. This rind contains little cysts or cells filled with a fragrant and volatile oil which is easily inflammable. The branches of the trees are spiny and the leaves in reality compound; that is, they consist of a single leaflet, as is shown by the articulation between the blade and the petiole. This is also shown by the trifoliate leaf of the related *Citrus tri foliata* (properly *Egle separia*).

The original of the orange came from the East Indies or from China. The orange has now spread over all the warmer regions of the earth. It has an astonishing productiveness. The trees we meet with in conservatories usually bear a bitter, unpalatable fruit, and are chiefly grown for ornament. Oranges are evergreen, and bear simultaneously fruit and blossoms. The leaves are fragrant and have a limited use in medicine in cases of hysteria, where they are employed instead of tea. Oil of neroli is prepared from orange-flowers, and is the basis of the popular perfume known as eau de cologne. The fruit contains citric acid, but not in so large proportion as the lemon. The rind enters into various articles of confectionery, and is used

for flavoring. The numerous seeds often contain more than one embryo. Sicily, Malta, Spain, the Azores, Portugal, and Cuba have furnished most of the oranges of commerce, but Florida and California are now strong competitors with these countries, and the markets of the Eastern U. S. are chiefly supplied with the Florida product. The Florida crop of 1893-94 was estimated at 4,000,000 boxes.

Consult Wickson's *California Fruits*, Manville's *Orange Culture*, Moore's *Orange Culture*, and the volumes of Bailey's *Annals of Horticulture*. Revised by L. H. BAILEY.

Orange: town of France, in the department of Vaucluse; on the left bank of the Aigue; 18 miles N. of Avignon (see map of France, ref. 8-II). It is old, ill-built, and dirty, but it has several well-preserved and interesting remains from the Roman time (a triumphal arch and a theater), some manufactures of linen and cotton fabrics, and a large trade in honey, wine, spirits, essences, oil, truffles, saffron, and madder. Pop. (1891) 6,804. The *Arausio* of the Romans, it became after Caesar an important Roman colony. It was an independent countship from the eleventh century until 1530, when it fell by marriage to René of Nassau Dillenburgh, stadtholder of the Netherlands, who, being childless, chose as his successor his cousin William, father of William the Silent. As William III., King of Great Britain, who was Prince of Orange, died childless, there began a controversy as to the succession between Frederick I. of Prussia, of the older branch of the house of Nassau, and the head of the younger branch. At the Peace of Utrecht in 1713 the King of Prussia made over Orange to Louis XIV., still calling himself, however, Prince of Orange; but the title was also assumed, and has been retained since, by the stadtholders and Kings of the Netherlands, who belong to the younger Nassau line.

Orange: city (first settled as a part of Newark about 1666, created a township in 1806, divided by separation of East Orange and Fairmount 1862-63, incorporated as a city in 1870); Essex co., N. J. (for location, see map of New Jersey, ref. 2-E); on the Del., Lack, and W. and the Erie railways; 4 miles N. W. of Newark, 12 miles W. of New York city. It is picturesquely located on rolling ground at the foot of the first range of the Watchung Mountain, nearly 200 feet above tide-water. It is the smallest in area of all the Oranges, but the largest in population, and ranks fourth among the hat-manufacturing cities of the U. S. Its proximity to New York city and its suburban attractions have made it a favorite place of residence for many metropolitan business men. The city is connected with Newark, Bloomfield, East Orange, and South Orange by electric and other street-railways; is lighted by electricity, and owns a water-works system with a reservoir between the First and Second Mountains, completed in 1884, and a sewerage system, completed in 1894. There are 6 public-school buildings, including a high school, a manual-training school, public-school property valued at over \$165,000, several high-grade private schools, public library, 2 national banks with combined capital of \$250,000, 2 savings-banks with aggregate deposits of \$1,750,000, and a monthly and 5 weekly periodicals. Among the notable buildings are several churches and new school buildings, Y. M. C. A. building, music hall containing the rooms of the New England Society, Memorial Hospital with training-school for nurses, House of the Good Shepherd, orphan asylum, Masonic Temple containing the post-office, Women's Christian Temperance Union building, also the meeting place of the Woman's Club, and the Orange National Bank. Among prominent local organizations are the Bureau of Associated Charities, the Orange Improvement Society, the Essex County Club, and the Orange Mendelssohn Union. Llewellyn Park, extending from the base to the summit of the First Mountain, comprising 750 acres, and containing many fine residences; Eagle Rock, 650 feet above tide-water, in West Orange, from which New York city and harbor may be seen; and Hemlock Falls, the wildest mountain part of South Orange, are among the attractions of the city and its immediate vicinity. The locality is noted for the excellence of its roads. Pop. (1880) 13,207; (1890) 18,844; (1895) 22,792.

EDITOR OF "CHRISTIANITY"

Orange: city; capital of Orange co., Tex. (for location, see map of Texas, ref. 5-K); on the Sabine river, at the head of navigation, and on the S. Pacific Railroad; 103 miles E. of Houston. It is in a rice, cotton, orange, sugar, and stock-raising region, and contains lumber and shingle mills, a national bank with capital of \$50,000, and two weekly newspapers. Pop. (1880) not in census; (1890) 3,173.

Orange, or Gariep: the largest river in South Africa, S. of 20° S. lat. It is about 1,150 miles long, rises on the western slope of Mont aux Sources in the Drakenbergs (29° S. lat.), runs through Basutoland, in a narrow valley and with swift current and many water-falls, and receives in the upper two-fifths of its course all its important tributaries, the Caledon and Vaal being most important. Then flowing W. through a wide semi-arid region the river loses much of its volume through evaporation, and in its lower course it is often fordable. It is about a mile and a half wide at its mouth in the rainy season, and is one of the largest rivers in the world, having no importance for navigation. The river and its two largest tributaries all have birth on the slopes of the same mountain.

C. C. ADAMS.

Orangeburg: city; capital of Orangeburg co., S. C. (for location, see map of South Carolina, ref. 6-E); on the North Edisto river, and the South Carolina and Georgia Railroad; 51 miles S. of Columbia, 80 miles N. W. of Charleston. It is in an agricultural region; is an important market for cotton, rice, turpentine, and lumber; has a variety of manufactures; and contains Claflin University (non-sectarian, founded on the national land grant, and chartered in 1872), the State Agricultural College, two State banks with combined capital of \$136,032, a private bank, and two weekly newspapers. Pop. (1880) 2,140; (1890) 2,964.

Orange City: town (founded in 1870); capital of Sioux co., Ia. (for location, see map of Iowa, ref. 2-C); on the Chi. and N. W. Railway; 42 miles N. of Sioux City. It is in an agricultural and hog-raising region, is the seat of the Northwestern Classical Academy (Reformed, chartered in 1882), and has a State bank with capital of \$75,000, two private banks, and three weekly newspapers. Pop. (1880) 320; (1890) 1,246; (1895) 1,480.

Orange Free State: independent Boer republic in South-east Africa, with the South African Republic on the N. and separated from the Indian Ocean by Natal, Basutoland, and Cape Colony. It was founded by Boers who withdrew from Cape Colony in 1836. Area, 48,326 sq. miles. Pop. (1890) 77,716 white and 120,787 black. The undulating and healthful plains are well adapted for stock-raising, which is the leading industry. The country is thinly populated, but the new railways (1894) are stimulating European immigration. The capital, Bloemfontein, has about 5,000 inhabitants.

C. C. ADAMS.

Orangemen: members of a political association whose official name is **The Loyal Orange Institution**, formed, in opposition to the Roman Catholic association of the Ribbonmen, for the purpose of defending the Protestant religion in Ireland, maintaining the legislative union between Great Britain and Ireland, and the Protestant succession to the throne. The term Orangemen, which came into use after the Revolution of 1688, meant originally the supporters of William III., Prince of Orange, against the deposed Stuarts and their Roman Catholic adherents; but the association was not formed till 1795, when the first Orange lodge was founded in the north of Ireland. The society grew rapidly, and the hostility between its members and Roman Catholics soon gave rise to bloody conflicts, which it required considerable military force to suppress. At last, in 1836, the association was dissolved, but in 1845 it was revived as a secret society. In 1829 the institution was transferred to British America with great success, but there, too, as well as in New York, its processions have sometimes occasioned riots.

Orange Oil: an essential oil which is extracted by pressure or distillation with water from orange-peel. This distilled oil consists almost wholly of a citrene boiling at 175°-176° which is identical with the hydrocarbon obtained from bergamot, caraway, and some other oils. The flowers of the orange yield, on distillation with water, a fragrant oil, called *oil of neroli*. It consists of two oils, one readily soluble in water, the other sparingly soluble. Alcohol of 90 per cent. separates a solid neroli-camphor.

Orange, Prince of: See WILLIAM OF NASSAU.

Orange Sands: See LAMARITE FORMATION.

O'rang U'tan, or (vulgarly) **Orang'-outang'** [from Malay *orang utan*, man of the woods; *orang*, man + *utan*, wood, forest]: a large anthropoid ape (*Simia satyrus*) inhabiting many of the low districts of Borneo, and more rarely found in the eastern portion of Sumatra. In bulk the adult male orang comes next to the gorilla, but owing to the shortness of the legs the animal rarely attains a height of 4 ft. 6 in., the maximum size recorded being 4 ft. 8 in. The arms

are very long, the digits of the hands and feet much curved, the thumb very small. In the old males the face, which is black, or nearly so, is almost round, owing to the presence of cheek callosities. The collar-bones are so long that the shoulders are nearly on a level with the ears. The canines are large and the jaws powerful, but, although the



Female orang utan.

males fight with one another, the orang is a timid animal and harmless unless brought to bay. The females, which are much smaller than the males, have no facial callosities. The orang is sparsely clad in coarse red hair, which is subject to considerable variation in tint. It is strictly arboreal, never descending to the ground unless compelled to do so, for it walks poorly, owing to the curvature of the toes and the oblique manner in which the foot is set on the leg. The orang prefers low-lying or swampy forests, feeds on fruits and vegetables, and builds a rude nest in which to sleep.

F. A. LUCAS.

Oraon: See DRAVIDIAN LANGUAGES.

Orato'rio [= Ital. < Late Lat. *orato'rium*, chapel, neut. of *orato'rius*, pertaining to praying; cf. *ora're*, speak, pray]; an elevated form of musical composition in which voices and instruments combine to represent scenes, passages, or themes from biblical or sacred history, the text consisting of verses from the Scriptures arranged with a view to moral and spiritual effect; the music comprising chorus, recitative, aria, quartette, trio, solo—in short, all the recognized combinations of harmony and melody, with organ and orchestral accompaniment, as in opera. It differs from opera principally in being sacred instead of secular, and in being unsuited to stage or scenic representation. When it becomes operatic in the sense of scenic and passionate, as in the case of Rossini's *Moses in Egypt*, it ceases to be oratorio. The movement is subjective, the development ideal, the characterization intellectual, the spirit epical. The oratorio was never intended to do service in the offices of worship, was never written in the direct interest of Sabbath or cathedral observances. It was, in fact, an effort to associate the charm of musical composition with the solemnity of sacred themes. Hence, in large measure, its popularity in England with the "evangelical" Protestants, who are forbidden by their religious feeling to attend operatic and theatrical entertainments, and with a similar class in the U. S. In Paris it has, in fact, no abiding-place, nor is it held in favor in Italy, where it originated. In Germany, also, oratorio is seldom heard, except at occasional festivals where many voices can be grouped together. The germs of oratorio existed in the Middle Ages in the shape of *mysteries* and *moralities*—scenes from Scripture rudely dramatized, with some primitive sort of music, the design being to entertain the coarse and vacant-minded peasantry and entice them from idleness and vicious pleasure. The steps of development in conception and form can not be traced. In the middle of the sixteenth century St. Philip Neri, a man of deep humor and genuine sympathy with the people, attempted to mingle instruction and entertainment by engaging the music director of St. Peter's church to aid him in his popular interpre-

tations of sacred story. The musician introduced songs in passages of dialogue and soliloquy. That the attempt was successful appears from the fact that it was made in other places and with more art. In the year 1600 one of these musical dramas was exhibited on a stage erected in the Church Sta. Maria in Valicella. It was called *Soul and Body*, was composed by Emilio dei Cavalieri, and may be regarded as the first systematic production of oratorio, with chorus, recitative, and song. To these the dance was added. From this point to the time of Handel the history of oratorio is uncertain. In the seventeenth century Giacomo Carissimi composed *Jephthah* and the *Judgment of Solomon*; in the latter part of the same century Francis Federici composed two pieces, *Santa Cristina* and *Santa Catarina di Siena*, which were called oratorios. Among composers of oratorio may be mentioned Alessandro Scarlatti, Alessandro Stradella (*John the Baptist*), Giacomo Perti (*Abraham*), Benedetto Marcello (*Judith*), Heinrich Schütz (*Resurrection* and *Seven Words*), all of about the same period (1645–1710). Among oratorios the *Passion Music according to St. Matthew*, composed by John Sebastian Bach, must be regarded as the greatest, most monumental work of its kind. Equally imbued with the religious spirit of its day as in case of Handel's *Messiah*, its technical value is far greater. From the standpoint of popularity, using the word in its best and broadest sense, the *Messiah* seems to enjoy a perennial life wherever the English tongue is spoken. Both by the number and caliber of his works, and by their enduring influence down to this day, Handel may well be considered the great master of oratorio. His best-known works were *Saul* (1740); *Messiah* (1741); *Samson*, *Judas Maccabeus* (1747); *Jephthah* (1751). All have English words. The greatest, *Messiah*, is considered the masterpiece of its kind. *The Creation*, by Haydn (1798), ranks next to it in popular repute. They have but one peer, Mendelssohn, whose *St. Paul* (1836) and *Elijah* (1846) are brilliant and beautiful examples of the capacity of this species of composition. With lovers of music *Elijah* is greeted with more enthusiasm than even the *Messiah*, its spirit being more modern, its musical form more flexible, its conceptions more intellectual. While the tone is purely and throughout religious, the ideas, less confined to dogma, are addressed to the imagination rather than to the heart—to the æsthetic rather than to the "spiritual" sense. Revised by DUDLEY BUCK.

Oratory, Congregation of the: a monastic order in the Roman Catholic Church, founded in 1560 by St. Philip Neri; established in France in 1611. Its first rule was oral, but was afterward written out, and received papal approval in 1612. The fathers are mostly devoted to the spread of learning; they assume no vows but those of the secular priesthood. One of the most eminent of their number in modern times was Dr., afterward Cardinal, J. H. Newman. Baronius, Bosio, Bérulle, Malebranche, Gallandi, and Massillon are among those who belonged to the order in times past. The French Oratory, called the Oratory of Jesus, was always a distinct though kindred organization. It is now nearly extinct. Revised by J. J. KEANE.

Orbego'so, LUIS JOSÉ: politician; b. near Huamachuco, Peru, Aug. 25, 1795. He was a rich proprietor, took an active part in politics, and on Dec. 20, 1833, was elected president of Peru by the constitutional convention which was then sitting. Strictly speaking, the convention had no right to elect a president, but Orbegoso was popular, and for a year his rule was generally accepted. In Jan., 1834, Gamarra declared against him, proclaiming Bermudez as supreme chief. The civil war which followed was ended in April by mutual agreement, but new rebellions, headed by Gamarra, Salaverry, and others, broke out early in 1835, and Orbegoso, after repeated defeats, accepted the intervention of President Santa Cruz of Bolivia. The result was the invasion of Peru by Santa Cruz, who formed the Peru-Bolivian confederation in 1836 (see SANTA CRUZ), Orbegoso being nominated president of North Peru, one of the confederated states. In 1837 he was defeated by Gamarra and the Chilians. After passing several years in exile, he was allowed to return to Truxillo, where he died in 1847. H. H. S.

Orbigny, ōr'bēn'yē', ALCIDE DESSALINES, d': zoölogist and ethnologist; b. at Coueron, Loire-Inférieure, France, Sept. 6, 1802. From 1826 to 1833 he explored Southern Brazil, the Platine States, Patagonia, Bolivia, and Peru. The results of this journey were published at the expense of the French Government, with the general title *Voyage dans l'Amérique Méridionale* (1834–47); the work includes, be-

sides the narrative, several volumes on zoölogy, and *L'Homme Américain* (2 vols.), an important treatise on South American ethnology. D'Orbigny also published various monographs on Foraminifera, etc.; he contributed the volumes on Foraminifera, Mollusca, and birds to Ramon de la Sagra's *Historia de Cuba*, and collaborated with his brother, Charles Dessalines d'Orbigny, in the *Dictionnaire d'histoire naturelle*. His most important work was the *Palaéontologie française* (14 vols., 1840-54; unfinished). From 1852 he was Professor of Palaeontology in the Museum of Natural History at Paris. D. near Paris, June 30, 1857. H. H. S.

Orbil'ius Pup'il'ius, Lucius; a grammarian and teacher at Rome in Horace's boyhood; b. at Beneventum. He served at first, as stated by Suetonius, who mentions him in his list of distinguished grammarians, as an attendant on the magistrates of his native place, then in the army in Macedonia. In his fiftieth year he removed to Rome, in the consulship of Cicero, where he taught school for many years, and had among his pupils the poets Domitius Marsus and Horace, who recalls in his *Epistles* the severity of his master. His teaching brought him more fame than profit, for he died poor at the age of nearly a hundred. His fellow townsmen erected a marble statue to his honor in Beneventum. Suetonius cites a work of his with the title *Periálogos*, but this name is evidently corrupt. See Teuffel, *Lat. Lit.*, § 200; Estré, *Prosopogr. Horat.*, p. 437.

Revised by M. WARREN.

Orbit [from Lat. *orb'ita*, wheel-track, course, circuit, deriv. of *or'bis*, circle, wheel]: the path in which a heavenly body moves. When there are but two bodies the revolution occurs in consequence of their mutual gravitation, combined with the original relative motion of the bodies. The orbit is then described in accordance with Kepler's laws, which, when modified in accordance with modern mechanics, are as follows:

1. Each body describes an ellipse in space, having the center of gravity of the two bodies as the center of motion, in one of its foci. If the motion of the lesser body is referred to the greater, taken as a point at rest, as is usual in astronomy, the lesser still describes an ellipse having the greater in one of its foci.

2. The velocity of each body in its orbit varies in such a way that the radius vector, or line drawn from one body to the other, sweeps over equal areas in equal times. The velocity is therefore greater the nearer the two bodies come together.

3. The cube of the semimajor axis of the ellipse, divided by the square of the time of revolution, is proportional to the combined masses of the two bodies.

These laws of Kepler were shown by Sir Isaac Newton to result directly from the theory of gravitation. From them it follows that, in order to determine and define the motion of a body around an attracting center, such as a planet around the sun, certain quantities, called *elements*, are necessary. In the case of an elliptic orbit these elements are as follows, the symbol which follows each being the letter commonly used to represent the elements:

1. The mean distance, or half the major axis of the ellipse in which the planet moves around the sun. It is equal to half the sum of the greatest and least distances of the planet. Symbol *a*.

2. The eccentricity of the ellipse, symbol *e*. Instead of *e* an angle ϕ is often used, of which *e* is the sine.

3. The longitude of the ascending node, or the angle which the vernal equinox makes with the line in which the plane of the orbit intersects the plane of the ecliptic. Symbol Ω .

4. The inclination of the plane of the orbit to that of the ecliptic. Symbol *i*.

5. The longitude of the perihelion, by which is commonly meant the longitude of the node, plus the angular distance from the node to the perihelion as seen from the sun. Symbol π .

6. The mean longitude of the planet at some given epoch. By mean longitude is here meant the longitude of a fictitious or imagined planet which moves around the sun with uniform velocity, in the same time as the actual planet, and in such a way that, in a general average, it is as much behind the actual planet as in advance of it. Symbol *L*.

7. The mean daily motion, or the daily angular motion of a planet which would revolve around the sun in the same time as the actual planet. When the masses of the two bodies are known this element can be determined from the mean distance. Symbol μ or *n*.

Various combinations of these elements are sometimes introduced, among them the distance from the node to the perihelion, symbol ω , and the mean anomaly, symbol *M*. The relations of these quantities to the other elements are:

$$\omega = \pi - \Omega \\ M = L - \pi$$

If but a single planet moved around the sun its motion would take place in strict accordance with Kepler's laws, and the elements of the orbit, as above described, would remain invariable; but, owing to the attraction of the other planets, each planet deviates from such an elliptic orbit. Moreover, this elliptic or mean orbit is slowly changing from century to century. These changes are called secular variations, and the problem of their computation is one of the most remarkable of modern astronomy. Their laws can not be derived from all the observations hitherto made on the planets; but from mathematical investigation, founded on the theory of gravitation, the changes in the orbits can be computed for hundreds of thousands of years past and to come.

S. NEWCOMB.

Orcagna, òr-kaan'yán, ANDREA (also called Andrea di Cione, after his father): painter, sculptor, and architect; b. at Florence about 1316. He learned sculpture as a child from Andrea Pisano. After a few years he studied painting, which he preferred, with the Gaddis, and architecture by studying the works of Giotto and Arnolfo di Lasso. The principal chapel in Sta. Maria Novella was painted by Andrea and his brother Bernardo. Andrea executed *A Last Judgment* and *Christ and the Virgin enthroned in Heaven*. From 1358 to 1360 he was chief architect of the cathedral at Orvieto. His architectural skill is shown in the Loggia dei Lanzi and in the tabernacle of Or San Michele, one of the wonders of the age for its richness of ornamentation. It was completed in 1569. Few of his paintings remain. One, a retable painted for the Church of St. Pietro Maggiore, in Florence, is now in the National Gallery in London. Orcagna was also a poet. D. about 1376. W. J. STILLMAN.

Or'cein (*lichen-red, Flechtenroth*): $C_7H_7NO_3$, the chief ingredient of the red and purple dyestuffs known under the name of ARCHIL (*q. v.*). It is formed by the action of ammonia and oxygen on orcin, $C_7H_5O_2$, and consists of two substances, one having the composition $C_{14}H_{13}NO_4$, the other $C_{14}H_{12}N_2O_5$. When ammonia is added to a solution of orcin, and the whole is exposed to the air, the liquid assumes a dark-red or purple tint by the absorption of oxygen. On acidulating with acetic acid, a dark-red precipitate of orcein is obtained. Orcein is slightly soluble in water and freely soluble in ammonia and fixed alkalies, with a purple or violet color; it is very soluble in alcohol.

Revised by IRA REMSEN.

Orchardson, WILLIAM QUILLER: genre and portrait painter; b. in Edinburgh, Scotland, in 1835. Studied in the Trustees' Academy, Edinburgh; painted portraits in Edinburgh until 1863, when he went to London; was elected Royal Academician 1878 and a D. C. L. of Oxford in 1890; was awarded third-class medals at the Paris Expositions of 1867 and 1878; first-class at Paris Exposition of 1889. His works are distinguished by fine quality of color and have a marked personality. Studio in London. W. A. C.

Orchestra, òr'kes-tra [from Lat. *orches'tra* = Gr. *ὀρχήστρα*, the space in a theater between the stage and the audience, liter., dancing-place, deriv. of *ὀρχεῖσθαι*, dance]: the place or structure occupied by performers on instruments in a theater, music-hall, or other building fitted for concerts, oratorios, etc. In oratorios, cantatas, and other pieces with vocal parts a portion of the orchestra is also allotted to the choir. The term "orchestra," in modern use, often means the body of instrumental performers themselves, especially as distinguished from the choir or vocal department, in the execution of such works as are for voices and instruments.

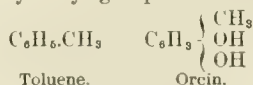
Orchids, or Orchid'aceæ [Mod. Lat. *Orchidaceæ*, from *Or'chis*, the typical genus = Lat. *or'chis* = Gr. *ὄρχις*, orchid, testicle, so called from the shape of its tubers]: a family of perennial endogenous herbs, found all over the world except in very cold and very dry climates. In the cooler regions they are terrestrial, while in hot countries they are often air-plants, growing upon stones and trees, but epiphytic rather than parasitic. They have irregular and often extremely beautiful, but sometimes very grotesque, flowers, perfect, with a hexamerous adnate perianth, a one-celled ovary, numerous ovules, and three parietal placentæ. The stamens are one, two, or three; the pollen generally coheres in masses.

Fertilization is almost always effected by the aid of insects. Many of the species have flowers singularly resembling insects in form. Many have very fragrant blossoms. This vast order affords a few useful plants, among which are vanilla, faham, salep, also several medicinal products. Florists successfully cultivate many superb tropical epiphytes of this order. The U. S. has comparatively few species of orchids, although some, like the lady-slippers, are curious and beautiful. See CATTLEYA, CYPRIPEDIUM, EPIDENDRUM, HOLY GHOST FLOWER, etc. Revised by L. H. BAILEY.

Orchil: See ARCHIL.

Orchom'enus (in Gr. Ὀρχομενός): an old city of Greece, situated in Boeotia, at the entrance of the river Cephissus into the Lake Copais; the capital of the prehistoric empire of the Minyæ. It is reported by Homer to have sent thirty ships to the siege of Troy, and to have contained riches which might be compared to those of Thebes in Egypt. In the Persian wars it abandoned the national cause, and in the wars between the various Greek races it always sided with the aristocratic party; but in 367 B. C. it was taken and destroyed by the Thebans. The buildings were burnt, the men put to the sword, the women and children sold as slaves. Rebuilt by the Phocians, it was again destroyed by the Thebans in 346, and although Philip of Macedon once more rebuilt it, it never again acquired any importance. The site was excavated by Schliemann in 1880, 1881, and 1886. See his *Orchomenos*, but better Schuchhardt, *Schliemann's Excavations* (London, 1891), pp. 299-303. J. R. S. STERRETT.

Or'cin: a compound belonging to the class of PHENOLICS (*q. v.*), being closely related to ordinary phenol or CARBOLIC ACID (*q. v.*). It is derived from TOLUENE (*q. v.*) by the substitution of two hydroxyl groups for two hydrogen atoms:



It is obtained from certain lichens which yield ARCHIL (*q. v.*), though in most of these it is not contained ready formed. It is produced by transformations of other constituents of the lichens, especially erythrin, $\text{C}_{26}\text{H}_{22}\text{O}_{10}$; lecanoric acid, $\text{C}_{14}\text{H}_{14}\text{O}_7$; evernic acid, $\text{C}_{14}\text{H}_{14}\text{O}_7$; and orsellinic acid, $\text{C}_8\text{H}_8\text{O}_4$. It can be made artificially by a number of methods, and is so prepared on the large scale. Ammonia converts it into ORCEIN (*q. v.*). IRA REMSEN.

Ord, EDWARD OTHO CRESAP: soldier; b. in Cumberland, Md., Oct. 19, 1818; graduated from the U. S. Military Academy, and was appointed second lieutenant of artillery July, 1839; served in Florida and on frontier duty, and at the outbreak of war in 1861 was stationed in California. Appointed brigadier-general of volunteers, he fought the battle of Dranesville Dec. 20, 1861; and as major-general of volunteers commanded the left wing of Gen. Grant's army in Mississippi Aug.-Sept., 1862, participating in the battle of Iuka, Sept. 19-20, and while in command at the action on the Hatchie, Oct. 5, 1862, was severely wounded. He commanded the Thirteenth Army-corps during the siege and capture of Vicksburg and capture of Jackson; the Eighth Corps and middle department July 11-21, 1864; and the Eighteenth Corps before Richmond, July 21-Sept. 29, when again wounded in the assault and capture of Fort Harrison. On Jan. 18, 1865, he relieved Gen. Butler in command of the department of Virginia and North Carolina and of the Army of the James, with which army he remained throughout the siege of Petersburg and subsequent pursuit of the Confederate army of Northern Virginia, ending in the surrender at Appomattox Court-house. At the close of the war he had received brevets from lieutenant-colonel to major-general. U. S. army, had attained the rank of lieutenant-colonel of artillery, but continued to hold his volunteer rank of major-general, and commanded various districts and departments until Sept., 1866, when mustered out of the volunteer service, having, however, been appointed a brigadier-general (July, 1866) in the regular army. He was in command of various military departments 1866-80; and on Dec. 6, 1880, was by special act of Congress placed on the retired list with rank of major-general Jan. 28, 1881. D. in Havana, Cuba, July 22, 1883. Revised by JAMES MERCUR.

Ordaz, or Ordás, DIEGO, de: soldier and explorer; b. in Spain about 1480. He was with Ojeda at Darien (1509), with Velasquez in Cuba (1511), and with Cortés in the conquest of Mexico 1519-21. Later he obtained a grant of the country now embraced in Guiana and Eastern Venezuela, and in

1531-32 he made the first exploration of the Orinoco, ascending, it would appear, to the mouth of the Meta. During this journey one of his officers, Martinez, wandered far inland, and claimed to have seen a magnificent city whose king was gilded with gold-dust; this account or invention was the origin of the myth of El Dorado. On his return to the coast charges were made against Ordaz, and he was arrested and sent to Santo Domingo; there he was released, and started for Spain, but died at sea 1533. H. H. SMITH.

Ordeal [O. Eng. *ordāl*, *ordāl*, judgment: Gerin. *urtheil*, judgment. The original meaning is something dealt out; cf. Goth. *us*, out, and Eng. *deal*]: a form of trial of guilt or innocence, consisting in an appeal to the immediate judgment or intervention of God by subjecting a person to a certain test in the belief that if he be innocent God will so shape the result as to indicate it.

Evidence of the existence in one form or another of the trial by ordeal is found in the earliest records of all the races of mankind; and the institution formed a prominent part of the jurisprudence of the Christianized barbarian races of mediæval Europe, from which the nations of modern Europe are descended, being the survival of customs which obtained among them when pagans. Its legal existence has survived in some countries into the nineteenth century, as in England, where trial by BATTEL (*q. v.*) was only finally abolished in the year 1819 (59 George III., c. 46). There are traces of the institution in the literature of all the civilized nations of antiquity, as among the Greeks in Sophocles's *Antigone* (ver. 264-267), and among the Jews in the Bible (Num. v. 11-31; Joshua vii. 16-18; 1 Samuel xiv. 41-42).

The tests which have been resorted to for the purpose of trial by ordeal are very numerous, such as fire, wager of battle, boiling water, the drinking of poisoned water, etc., the last mentioned being a very general practice among savage races.

Trial by *wager of battle* was a very common form among the Germanic nations, and was resorted to in both criminal and civil cases. The accused challenged the accuser, and they fought, either in person or later by champions, in the presence of judges, the victor being deemed innocent or just in his cause. (See BATTEL.) The trial by battle continued in practice until the seventeenth century, and survives to-day in the modern duel. See DUEL.

Trial by *fire* was one of the forms of ordeal most thoroughly established in mediæval Europe, and was sanctioned by the Christian clergy, and administered under their superintendence. At first it was used only on very solemn occasions, but later became quite common as a more aristocratic mode of trial than that by water, which later came to be considered plebeian. It had various forms, such as the putting on of a red-hot iron glove, walking barefooted and blindfolded over red-hot plowshares, and passing through a fire with nothing but a thin shirt for a covering; but the most common method was for the accused to carry a piece of red-hot iron in his hand for a given distance. If unhurt, he was declared innocent; if burned, guilty. Cases in which persons were injured or killed by this ordeal were very rare, for the trial was seldom granted, except when the accused by some means could be given a victory. It was granted to noble ladies as a means of proving their chastity, and tradition records a number of instances in which the ordeal was successfully submitted to. In 1498 Savonarola appealed to the trial by fire, but at the last moment the ordeal was given up, his enemies alleging that he refused to submit to it. Another form of trial by fire or heat was that in which the accused thrust his hand, or hand and arm, into a vessel filled with boiling water to take up some small object placed in the water. Sometimes boiling oil was used instead of water. If the accused escaped uninjured, he was deemed innocent; if burned, guilty; but in some cases it was the custom to bind and seal up the arm for three days, when it was examined, and innocence or guilt determined by the result. This ordeal survived as late as the middle of the fifteenth century.

In the *cold water* ordeal the accused was thrown, with the arms and legs tied, into a pond or river, and was adjudged guilty if he floated, innocent if he sank. If he was drowned before he was removed by the rope which was attached to his body, the innocent dead person became a saint. After this form of ordeal ceased to be in general use, it was much used in cases of women accused of witchcraft, and these witch ordeals did not disappear until the middle of the eighteenth century.

The ordeal of *bread or cheese* consisted in giving the accused a bit of bread or cheese over which prayers and adjurations had been performed, and if the accused were able to swallow it, he was adjudged innocent; if not, guilty. A special form of this was the ordeal of the *Eucharist*, used mostly among the clergy, which consisted in taking the holy sacrament under solemn imprecations of the vengeance of God if it were taken to cover a lie. It was believed that the guilty could not swallow the morsel without being choked; and it is possible that the consciousness of guilt might produce involuntary inability to swallow.

The ordeal of the *cross* was one of simple endurance between the accused and the accuser, the test being which could uphold his arms the longer before the cross. This ordeal became obsolete at an early day.

The ordeal of the *bier* was based upon the superstition that the body of a murdered person would bleed or move upon the approach or touch of the murderer. This ordeal survived until a comparatively late date as a superstition, although it early lost its authority as an ordeal.

Trial by *lot* was an early form of ordeal which was chiefly used as a means of discovering a thief or a murderer. Its insufficiency for this purpose was soon understood, however, but it continues as a superstitious means of decision in doubtful circumstances.

In the early periods many of the forms of ordeal were sanctioned by the councils of the Church, and administered by ecclesiastics; yet from the sixth century down they were generally condemned by the popes, but with little effect on the clergy, who continued to sanction and administer them. The papal authority, however, and the revival of the Roman law in the twelfth and thirteenth centuries, and the general growth of intelligence among the people, finally resulted in the overthrow of the institution of trial by ordeal. See Henry C. Lea's *Superstition and Force* (2d ed. Philadelphia, 1870). F. STURGIS ALLEN.

Order [from Lat. *or'do*, *or'dinis*, row, series, order]: a name used by zoologists and botanists for combinations of animals and plants. In zoölogy it is now always used for a group comprising one or more families and intervening between the *FAMILY* (*q. v.*) and the class. In botany the term has generally been used much as family is used in zoölogy—that is, to denote a group above the rank of a genus; but in the botanical articles in this cyclopædia the usage agrees with that in zoölogy. F. A. L.

Orders: originally, organized bodies of men vowed to monastic rule as well as military life, especially for war against the Saracens and Moors; secondly, select bodies of knights and nobles having a peculiar title conferred upon each of them, and a badge of some sort to testify to it; thirdly, modern organizations, sometimes supposed to be confined to men (or in rare cases to women) who have shown especial courage or merit, and more often consisting partly of these and partly of men occupying high official positions; also the decorations or badges indicating membership in such organizations. Perhaps 300 orders have existed in Europe since the tenth century, and there are imitations of these established by Oriental sovereigns.

1. *Medieval Fighting Orders*.—The Order of St. John of Jerusalem is thought to have been founded in the eleventh century, and was certainly organized as a great military and religious body about 1120. When the Christians were finally expelled from Palestine this order settled at Rhodes, and afterward at Malta, and they were called Knights of Rhodes and Knights of Malta accordingly. They are often called *Knights Hospitallers*, because their first organization was connected with a hospital in Jerusalem. The order still exists, and a grand-master was elected in 1879, but it is now *honorary*. The Templars, or Knights of the Temple, were a similar order, equally famous and powerful, but the order was entirely destroyed and the leaders put to death with torture during the pontificate of Clement V. and largely by the efforts of King Philip the Fair of France. The rich possessions of the order, which could easily be confiscated, probably had much to do with this act of authority, which may be compared with the dissolution of the monasteries under Henry VIII. of England. The Teutonic Order was another body of religious knights; this still exists in a much modified condition.

2. *Honorary Orders of the Middle Ages and of the Renaissance*.—The Order of the Garter was founded by Edward III. of England after his victories in France and against the Scots, and dates from 1349. It has existed ever

since. The number of Knights of the Garter is limited to twenty-five besides the sovereign as its patron. As it is very small in numbers, and limited to nobles of very high rank and to members of foreign royal houses, it is one of the two or three most envied and admired orders of Europe. The Order of the Elephant of Denmark is another such; it dates from the fifteenth century and consists of thirty members, each of whom must be already a member of the Order of the Danebrog. The most famous of all these orders is that of the Golden Fleece, founded by the Duke of Burgundy, Philippe le Bon, in 1429. It was established with great splendor, and even more magnificently treated by Philippe's successor, Charles le Téméraire. After his death and the ruin of the duchy of Burgundy as an independent state, the order was claimed at once by Spain and by the house of Austria, and to this day there are two branches of it. No person but a Catholic of very high birth and dignity can become a member. The Order of the Thistle, founded by James II. of England and VIII. of Scotland, consists of sixteen knights only. The Teutonic Order, named above, is now an Austrian aristocratic and limited body having strong Catholic tendencies. The Black Eagle of Prussia, though not founded until 1701, ought to be named here as being purely aristocratic and limited to thirty persons besides foreign princes. These five orders, together with a Prussian branch of the great Order of St. John of Jerusalem and two orders for women, one of Prussia and one of Bavaria, are the only ones which the *Almanach de Gotha* mentions in connection with the names of princes and princesses who belong to them. This serves to show the peculiar importance ascribed to these eight among all the other orders of Europe, an importance depending entirely upon their honors being shared by so few persons.

3. *Modern Orders*.—Of these much the most celebrated is the Legion of Honor, founded by the First Consul Bonaparte. It was maintained by the Restoration, but with Henry IV. substituted for Napoleon on the badges, and other similar changes, all of which were done away with when the second republic brought Louis Napoleon to the front. Under the Second Empire it consisted of 80 Knights Grand Cross, 200 grand officers, 1,000 commanders, 4,000 officers, and any number of knights, the chief of the state being the grand-master. The present organization is nearly the same. The rank of knight (*chevalier*) is given theoretically for merit in military or civil life, and for merit only, but some men receive the honor as a necessary consequence of some public office which they have discharged, apart from special merit, and of course there are sometimes complaints and charges of favoritism. The knights receive a very small annual stipend, the members of higher grade a little more, but the pay even of the *Grand Croix* is only 3,000 francs a year. All have, however, certain privileges much esteemed in France. Although there are perhaps 30,000 men entitled to wear the red ribbon or rosette, it is a most honorable and enviable distinction. The English Order of the Bath is somewhat similar, though much more rarely given; it consists of 75 Knights Grand Cross, who may put G. C. B. after their names, 200 or 300 knights commanders (K. C. B.), and about 700 "Companions of the Bath" (C. B.). The Order of the Star of India and that of St. Michael and St. George are British orders provided for distinction in the colonial service and in India. Every nation of Europe has such distinctions for military merit in the first place, and then for success as artist, author, engineer, or the like.

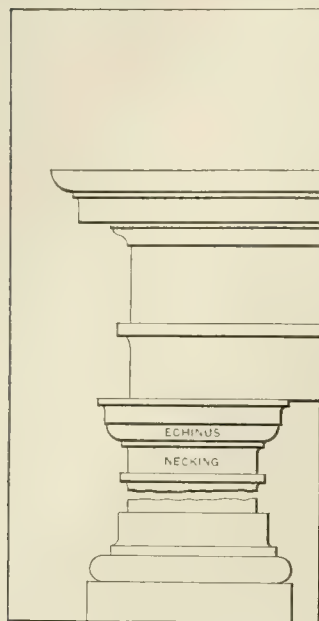
4. *Badges and Visible Distinctions*.—All the orders have their "crosses" or "jewels," and their ribbons of special colors; and for the higher grades *plaques* or stars, which are worn on the breast. The cross of the Legion of Honor is a five-pointed flat jewel of gold and enamel, worn at the buttonhole, or hanging from a ribbon at the neck according to grade, but it is worn only by soldiers or navy men in uniform, or by citizens when in evening dress. Citizens in their ordinary dress wear a small bow of ribbon of a peculiar red in the buttonhole for the grade of chevalier, and a rosette of the same silk for the higher grades; a broad ribbon is worn over the shoulder by the *Grand Croix*. A silver star is borne on the right breast by the grand officers and on the left breast by the *Grands Croix*. Similar laws govern the decorations of all the honorary orders. RUSSELL STURGIS.

Orders in Council: See PRIVY COUNCIL.

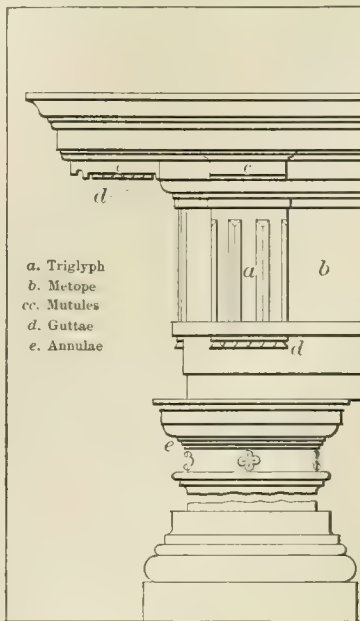
Orders of Architecture: While the word *order* may be used in architecture to mean any systematic combination of

supporting and supported members, it is customarily understood, in the absence of qualifying context, to refer to the

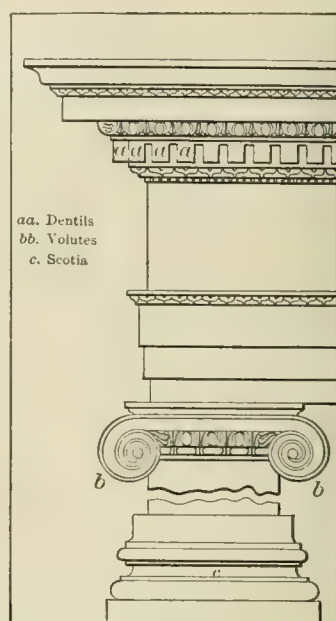
ing to the order, as shown in the diagrams. The architrave is moulded in two or three horizontal bands, and crowned



Tuscan order.



Doric order.



Ionic order.

combination of a column or a pilaster with an entablature consisting of architrave, frieze, and cornice, according to an established system or canon of design. The five orders commonly referred to in architectural treatises, and known respectively as the Tuscan, Doric, Ionic, Corinthian, and Composite, formed the basis of Roman decorative architecture, and were copied by the architects of the Italian Renaissance of the fifteenth century, and their successors in Italy and elsewhere. At first the imitation was free and more or less fanciful. As the result of minuter study and comparison, their proportions and details were systematically formulated by various architects, who sought to establish, in spite of endless variations of detail, a canon of proportions for each order. Among these various efforts the *Treatise on the Orders*, by Giacomo Barozzi da Vignola (1507-73), has found the widest acceptance, and has survived down to our own day as the best text-book on the subject.

The Egyptians had no orders in the accepted sense of the term; they employed an unvarying type of entablature over a great variety of columns of diverse proportions. The Greeks employed mainly two orders. The *Doric* was at first the only one known to them, but the *Ionic* was in the early fifth century imported, so to speak, from Asia Minor, and made use of in buildings calling for more elegant and slender forms than those of the sturdier Doric order. (See ARCHITECTURE.) In the fourth century a variant of the *Ionic* was devised, with a much enriched capital, and called Corinthian, though hardly forming a distinct order, except as to its capital.

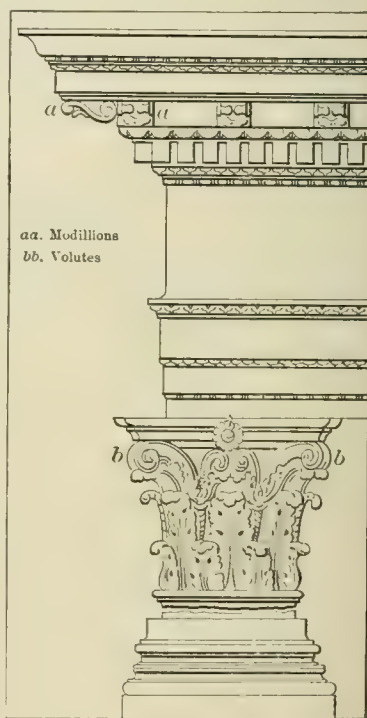
These orders, as used by the Greeks, varied widely both in proportions and details. The practical and systematic Romans, having conquered the Greeks and adopted the forms of their architecture, modified them radically in the direction of greater uniformity and of increased splendor of detail, perfecting and enriching all parts of the Corinthian, and retaining in addition their own uncouth Etruscan or Tuscan column and entablature as a fourth order. They also added a fifth, the Composite, a sort of hybrid combination of the Ionic and Corinthian. See COMPOSITE ORDER.

An order is composed of the *column*, having a *base* (except in the Greek Doric), *shaft*, and *capital*; and the *entablature*, resting upon the columns and comprising an *architrave*, *frieze*, and *cornice*. The base consists of circular mouldings (*tori* and *scotiae*), resting on a square *plinth*. The shaft, flaring into a *cincture* at the bottom and an *astragal* at the top, has a slight taper, called *entasis*, for the upper two-thirds of its length. It may be smooth or fluted; the edges of the flutings are called *arrises*. The capital is composed of various parts (*necking*, *echinus*, *volutes*, *abacus*), accord-

ing to the order, as shown in the diagrams. The architrave is moulded in two or three horizontal bands, and crowned

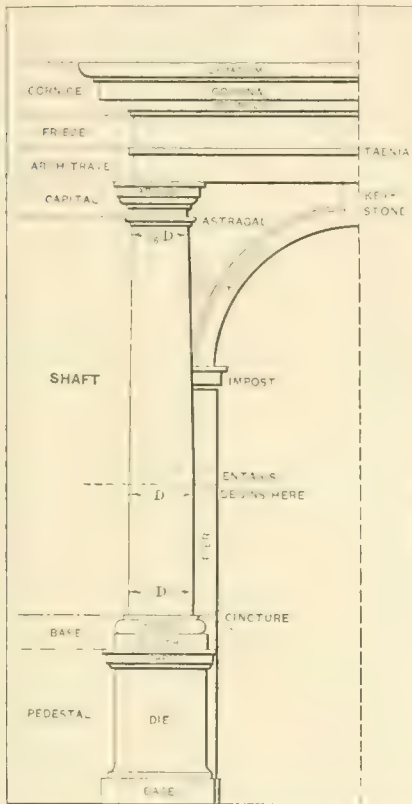
by a *tania* or upper moulding. The frieze has no special characteristic in any order except the Doric, where it is decorated with repeated vertical-grooved members called *triglyphs*, alternating with square spaces called *metopes*. The cornice always has a *bed-mould* (which may comprise a group of mouldings), an overhanging shelf-like *corona*, and a crowning moulding, the *cymatium*. In the Doric there are also *mutules*, the under surfaces of which are ornamented with *guttae* resembling trenail-heads; in the Ionic there are *dentils* in the bed-mouldings; and the Corinthian and Composite cornices have in addition under the *corona* more or less rich brackets or *modillions*. When arches are used in conjunction with columns or pilasters, the arch springs from an *impost* which serves as cap to the *pier*, and is adorned with an *archivolt* (somewhat like a curved architrave) and *key-stone*. The column is sometimes elevated on a *pedestal* composed of *base*, *die*, and *cap*.

Vignola's system involves an elaborate kind of measurement of the relative proportions of all the orders by means of modules, each module being divided into twelve or eighteen parts according to the order; but it is equally useful and more simple to express all measurements in terms of the lower diameter of the shaft (D and fractions of D).



Corinthian order.

The same orders, as given by Palladio, Scamozzi, and Sir William Chambers, vary slightly from Vignola's in minor details, but not in essentials. It may be stated that in all cases the base is $\frac{1}{4}$ D in height, as also the capital in the first three orders; that the shaft diminishes in each order exactly $\frac{1}{4}$ D in its upper as compared with its lower diameter; that the entablature always measures in height precisely one-quarter the total height of the column, or one-fifth the height of the whole order; and that the cornice always



One half of an arched order, showing names of principal parts.

measures $\frac{1}{4}$ D more than the architrave. Taking the columns of the Doric, Ionic, and Corinthian in that order, each is seen to exceed the one preceding it in the diagram by one diameter in height.

This formal canon of proportions, though generally accepted as the most perfect standard, was never strictly adhered to even by Vignola himself and his contemporaries. The apparent uniformity of the antique Roman orders was approximate, not absolute, and the value of Vignola's formulation of an exact canon is disciplinary and suggestive, rather than authoritative and binding. For further details, consult the editions of Vignola's treatise published in Paris, New York, and Boston. See ARCHITECTURE, COLUMN, MODULE, RENAISSANCE ARCHITECTURE, and the brief articles on the several orders; also *Treatise on Civil Architecture*, by Sir William Chambers (London). A. D. F. HAMLIN.

Orders, Religious: See MONACHISM.

Ordinance of 1787: The confederation of the U. S. was delayed and put in jeopardy more by a dispute as to what should be the fate of the unoccupied lands at the West than by anything else. The large States, which by their charters extended to the "South Sea," claimed to have the entire disposal of and jurisdiction over the territory within their boundaries as described in charters proceeding from the crown of England. Some of the States not thus richly provided with unsettled lands, as Maryland and New Jersey, claimed that the States which were proprietors of them ought to yield them up as common property for the benefit of all, since the efforts of all the States had secured the acknowledgment of independence from Great Britain. In 1780 New York gave authority to its delegates in Congress to fix a limit for its western boundaries, and to cede a part of its lands for such States as should become members of

the Confederation. It was not until the next year that Maryland, last of all the States, joined the new league. Soon afterward the State of Virginia gave up her lands N. W. of the Ohio for the general benefit; but it was not until 1784 that an ordinance for the temporary government of the Northwest Territory, which emanated from a committee of which Jefferson was chairman, was passed by the Congress of the Confederation. Jefferson's act provided for the formation on this soil of States which might be organized whenever there should be 20,000 inhabitants on the territory to be formed into a State, and which might be admitted into the Confederation on certain terms whenever their inhabitants should be equal in number to those of the smallest of the original thirteen States. It also contained this provision in its original form as presented to Congress: "that after the year 1800 there should be neither slavery nor involuntary servitude in any of the said States, otherwise than for the punishment of crimes, etc." This anti-slavery clause was lost, and the ordinance without it was passed Apr. 23, 1784, but no settlements were made within the territory in question for some years.

Two other attempts at legislating for the Northwestern Territory were made in 1785 and 1786, and the committee appointed in the latter year to consider this subject made a report which was ordered to a third reading in 1787. Very fortunately the bill reported was laid aside, and a new committee, appointed July 9 of the same year, reported two days later the ordinance of 1787, which became a law in two days after it was submitted to Congress. It related to the whole of the Northwest Territory, and included what afterward constituted the States of Ohio, Indiana, Illinois, Michigan, and Wisconsin. This ordinance, besides defining the rights of the citizen, contained provisions of great importance. The fourth article prohibited slavery and involuntary servitude except in punishment of crimes. Another article provided that the navigable waters leading into the Mississippi and St. Lawrence, and the carrying-places between the same, should be common highways, free to the citizens of the U. S. The importance of this ordinance in shaping the destinies of the U. S. is beyond calculation. It can scarcely be doubted that if slavery, even a small percentage of it, had been able to creep into the territory where the great free States of the West, E. of the Mississippi and N. of the Ohio now lie, the U. S. would have become a slave republic. Another declaration of great importance was that in regard to education, in which it was declared that "religion and morality being necessary to the welfare of the State, therefore schools and the means of education shall for ever be encouraged." On the basis of this declaration the Constitutional Conventions, as well as the Legislatures of the several States formed of the Northwest Territory, have felt bound to make liberal provisions for all grades of educations. It has been generally supposed that Nathan Dane, of Massachusetts, then in the Congress of the Confederation and a member of the committee which reported the ordinance, was its principal author; but it has been shown by Dr. W. F. Poole and others, from documents which had not been used before, that the authorship of it belongs mainly to the Rev. Manasseh Cutler, who appeared in New York, where the last Congress of the Confederation was then sitting, and who was ready to purchase 1,500,000 acres in Ohio for a company composed of officers in the then recent war living in Eastern Massachusetts, and 4,000,000 acres for other parties in case the ordinance should be adopted. The history of Cutler's connection with the ordinance may be found in *The North American Review* for Apr., 1876, and in W. P. Cutler's *Life, Journals, and Correspondence of Manasseh Cutler* (1888).

T. D. WOOLSEY. Revised by C. K. ADAMS.

Ordinances: See BY-LAWS.

Ordinary [from Lat. *ordinarius*, orderly, regular, deriv. of *or-do*, order]: In the later Roman empire the official who heard and decided in first instance the more important civil and criminal cases (the president of the province) was commonly described as the ordinary judge (*iudex ordinarius*). In the mediæval Church judicial powers were vested, in first instance, in the bishop of each diocese; and the ecclesiastical law, which was largely based upon the Roman, transferred to the bishop, as a judicial officer, the Roman title of judge ordinary. The judicial powers of the bishop, however, were commonly delegated to and exercised by a deputy or surrogate (*subrogatus*).

The jurisdiction claimed and exercised by the mediæval

Church extended over marriage and family law in general, and over cases of testamentary and interstate succession, as far at least as the personal estate was concerned. In modern states this entire jurisdiction has been transferred to the civil courts, but in England, even after the Reformation, it was exercised by special tribunals (ecclesiastical courts), and in the U. S. probate business at least is still regularly assigned to special judicial officers, who in many of the States retain the designation of "ordinary" or "surrogate."

MUNROE SMITH.

Ordinate [from Lat. *ordina'tus*, perf. partic. of *ordina're*, appoint, order, arrange, deriv. of *or'do*, *or'dinis*, series, order]: in co-ordinate geometry, one of the elements of reference used to determine the position of a point with respect to the co-ordinate axis. It is the distance of the point from the axis of abscissas, measured on a line parallel to the axis of ordinates. Every function of a single variable may be regarded as the ordinate of a point of a curve of which the variable is the corresponding abscissa. This curve is called the curve of the function.

Ordination [from Lat. *ordina'tio*, appointment, ordering, deriv. of *ordina're*, appoint, order, ordain]: the ceremony by which ministers of the Christian Church are dedicated to their office. It is performed in a somewhat different manner, and somewhat different ideas are attached to it, in the different Christian Churches, but the ceremony itself and its principal feature, the imposition of hands, are as old as the Church, and are mentioned in the New Testament (Acts vi. 1-7; xiii. 1-4; xiv. 23; 1 Tim. iv. 14; 2 Tim. i. 6). In the Greek and Roman Churches ordination is considered a sacrament; that is, a special divine gift, a new spirit, a fitness for the office, is believed to be conferred by the ceremony upon the candidate, and he is thus, at once and for ever, set apart from the laity and entered among the clergy, *ordo*. In order to be valid ordination must be performed by a bishop of the Church, and if once duly performed it can never be forfeited or made invalid by any act of the ordained in his after life, and it is not repeated when the candidate ascends from one rank in the Church to another. An ordination is not lawful, however, because it is valid; the Roman Catholic Church has enacted very strict and very minute laws concerning this point. A candidate can be lawfully ordained only by his own bishop—that is, the bishop to whom he belongs by birth, by domicile, by benefice, or by connection of personal service—and any irregularities render both the ordaining bishop and the ordained candidate liable to heavy ecclesiastical penalties. In the Protestant or Evangelical Churches ordination is not considered as sacramental or indelible, though it has been questioned in the Church of England whether a bishop could be lawfully deprived of his orders as bishop. The Church of England has generally retained the regulations of the ancient canon law, according to which no one could be ordained who was not provided with some appointment in the Church capable of maintaining him, or who was disqualified by bodily infirmity, immorality, etc., nor could the ordination take place until after an examination of the fitness of the candidate. The ordinal, as drawn up under Edward VI., then modified in the reign of Elizabeth, and finally fixed by the convocation of 1661, also resembles the ancient service, though it is simpler, and lays a particular stress on the examination. A clergyman may be suspended or deprived of his ecclesiastical benefices by his bishop without forfeiting his ordination. He is deprived of his status of priest or deacon only when he is deposed or degraded on account of his being convicted of treason, murder, or felony. In the Presbyterian Church when a minister is deposed he forfeits not only his office but his clerical status. Those who accept the idea of a universal priesthood of believers view the ministry as a calling rather than an office, and consider ordination simply as a solemn ceremony, conferring no special gift and establishing no special status, but beautiful by itself on account of its pious remembrance of the time of the apostles.

Revised by S. M. JACKSON.

Ordnance [an old form of *ordnance*, ordaining, arrangement, decree, preparation, provision, from Lat. *ordina're*, appoint]: guns, howitzers, and mortars. The term *ordnance* is synonymous with *artillery*, but less comprehensive in its meaning. It signifies cannon, and these simply as material and nothing more. Its application as a military term had its origin from an *ordnance* promulgated in the reign of Henry VIII. of England, regulating the caliber, figure,

and dimensions of cannon. Under this a board—which subsequently took the name of the ordinance or ordnance board—was established, charged with the care of crown fortifications and their armaments. Prior to this, artillery, as well as arms of all kinds, had been fashioned according to the fancy of each manufacturer, and the object and effect of the ordinance was to establish uniformity. Arms made in conformity to the specifications of the board were termed *ordnance* or *ordnance*, in contradistinction to those of irregular pattern; and from this sprang the custom of designating all artillery as ordnance. In addition to cannon, strictly speaking, the U. S., following the English custom, has extended the term ordnance to include all firearms of every description, whether cannon or small-arms. The term *ordnance stores* comprehends every description of ammunition, all carriages used for artillery purposes and their equipments, and all other apparatus and machines required for the service and manœuvres of artillery, together with the materials for their construction, preservation, and repair; also all side-arms and accoutrements for artillery, cavalry, and infantry, together with utensils and stores for laboratories. For the various steps of development leading up to modern ordnance, see ARTILLERY.

Since 1860 the entire system of gun-construction throughout the world has been revolutionized. The chief, if not the primary, impulse to this was imparted by the battle between the U. S. ironclad Monitor and the Confederate ironclad Merrimac in Mar., 1862. Up to this period the art of constructing armor-clad vessels had not progressed beyond the experimental stage, and the battle referred to was the first practical test of armor *versus* guns. The maritime nations of Europe, taking alarm at this successful application of the armor principle, at once began remodeling their navies, and clad their vessels with a thickness of plating before unknown. To meet these new conditions guns were devised capable of piercing the heaviest armor then in existence. Then more powerful armor of steel was adopted, and still more powerful guns constructed. The contest yet continues. In its progress it has evoked much scientific study and mechanical ingenuity, leading through various stages to the present system of "built-up" guns. Pieces of this nature are constructed of an inner tube, forming the bore, and certain bands and hoops surrounding and strengthening it. This method of construction admits of the principle of initial tension, a chief factor in the strength of modern artillery. This principle is based upon the phenomena of elasticity, and in gun-construction is utilized by shrinking successive layers of metal one over the other, each being given an initial strain to assist it in supporting the layer underneath. (See under GUNNERY, *Interior Ballistics*.) The cost of guns constructed on the built-up principle is enormously great as compared with cast-iron pieces of equivalent calibers.

In 1883 the U. S. Government sent to Europe a mixed commission of army and navy officers to examine and report upon the most advanced methods there in use. Special inquiry was made as to the systems pursued by the leading European nations for supplying themselves with artillery. The board found the system in vogue in France (since the Franco-German war) the most promising of good results, and accordingly recommended it. In this system the Government depends upon the private industries of the country for foundry-work—i. e. for the rough forgings of the various parts of the guns; but for assembling and finishing work the Government has its own factories.

Acting upon these recommendations, the Government established two gun-factories—that for the army at the Watervliet arsenal, West Troy, N. Y., and that for the navy at the Washington navy-yard. The board, in its recommendations, emphasized the necessity of proper encouragement to the private steel-manufacturers of the U. S. by such liberal appropriations for gun-forgings as would induce them to expand their plants and means of production. Liberal appropriations of money by Congress soon followed, and under this stimulus several steel-foundries expanded their plants to a capacity equal to any requirements. Chief among these works is that at Midvale, Pa., and that at Bethlehem, Pa., both of which are capable of fabricating forgings for guns up to and even beyond 12 inches caliber.

Description of Heavy Ordnance.—All guns, howitzers, and mortars of the built-up system consist essentially of a tube, surrounding bands, and the breech mechanism. They differ but little except in dimensions of parts and the number of bands. For a general description of the U. S. system the

8-inch rifle may be taken as a fair type. This piece (see Fig. 1) is composed of a tube, a jacket, 8 C, 3 D, and 7 A hoops, a breech-block receiver, and the various parts of the breech mechanism. The tube is 266 inches (22 ft. 2 in.)

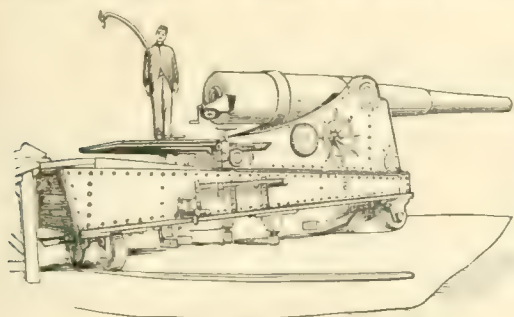


Fig. 1.—8-inch breech-loading rifle.

long, and has an exterior diameter of 15 inches at the breech and 11.5 inches at the muzzle. This tapering is by nine shallow steps or shoulders against which the jacket and certain of the hoops abut. The jacket is an elongated hoop embracing the rear part of the tube for a distance of 96.6 inches, and extending beyond the rear of the tube 12.5 inches. The front end of the jacket rests about 19 inches in front of the axis of the trunnions; from this point to the muzzle the tube is enveloped and strengthened by eight hoops, technically known as C-hoops. These have varying widths, the average being 21.2 inches; the rear one—that next the jacket—has an exterior diameter of 18.25 inches, while that at the muzzle has but 14 inches, this being the diameter of the finished piece at this part.

The jacket and C-hoops constitute the first layer over the tube. Then comes the layer of D-hoops, three in number, having an average width of 22.5 inches. The rear D-hoop overlaps an offset on the front end of the jacket; the other two break joints with the underlying C-hoops. The rear D-hoop—partly covered by the front A-hoop—has an exterior diameter of 24.5 inches; from here forward the D-hoops have a uniform taper to a diameter of 17.6 inches, when the end of the front one is rounded off, forming the first projection, or offset, on the finished piece.

Next come the A-hoops, seven in number, covering the entire length of the jacket and part of the rear D-hoop. They have varying widths, the total being 112.75 inches. The second from the front constitutes the trunnion band; the one in front of it tapers and is rounded in front, forming the second offset or shoulder on the exterior of the finished piece. The exterior of those in rear of the trunnion hoop have no taper.

The 10 and 12 inch guns have another layer of hoops covering the A-hoops from the breech to the front of the trunnions; the last, or front one, is the trunnion band, and

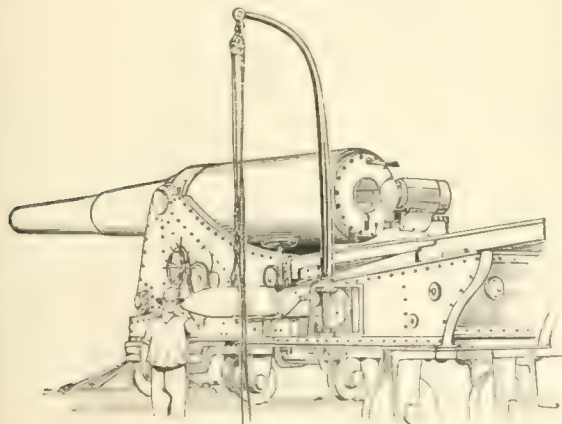


Fig. 2.—12-inch breech-loading rifle.

being rounded off in front forms a shoulder on the exterior of the piece. Fig. 2 represents a 12-inch rifle ready for loading.

The exterior of the muzzle of the tube is made slightly conical, with the base of the cone to the front; the interior of the front C-hoop being also conical—but in the opposite direction—prevents, when the latter is shrunk on, all possibility of slipping forward. The jacket sustaining the breech mechanism is prevented from slipping to the rear by a projection on its front end engaging a shoulder on the tube. The entire system—tube, jacket, and hoops—is thus united into one compact body.

The rifling occupies 200.76 inches of the bore, the remaining 60.74 inches being taken up by the seat for the shot, the powder-chamber, and the seat for the gas-check. The shot-seat and the powder-chamber are connected by a sloping surface, 10 inches in length, to give facility in shoving the shot home to its seat. The rear ends of the lands are sloped for the same purpose. The powder-chamber of modern guns is made larger than the bore, in order that the enormous charges now used may not take up so much of the length of the bore. This increase of diameter possesses also other advantages of a ballistic nature. (See GUNNERY.) The powder-chamber of the 8-inch rifle has a capacity of 3,609 cubic inches, or of 130 lb. of powder.

The gas-check seat, 2.5 inches long, is a slightly tapering enlargement of the rear end of the powder-chamber, and is intended for the reception of the gas-check, hereafter described. The shot when in position for firing rests directly between the trunnions; its base, with the copper rings to take the grooves, rests in the shot-chamber.

The breech mechanism, although originally invented in the U. S., is a modification of what is known as the French system. The principal parts are the receiving-ring, the breech-block, the obturator, the console or loading-tray, and the breech-plate. The extension of the jacket beyond the rear end of the tube forms a recess for the reception of an inner hoop called the receiving-ring, which has the same thickness, viz., 2.75 inches, as the end of the tube against which it abuts. A screw-thread is cut on its exterior, which works in a thread on the interior of the jacket, the ring is then set home by powerful leverage, the junction between the ring and end of the tube being hermetically sealed by a thin ring of copper. The interior of the receiving-ring contains slotted screw-threads into which similarly slotted threads on the breech-block engage. There are three of these slots, each occupying one-sixth of the circumference of the interior of the receiving-ring, and running longitudinally. The breech-block is turned on its axis to engage or disengage the slotted screw-threads by means of a pinion and circular rack, for which recesses are cut in the upper part of the breech-plate. When disengaged, the slots of the receiver being opposite the threaded portions of the breech-block and *vice versa*, the breech-block may be moved back and forth with freedom; when engaged, the bore is closed ready for firing the same as though the threads were continuous.

The obturator consists of a steel head of mushroom shape, of the diameter of the powder-chamber, the rear part of which it occupies; this head is attached to a spindle which works with freedom through the axis of the breech-block, to the rear end of which it is secured by a screw and nut. In rear of the mushroom head are two annular cups of elastic steel surrounding the spindle. These cups inclose between them a canvas pad containing a mixture of tallow and asbestos. The spindle is fitted to allow a certain amount of longitudinal motion within the block, so that when the piece is fired the gas pressure on the mushroom head forces it back upon the annular cups, compressing the canvas pad until it swells out against the walls of the bore, thus making a tight packing, effectually preventing the escape of gas to the rear. After the explosion a spring at the rear end of the spindle forces it forward to its former position, thus releasing the cups and packing from pressure, and allowing the breech-block to be withdrawn without difficulty. One packing-pad will stand many rounds, and when no longer serviceable is readily replaced by a fresh one. The vent is bored longitudinally through the spindle and mushroom head. An automatic safety-cover keeps it closed except when the breech-block is in position ready for firing.

The console, or tray, is an irregularly shaped bronze casting attached to a hinge fastened to the breech of the piece, and is intended to receive the breech-block when withdrawn from the bore and swing it around on a hinge to one side. As the breech-block is heavy, it is moved back and forth on the tray by means of a translating roller, on which is cut a

screw-thread, of considerable pitch, into which engages a stud on the bottom of the block. On the under side of the tray is a latch securing it to the breech of the piece, when the block is being withdrawn from or inserted into the bore.

The breech-plate is a 4½-inch thick steel disk attached by screw-bolts to the breech of the piece, covering and protecting the breech mechanism, and giving support to some of its parts. An opening is cut in the central portion of the plate, through which the breech-block enters to close the bore.

To operate the breech mechanism, suppose the breech closed as though ready for firing; to open it, turn the rotating crank in the direction marked "open"; this rotates the breech-block to the proper position to be withdrawn. While the block is making this one-sixth of a revolution it is moved slightly to the rear by the action of the screw-threads, and this loosens the gas-check from its seat. As soon as the motion begins the vent-cover slides into position, thus preventing the insertion of a primer until the block is again in position for firing. The translating stud of the block at the same time enters the thread of the translating roller, the crank of which is now turned to the left, causing the breech-block to slide back upon the tray. When the block is withdrawn to the proper point the tray-latch is disengaged automatically from its catch, allowing the tray and block to be swung around by hand to the right, until the securing latch catches and holds it in that position. The piece is now ready for loading.

The operation of closing the breech is almost the reverse of the foregoing.

Forging.—All of the parts of a gun, forged and fashioned in the rough, are furnished by the steel contractor. The metal is steel of a low percentage of carbon, commonly called low steel. This is melted and brought to a proper physical and chemical condition in an open-hearth furnace—the Siemens furnace. (See FURNACE.) From the furnace the liquid metal is drawn off into cylindrical moulds of great strength and peculiar construction. These are placed under a powerful hydraulic press, which expels all gas from the fluid mass and compresses it into a dense ingot. Some of the ingots thus treated weigh upward of 40 tons. After cooling the ingot is transferred from the mould to the lathe, where it is bored and cut to proper lengths for the parts to be forged from it.

To forge one of these sections to a required figure it is placed in a furnace heated by coal-gas—all the heating is done by gas—where it is brought to a glowing heat, and then transferred to the hydraulic forging-press, where it is fashioned into the desired shape, the soft metal being moulded into shape as putty is moulded in the fingers. Owing to the great weight of the ingots and forgings, the most powerful cranes and other machinery, set in motion by compressed air, are employed for handling them. Metallic templates are used by the workmen in fashioning the forgings as the pressing progresses.

The forgings are now rough-bored, turned, and machined to the required dimensions, which is just sufficient to admit of proper tooling in the assembling and finishing process at the gun-factory. After this the parts are oil-tempered and then annealed. These two processes impart to the metal toughness with the required degree of hardness. In oil-tempering the tubes and jackets are heated vertically and as evenly as possible; they are then immersed in rapeseed oil, in the direction of their axes, in such manner that a current of the fluid flows through the bore. This operation must always be performed on the whole of each piece at one time.

For annealing, which removes any strains that may have been produced in tempering, the tubes and jackets are heated as evenly as possible; this operation also is performed on the whole piece at one time. The degree of heat, which is generally that producing a salmon color, is maintained uniformly for several days.

After the tempering and annealing treatment, should a part be found to have warped or bent to such a degree as to require straightening, it is returned to the forging furnace and press and tempered and annealed again. All the hoops and the forgings for the various parts of the breech mechanism are treated in like manner.

The forgings, stamped and numbered, are delivered to the Government on board of cars at the foundry, whence they are transported to the Government gun-factory. The present cost of a set of forgings for an 8-inch gun is \$10,938, or

27½ cents per pound. For the 10-inch gun the cost is \$24,865, or 30½ cents per pound. For the 12-inch gun it is \$42,218, or 30½ cents per pound.

During all of the foregoing operations each process is subject to the inspection of expert officers of the ordnance department, who are stationed at the foundries for that purpose, and for this it is stipulated in the contracts that they and their employees shall be allowed free access at all times to every part of the manufacturers' works; but the details of operations carried on are considered confidential so far as the manufacturers may desire. Each establishment has its own chemist, laboratory, and testing-machine. The latter is compared with and adjusted to the Government machine at Watertown arsenal, thus assuring uniformity of results among all establishments supplying forgings. The test specimens have a stem length of 3 inches, with a diameter of 0.564 inch, and the specifications are very precise as to their number and the part of the forging from which taken. They must show an elastic limit of not less than 42,000 lb. per square inch for tubes and 46,000 lb. for jackets, and a tensile strength of not less than 78,000 lb. for tubes and 86,000 for jackets. A tabulated record is kept of all these tests, so that the Government has a complete history of the fabrication of each piece and the strength and composition of each fiber of its body.

Assembling the Piece.—The first operation in assembling the forgings received from the founder is to place the tube in a lathe, where it is bored and reamed to within about a tenth of an inch of the exact diameter of bore; at the same time the exterior is turned to the proper dimensions for the hoops. It is then faced at the rear end, from which all measurements are made. The powder-chamber is next bored and reamed, as also the conical junction between the chamber and bore.

The jacket is then bored and reamed to fit the shoulder left on that part of the tube over which it is to fit. The interior diameter of the jacket is about 0.02 inch less than the exterior diameter of the tube. This is for the purpose of bringing an initial strain on the jacket after it has been shrunk to the tube. The shrinkage allowance for each part is taken from tables carefully prepared from a long course of experiments, conducted for the purpose of determining the most suitable strains.

The next operation is to shrink the jacket on the tube. The assembling-pit, about 30 feet deep and 8 feet in diameter, is so arranged as to receive and sustain the tube in a vertical position. The tube is adjusted muzzle upward in the pit; the jacket is brought to the proper temperature (about 600° F.) in the furnace, swung over the tube by means of a crane, and then let down over the tube a short distance, after which the tube is pulled up through it, by means of the crane, until the shoulders come together. A water-collar and water-rings are then adjusted to perform the function of jetting water upon the precise parts to be first cooled. The whole is then allowed to cool, after which the now united tube and jacket are removed from the pit to rest in a horizontal position. The first C-hoop is now heated for expansion, slipped over the tube, and tightly clamped up against the jacket by means of a powerful clamping device, when it is allowed to cool. After this the piece is returned to the lathe, and the shrinkage surface of the tube turned for the next two C-hoops, which are now shrunk on, following which the piece is again returned to the lathe, and the shrinkage surface of the tube is prepared for the remaining C-hoops, and also that portion of the jacket and of the C-hoops to be covered by the D-hoops, all of which are now shrunk on in succession. The exterior of the jacket is next turned and the A-hoops shrunk into position. While the exterior is being turned and finished, the bore (now diminished by the heavy pressure brought upon the tube by the shrinkage of jacket and hoops) is reamed out to the precise caliber of 8 inches. At the same time the powder-chamber, the seat for the shot and for the gas-check, are bored to the proper dimensions, the whole interior being given a well-polished surface. The threads for the breech-block receiver are now cut, and the latter is screwed home against the thin copper ring fitting between the receiver and the rear end of the tube, and intended to prevent all escape of gas in this direction. The next operation is to slot the receiver and cut the threads for the breech-block. The piece is now rifled. For the number and dimensions of grooves and lands, see table at end of article. The twist of the rifling is increasing, being one turn in 50 calibers at the breech, and 25 calibers at 16 inches from the muzzle, from which point

it is uniform. The various parts of the breech mechanism are now fitted on, and the gun is complete.

The Appropriation Act passed by the U. S. Congress in 1890, supplemented by that of the following year, directed the purchase of 100 completed guns, viz., 25 8-inch, 50 10-inch, and 25 12-inch, the total expenditure for which shall not exceed \$4,250,000. The length of time required for the production of these guns, including the time required for the erection of a gun-factory plant, is estimated to be about ten years.

Mortars, as well as guns, are now constructed on the built-up principle, and are also breech-loading. A mortar thus constructed is, in general features, but a gun of the same caliber shortened. A mortar of the 12-inch type is made up of an interior tube, a jacket, and one layer of hoops. The breech mechanism is the same as for guns. For weight, dimensions, etc., see table at end of article.

Carriages.—The great weight and power of the new guns require proportional strength and mechanical appliances in the carriage. A thoroughly equipped carriage for a modern piece is a machine almost as complicated in construction as a locomotive. Owing to the very great accuracy of modern fire and the rapidity of discharge of machine-guns, it becomes an essential condition that the pieces and their carriages, as well as the cannoneers, should be protected. The tendency is therefore to resort to armor-shields and to disappearing carriages. In the latter case the gun is exposed to the fire of the enemy only for a brief period—at the time when it is hoisted above the parapet to its firing position. After discharge the piece disappears behind the parapet, where it is again loaded in security. One form of such an arrangement is a gun-lift, by means of which gun and carriage are hoisted and lowered on a platform by means of hydraulic power. The most general form, however, is some application of the counterpoise principle. Still another form, and one promising good results, is a pneumatic disappearing carriage.

Another difficult problem is a suitable carriage for the modern high-power, breech-loading mortar, the conditions for which embrace enormous strength to resist the great strain of vertical fire, together with the freedom and precision of motion demanded by this class of artillery. A mortar mounted on one form of such carriages—the hydro-pneumatic carriage—is illustrated by Fig. 3.

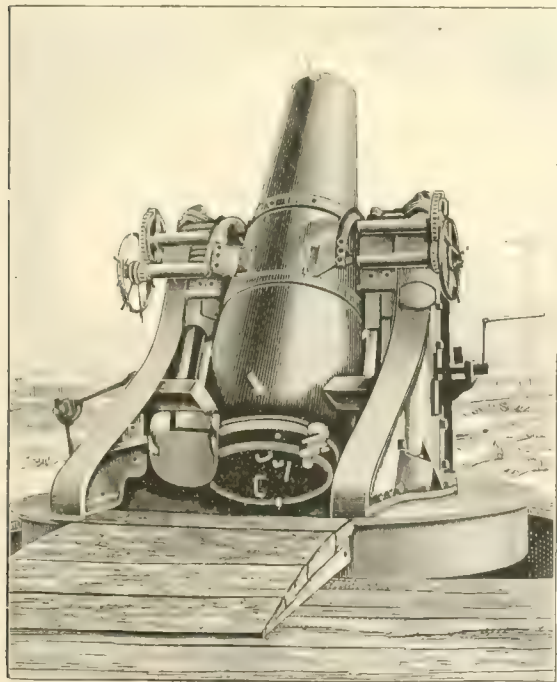


FIG. 3—Modern breech-loading mortar.

Field Ordnance.—A new type of field-gun has been introduced by the U. S. Government. In this piece there are no hoops proper. The trunnion band and jacket are forged in one piece. The breech-block, being comparatively light,

dispenses with the tray, and is supported by a ring hinged to the breech of the piece, which swings readily to one side. For dimensions, etc., of this piece, see table at end of article. The carriage and caisson for this piece are of steel so far as practicable; the only parts of wood being the felloes, spokes, pole, and the ammunition-chests. A swinging bar takes the place of the old-fashioned pole-yoke. The rigid splinter-bar of the old carriages is replaced by a movable double-tree, similar to that of ordinary carriages. The ammunition-chests, dispensing with trays, are much lower than formerly. Each one carries 42 rounds, making 168 per gun. For each battery of six pieces three extra caissons are allowed, making in all 33 chests carrying an aggregate of 1,386 rounds. The battery-wagon and forge of the old system have been united into one carriage, resembling in appearance a caisson.

The U. S. system of field artillery embraces a 3.6-inch breech-loading mortar—a short light piece (Fig. 4) intend-

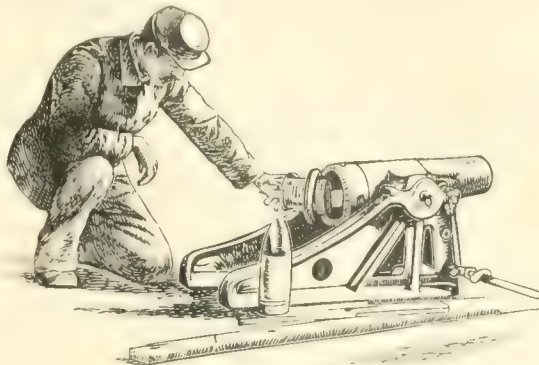


FIG. 4—Breech-loading mortar for field use.

ed for vertical fire, chiefly against the *personnel* of an enemy protected by field intrenchments or inequalities of the ground against the direct fire of field-guns. It takes the place of the old Cohorn, but is much more powerful, accurate, and far-reaching. The body of the piece is made of a single ingot of forged steel, having the trunnions forged solid with the piece. The breech mechanism is similar to that of field-guns. The carriage is of bronze, cast chiefly in one piece, and when in position for firing rests directly on the ground; in transportation it, with the piece, is carried on a wagon especially devised for it—three on one wagon.

A 5-inch gun has been devised for light siege or heavy field service. In general construction it is similar to the 3.2-inch field-piece. For dimensions, etc., see table at end of article. The carriage supporting the piece is of steel, to be attached to a limber for traveling. The most noticeable feature about the carriage is the great height of the trunnions (72 inches) as compared with ordinary field-carriages. This is to admit of high elevation in firing. In the ordinary field-carriage the lowness of the trunnions is noticeable. Owing to the heavy charges used the recoil is excessive; to check this an hydraulic buffer, consisting of a cylinder and piston, is attached to the carriage and to a pintle firmly secured to the front of the platform on which the carriage stands. The piston-rod is attached to the under side of the stock, and the front end of the cylinder to the pintle.

The 7-inch siege-howitzer, the dimensions of which are given in the table at the end of this article, has about the same construction as the siege-gun just mentioned, except that it is very much shorter; the carriage for it is almost identical.

A 3-inch Hotchkiss rapid-firing gun has been adopted as a mountain-piece, to take the place of the small bronze mountain-howitzer of the old artillery.

Pneumatic Dynamite Gun.—Much ingenuity has been expended to devise some means of safely firing shells loaded with high explosives from ordinary powder-using guns. Although some experiments in this direction have been successful to a limited degree, the problem, as a whole, is as yet quite unsolved.

About 1885 a pneumatic gun capable of throwing heavy charges of high explosives was produced in the U. S. This machine, often called the Zalinski gun, consists essentially of a long steel tube, made as light as admissible, an air-reservoir, and a system of valves and other mechanism at

the breech for the control of compressed air, the propelling force of the projectile. The piece is provided with trunnions, supporting it on a carriage, one form of which resembles in general appearance the top carriage of an ordinary barbette gun. (See Fig. 5).

limited to about 5,000 yards. The piece is fired at a high elevation, giving the trajectory the character of that of the ordinary mortar shell.

The success attending the firing of an 8-inch piece of this character induced Congress to authorize the procurement of

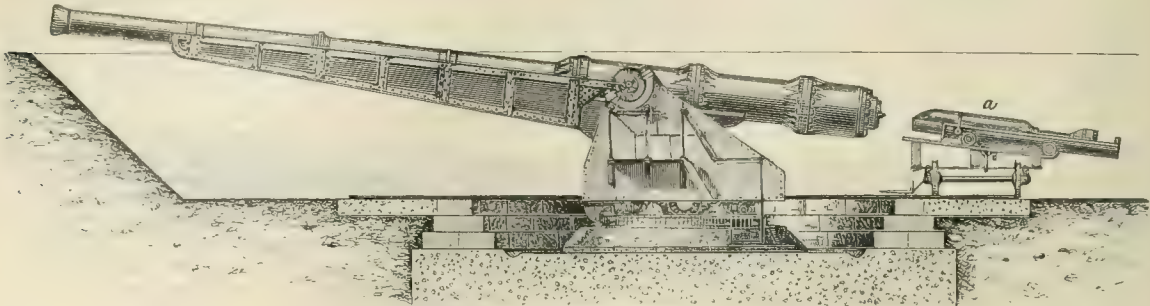


FIG. 5.—Pneumatic dynamite gun.

The tube is supported underneath by a cantilever steel truss, extending forward almost to the muzzle. The piece, as its name implies, is simply an air-gun. The air-compressor is a complicated system of cylinders, pistons, chambers, coolers, pipes, and valves. This apparatus is disposed of under and within the carriage, and is operated by a steam-engine, which may be at any convenient distance from the piece. The working capacity of the apparatus admits of about ten shots per hour, and the valve arrangements are so nicely adjusted as to admit the required amount of air with as much precision as gunpowder is weighed for ordinary guns. The projectile is simply a vessel to convey the explosive agent against or near the object to be destroyed, and consists of an elongated metallic cylinder to which is attached an ogival head containing the fuse mechanism. To the rear end of the cylinder is attached some form of oblique flanges, which, acting against the air, gives rotation to the projectile during its flight. Such a projectile is seen at *a* in Fig. 5. Dynamite and nitrogelatin are the usual explosives. As it is all-important that the explosion should take place with certainty, and at the proper moment, the fuses are an important feature of the projectile, each of which is usually provided with three—one to act by impact against the object, one to act by immersion when the water is struck, and the other to act in case of failure of the other two. The impact fuse is similar to the ordinary percussion fuse, but the other two act by means of a complicated electrical device.

ten others, nine of which are of 15-inch caliber. Three of these are to be mounted at San Francisco, and the remainder are to be mounted at important harbors on the Atlantic coast.

Wire-wound Guns.—In the U. S. considerable success has attended efforts to produce guns by this process. Pieces of this nature consist essentially of a steel tube for the bore, and of a series of layers of wire coiled around it. During the winding process a strong tension is given the wire, decreasing gradually from the interior to the exterior. The wire—which is tinned—has a rectangular cross-section. A jacket sustaining the trunnions covers the rear part of the piece, as likewise the breech mechanism. When the wire-winding process is complete, the piece is subjected to a low furnace-heat, to effect a soldering together of the wire strands through the agency of thin sheets of soldering foil inserted between the layers of wire during the winding process.

It is claimed that serviceable guns can be constructed by this method with but moderate plant as compared with built-up pieces—a feature of great importance to a nation of defensive unreadiness.

The following table shows the principal dimensions, weights, etc., of the system of rifled and breech-loading field, siege, and seacoast artillery, adopted for the U. S. land service, and now constructed at the Watervliet gun-factory:

DIMENSIONS, WEIGHTS, ETC.	FIELD ARTILLERY.			SIEGE ARTILLERY.		SEACOAST ARTILLERY.			
	3·2 inch steel breech- loading rifle.	3·6 inch steel breech- loading rifle.	3·6 inch steel breech- loading mortar.	5 inch steel breech- loading rifle.	7-inch steel breech- loading howitzer.	8 inch steel breech- loading rifle.	10 inch steel breech- loading rifle.	12-inch steel breech- loading rifle.	12-inch steel breech- loading mortar.
Weight, pounds	829	1,230	250	3,660	3,710	32,311	67,200	115,046	29,120
Total length, feet	7·5	7·5	2·0	12·1	8·0	23·2	30·6	36·6	11·7
Length of bore, calibers.	26	22·7	5·25	23·5	12·4	32	34	34	10·
Twist of rifling, calibers.	30	35	30	35	35	50 | 25	50 | 25	50 | 25	30
Number of grooves	24	24	24	32	40	48	60	72	72
Width of grooves, inches	0·3	0·3	0·3	0·35	0·399	0·373	0·373	0·373	0·373
Depth of grooves, inches	0·05	0·05	0·05	0·06	0·06	0·06	0·06	0·06	0·07
Width of lands, inches	0·119	1·71	1·71	0·141	0·160	0·150	0·150	0·150	0·150
Length of powder-chamber, inches	10	14	3·9	19·7	10·64	41·25	53·25	62·5	20·0
Diameter of powder-chamber, inches	3·8	3·9	3·8	5·7	7·2	9·5	11·8	14·2	12·5
Length of axis of trunnions, inches	14·9	15·5	14·5	21·6	26	44·5	55·5	66·8	56
Diameter of muzzle, inches	5·1	6·0	5·4	8·00	10·00	14·0	16·8	21·0	21·0
Diameter of breech, inches	9·25	9·8	7·8	15·00	16·70	30	38·5	46·25	38
Number of hoops	2	1	0	3	3	14	18	30	6
Weight of forgings, pounds	...	1,738	347	...	...	40,091	82,002	138,732	...
Weight of tube forging, pounds	641	858	302	2,421	2,169	9,612	18,808	32,363	7,666
Weight of jacket forging, pounds	776	812	...	2,031	1,223	9,082	16,870	29,150	9,632
Weight of projectile, pounds	13·05	18·86	18·86	42	91	300	575	1,000	800
Length of powder, pounds	3·75	4·63	1·00	12·5	9·75	130	256	440	100
Length of projectile, calibers	3	3·25	3·25	3	3	3·5	3·5	3·5	3·5
Initial velocity, foot-seconds	1,700	1,554	650	1,829	1,085	1,935	1,940	1,940	1,150
Muzzle energy, total, foot-tons	270	335	59	997	857	7,787	15,001	26,089	7,334
Muzzle energy per ton of gun, foot-tons	731	610	525	612	519	546	500	508	564
Muzzle energy per pound of powder	72	72	59	80	88	60	59	60	73
Penetration in Cresset steel at muzzle, inches	...	...	...	...	...	16·5	20·5	25	...
Approximate range at 30° elevation, in yards	...	...	...	...	...	11,000	13,650	14,700	...
Approximate cost of piece, in dollars	...	...	...	...	...	15,600	34,500	52,300	...
Approximate cost per charge, in dollars	...	...	...	...	...	17·00	131·00	217·00	...

The ordinary projectile for the 15-inch gun has a total length of about 10 feet, exclusive of the directing apparatus attached to its rear end. Its weight when loaded with 500 lb. of nitrogelatin is approximately 1,000 lb. The muzzle-velocity is only about 500 feet per second, and the range is

John C. Tidball.
Ordnance Department: that branch of the U. S. army which supplies arms, ammunition, and equipments to the military force of the nation. In instituting this as a separate branch the U. S. has followed the traditions of Great

Britain. The European continental states do not have such distinct organizations for the supply of ordnance and ordnance material. These duties devolve upon the artillery, and are performed by officers detailed therefrom. Attached to its department of war, each government has a bureau of artillery, which regulates all matters connected with national armament. In Germany the fabrication of arms is directed by officers detailed from the foot-regiments of artillery; the labor is performed by civilian employees. Besides Government establishments, there are private armories supplying small-arms to the Government the manufacture of which is superintended by officers of infantry.

In the U. S. the department was created a distinct branch of the military establishment in 1812, a short period before the outbreak of the war with Great Britain. Prior to this ordnance and ordnance stores had been obtained from private establishments, and were received and inspected by civil or military agents without regard to any strict system.

The duties of the ordnance department were specifically set forth in the law creating it to be the inspection and proving of all pieces of ordnance, cannon-balls, shells, and shot procured for the army, and to direct the construction of all carriages and every apparatus of ordnance for garrison and field service, and all ammunition-wagons, pontoons, and traveling forges, and also the direction of the laboratories, the inspection and proving the public powder, and the preparing of all kinds of ammunition for garrison and field service. In 1815, at the close of the war with Great Britain, the department was reorganized and its duties and powers enlarged. The officers, with a colonel at the head, were given direct military rank, and it was made the duty of the chief to make estimates, and, under the Secretary of War, to make contracts and purchases for procuring the necessary supplies of arms, equipments, ordnance, and ordnance stores. The national armories were placed under control of the department, and authority was given to establish dépôts of arms, ammunition, and ordnance in such parts of the U. S. as might be deemed necessary. These are substantially the duties of the ordnance department at the present time, except that all that relates to pontoons has been transferred to the Engineer Corps of the army. In the following year an act was passed assigning ordnance officers to their duties with the staff of the army, in the same manner as for the Corps of Engineers. Ever since then they have continued to belong to the staff.

By the act of Congress of 1821, reducing the military peace establishment, the ordnance department, as an independent bureau, was abolished. It was merged into the artillery, and the President was authorized to select from the regiments of artillery such officers as might be necessary to perform ordnance duties. One supernumerary captain was provided for each of the four regiments of artillery to perform ordnance duty. In 1832 the department was reorganized and placed on an independent footing by an act of Congress which provided for one colonel, one lieutenant-colonel, two majors, ten captains, and as many enlisted men, not exceeding 250, as the public service might require.

From time to time, but especially during the civil war, the department has been enlarged until now it consists of 1 brigadier-general, chief of ordnance, 3 colonels, 4 lieutenant-colonels, 10 majors, 24 captains, 12 first lieutenants, 4 ordnance storekeepers, and 543 enlisted men of various grades, from sergeants to privates. The enlisted men serve in detachments as guards at the various arsenals and dépôts. All operations of construction and repair at these establishments are performed by the hired labor of civilians.

Since 1874 all officers entering the ordnance have come from the line of the army, entering as first lieutenants at the foot of the list, and by competitive examination. Previous to this vacancies at the foot of the list were filled by appointments direct from the military academy, the ordnance having second grade, the engineers the first.

In supplying the *fighting* material of war the ordnance department has recourse to both manufacturing and purchasing by contract. The chief establishments for the former are the national armory at Springfield, Mass., for the manufacture of small-arms of all kinds; the Watervliet arsenal at West Troy, N. Y., at which is the gun-factory referred to in the article on **ORDNANCE**; the Watertown arsenal, near Boston, Mass., at which gun-carriages are constructed; the Frankford arsenal, Philadelphia, Pa., for the manufacture of small-arm ammunition; and Rock Island arsenal, Illinois, at which are manufactured saddlery and other horse equipments, targets and accessories for rifle-ranges,

knapsacks, haversacks, and canteens, together with other stores required for current use.

In addition to the fourteen arsenals, most of which are mere depositories of obsolete material, the ordnance department has charge of the powder dépôt near Dover, N. J., and the one near St. Louis, Mo.

The Fortification Act of 1888, resuming measures for the national defenses, established a board of ordnance and fortifications, consisting of the commanding general of the army, an officer of the Corps of Engineers, an officer of ordnance, and an officer of artillery, and by subsequent legislation a civilian. This board is empowered to provide suitable regulations for the inspection of guns and materials at all stages of manufacture to the extent necessary to protect fully the interests of the U. S., and generally to provide such regulations concerning matters within its scope as shall be necessary to carry out to the best advantage all duties committed to its charge. It will be observed that this board is constituted to subserve the best interests of the Government—the engineer to plan and construct fortifications, the ordnance to plan and construct cannon, and the artillery to use the latter and defend the works. The board meets once a month, and, besides directing how appropriations shall be carried out, passes upon inventions and improvements proposed for guns, mortars, ammunition, implements, and other kindred matters. Liberal allotments are made for inventions that bid fair to be useful. All contracts and expenditure of money are made, as before, by the ordnance department, the officers of which conduct the work and make all tests and experiments under general instructions from the board.

A permanent board of ordnance officers has existed since 1882, and carries out the details of the operations prescribed by the ordnance and fortification board. Tests and experiments are made at the proving-ground at Sandy Hook, N. J.

Beginning with the year 1882, the department has published from time to time a series of papers bearing the title *Notes on the Construction of Ordnance*, containing the results of its own investigations and experiments in the development of heavy guns, carriages, powders, etc.; also such translations of papers published in Europe as are considered important in their bearing on the manufacture or treatment of steel or the construction of cannon, carriages, etc. See **ORDNANCE**. JOHN C. TIDBALL.

Ordnance Survey: the name given to the aggregate of persons employed by the British Government, or the operations undertaken by them, for the surveying and preparation of maps of the British islands; so called from having been originally under the control of the board of ordnance. It may be said to have had its beginning in the operations conducted by Gen. Roy in 1784 for the determination of the difference of longitude of the observatories of Greenwich and Paris, though it was only in 1791 that the systematic survey of the country with the view of producing a military map of the whole kingdom on the scale of an inch to a mile ($\frac{1}{63,360}$) was begun. The first sheet of this map was published Jan. 1, 1801, and in 1824 the work was so far advanced as to include the whole of the south of England, with part of Wales and a small part of Scotland, when it was in a great measure suspended in order that the survey of Ireland on the scale of 6 inches to a mile might be proceeded with. In 1840, this survey of Ireland being completed, and the military map of England finished up to the southern boundaries of Lancashire and Yorkshire, the Government decided on adopting the scale of 6 inches to a mile for the survey of the remaining counties of England and the whole of Scotland. Lancashire and Yorkshire and six of the southern counties of Scotland were accordingly surveyed on the 6-inch scale. In 1855 the scale was again changed, and that of $\frac{1}{25,344}$ (25,344 inches to a mile) ordered for the cultivated districts of the four northern counties of England and of the whole of Scotland. The uncultivated districts were at the same time to be drawn on the scale of 6 inches to a mile ($\frac{1}{63,360}$), and the $\frac{1}{25,344}$ th plan to be reduced to the 6-inch scale, so as to make the plans of every county perfect on that scale. In 1862 the four northern counties were finished, and in 1863 the extension of the large scale to those portions of the country which had been previously surveyed on the scale of an inch only was ordered. In 1893 the state of the survey was as follows:

1. Scale $\frac{1}{63,360}$, or 10.56 feet to a mile, and $\frac{1}{25,344}$ th, or 2.64 feet to a mile. On one or other of these two scales every town of the United Kingdom which has a population of 4,000 in

habitants or upward has been surveyed. Most of the plans are on the $\frac{1}{25000}$ scale.

2. Scale $\frac{1}{25000}$, or 25·344 inches to a mile. This is the scale for the agricultural or cultivated districts. The whole of the cultivated area of Great Britain was completed in 1893, except parts of Lancashire and Yorkshire and of six counties of Scotland, which were originally surveyed, as stated above, on the 6-inch scale; it was expected that these would be completed about 1896. The survey of Ireland on this scale was only begun.

3. Scale $\frac{1}{100000}$, or 6 inches to a mile. The plans of the whole of the United Kingdom have been published on this scale. Those of Ireland were completed in 1840, those of Great Britain in 1890. Most of the latter have been produced by reduction from the $\frac{1}{25000}$ scale.

4. Scale $\frac{1}{62500}$, or 1 inch to a mile. Maps of England and Wales, most of them drawn from a special survey on a scale of 2 inches to a mile, were completed on the scale of 1 inch to a mile about 1868. In 1872 it was decided to make a "new series" map on this scale, based on the large-scale surveys. In 1893 this was still in progress, both in outline and with hills; the outline edition was to be completed about 1896, the "hills" edition about 1900. The 1-inch map of Scotland, reduced from the large-scale plans, was completed in outline in 1886, and that of Ireland reduced from the 6-inch plans was completed in outline in 1861.

The $\frac{1}{25000}$ and $\frac{1}{62500}$ plans are either zincographed, or, more recently, photozincographed. The 1-inch maps are engraved on copper. The 6-inch plans were also up to about 1880 engraved on copper, but this method was then found to be too slow to keep up with the progress of the survey, and they are now photozincographed by direct reduction from the $\frac{1}{25000}$ plans. The relation between the maps on these two scales is that a 6-inch plan contains $4 \times 4 = 16$ similar rectangles, and each of these rectangles corresponds to a plan on the $\frac{1}{62500}$ scale. The plans on the $\frac{1}{25000}$ or town scale are formed by dividing a $\frac{1}{62500}$ plan into $5 \times 5 = 25$ similar rectangles, and each of the latter forms a plan on the $\frac{1}{62500}$ scale.

The principal triangulation of Great Britain and Ireland consists of some 250 stations, the triangle sides being in some cases upward of 100 miles in length. The angles were measured with theodolites of 36, 24, and 18 inches diameter. The latitudes of 32 stations were determined by observation, and the direction of the meridian observed in 60 stations. The triangulation was reduced by the method of least squares. Six base-lines were measured in the course of the work, but the final results are made to depend on the two lines—one in the north of Ireland (8 miles long) and the other in the south of England (7 miles long)—which were measured with Colby's "compensation-bars."

Special surveys have been and are made from time to time for the War Department and other services, not only in the United Kingdom, but, for instance, in Canada and in Gibraltar, and trained parties from the Ordnance Survey have been employed at the Cape of Good Hope and in British Columbia and elsewhere, as well as on the delimitation of various colonial boundaries. The Ordnance Survey is under the control of the Board of Agriculture. The essential feature of the organization is the combination of military and civil elements. There are employed on the survey 24 officers of the Royal Engineers, including 1 director, 4 field officers, 18 captains, and a quartermaster. There are four companies of Royal Engineers, which, including non-commissioned officers, number 361 men, and are about to be increased to 454 men. The number of civil assistants and laborers is about 2,000. At Southampton there are from 60 to 70 non-commissioned officers and men of the Royal Engineers, with 9 officers and about 700 civil assistants and laborers. In this staff are included about 70 engravers on copper, 130 zincographic tracers and printers, 50 colorists, 170 draughtsmen and examiners of plans, 6 trigonometrical computers, from 20 to 30 artificers, including 2 opticians, and about 40 photographers and engravers on glass negatives. The sum voted annually by Parliament for the prosecution of the survey varies; in 1893 it was £218,000.

A. R. CLARK. Revised by JOHN FARQUHARSON.

Ordovician Period: See SILURIAN PERIOD.

Ore [O. Eng. *ār*, brass; Goth. *ais* < Teuton. *ais*; Lat. *aes*, *ae*ris, bronze (for older **ayēs*); Sanskr. *ayas*, metal, bronze]: a metal chemically combined, or in a native state, mechanically mixed with other substances, which render treatment necessary to separate it. In a strictly technical sense, only

those substances are ores which contain the metal in sufficient quantity and of sufficient purity to make the treatment profitable. Arsenopyrite, a combination of arsenic, sulphur, and iron, contains 34·4 per cent. of iron, but is not an ore of iron, because the metal made from it is not of sufficient commercial value to pay the expenses of treating it.

THOMAS EGGLESTON.

Ore Deposits: any natural occurrences of metalliferous minerals from which one or more of the heavy metals can be profitably extracted. The ore may be a single native metal, or a chemical or mechanical mixture of metals, or a single mineral consisting of a metallic oxide or a metallic salt, or it may be a mechanical mixture of several of these minerals. Generally, the ore is associated more or less intimately with other minerals, which are called the gangue. The ore and the gangue together form the deposit.

Texture.—Metalliferous deposits sometimes consist solely of one ore, as in some occurrences of magnetite, hematite, spathic iron ore, galena, more often of two or more ores, with one or more minerals forming the gangue. The different ores may be intimately associated with each other and with the minerals forming the gangue, or they may exist separately and with a greater or less regularity of distribution. The more common varieties of texture, chiefly as given by von Cotta, are—

Compact, when the texture is so fine that the separate particles are not visible to the naked eye: compact hematite.

Granular, when the particles are visibly in the form of grains: fine-grained, medium-grained, coarse-grained, are terms used to indicate the size of the individual particles: granular magnetite, granular pyrites, etc.

Micaceous or finely laminated, when the particles are in thin laminæ or scales: micaceous specular iron ore.

Disseminated, when the ore is distributed through the gangue in grains or laminæ.

Porphyritic, when the ore is distributed as integral crystals through the gangue.

Banded or combed, when the constituents—ores or gangue or both—are arranged in parallel layers. This variety, which is very common in certain kinds of deposits, is of signal interest from both scientific and economic standpoints. Deposits having this structure were formed in cavities, fissures, caves, chimneys, and the layers indicate gradual growth under more or less varying conditions. The oldest members or layers (*a a*) formed on the opposite walls (Fig. 1), then *b b* *c c*, till finally the two youngest members, *d d*, filled the narrowed space. Frequently two contemporaneous layers, which may alone fill the vein or may form the two youngest members, consist of crystals set perpendicularly to the walls of the vein, and with their terminal faces bristling toward each other from opposite sites or interlacing (*d d* in the sketch). This symmetrical repetition is sometimes interfered with by the interposition of other layers when the vein has reopened and formed a new vein between the walls of an older one. Fig. 2 represents three distinct veins, A B C, between the same walls.

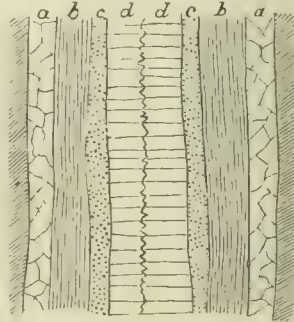


FIG. 1.

Concentric-banded, Cocardenerze, or Ringerze, when the bands are arranged symmetrically around a nucleus, which is often a fragment, as in Fig. 3.

Brecciated.—The deposits very often contain fragments of the inclosing rock or "country," or, also, pieces of still older ore-formations. When these are very numerous the texture is brecciated. Sometimes these fragments form nuclei, around which the

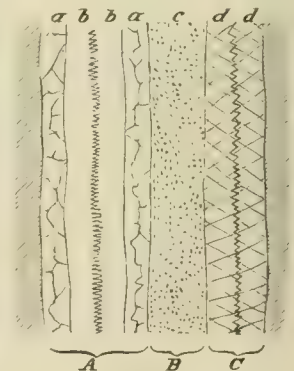


FIG. 2.

ple, Fig. 10 shows a vertical east and west section, after A. A. Blow, through the McKean shaft, Iron Hill, Leadville, W P being white porphyry, B L blue limestone, G P gray porphyry, W L white limestone, L Q lower quartzite, and

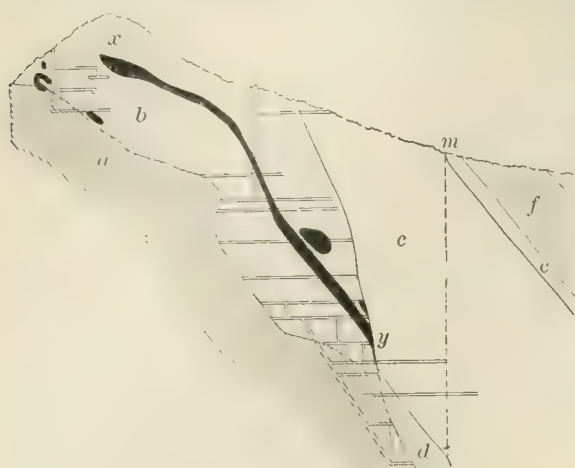


FIG. 9.

G granite, the ore deposit being indicated by heavy black. Elaborate rules have been worked out to aid the miner in the search for the displaced ore body, which it would lead too far to follow up.

The contents of a vein are the ore and the gangue. Some veins have a very simple character as regards the filling, containing one ore, or this and one kind of gangue. Others, again, are exceedingly complex, containing in the same part of the vein or in different parts a great variety of metallic compounds, associated with numerous gangue minerals. Veins are generally filled compactly with their contents, though druses sometimes exist. As has been already mentioned, the constituents—ore and gangue minerals—are often distributed in symmetrical layers parallel to the walls; they are often also heterogeneously mixed. The distribution of ore and gangue minerals is generally more or



FIG. 10.

less irregular within the same vein. Sometimes the ore is concentrated at different points into bodies called bonanzas, nests, chimneys, pockets, masses, etc., while the rest of the vein is barren or contains only disseminated ores of the same kind or of different kinds to that of the bonanzas. This inequality of distribution is sometimes traceable to a cause. Thus in some veins changes in the character of the wall-rock are accompanied by change in the character of the vein-filling—changes which may in one place be due to certain portions of the country rock contributing metallic solutions, in another place to parts of the country contributing a reagent capable of precipitating metals from solutions in the vein. Again, in veins of varying thickness, if the ore is one of the younger members, the older filling of the narrower parts by poor or barren material would leave room only in the wide parts for the richer member. The intersection of veins is often accompanied by enrichment. Besides changes due to local influences, there is observed in some districts a difference of character in depth. Thus the veins of Oruro in Bolivia, which were rich in silver in their upper levels, contained ores barren of silver in depth.

Veins containing both tin and copper have often the tin ores above and copper ores below. Sometimes a dike of eruptive rock has been altered to a considerable depth in such manner as to roughly simulate a fissure-vein.

Surface-deposits, or, as Posepny calls them, "hystero-genous" deposits, have formed the source of enormous quantities of gold, platinum, and tin ore. When, by disintegration and erosion or by being dissolved, a rock-mass containing ore deposits of any form is removed, and the removing cause is not competent to carry away the ore, this remains in a more concentrated form and is a residuary deposit. The often important masses of magnetic iron sand which are concentrated by the wave-action on beaches from the disintegrated *débris* of rock-masses are of this form. Iron Mountain, in Missouri, was wholly mantled to a depth of from 2 to 20 feet with a loose mass consisting entirely of fragments of iron ore of all sizes. These representatives of the broken-up reticulated veins are all that remain of a large amount of porphyry, which has disappeared, leaving only the insoluble iron ore.

Stream-deposits consist of loosely aggregated material in modern or ancient water-courses. They are generally the lowest member of a river-deposit, and owe their existence to the specific gravity and insolubility of the metals or ores. The annexed sketch (Fig. 11) from Whitney (*Geological Sur-*



FIG. 11.—Table Mountain: l. lava; s. sandstone; c. c. auriferous channels; a. slate.

vey of California) represents an auriferous stream-deposit formed in a valley which, after being filled with a lava stream, became a mountain-crest by the erosion of the softer hills on either side.

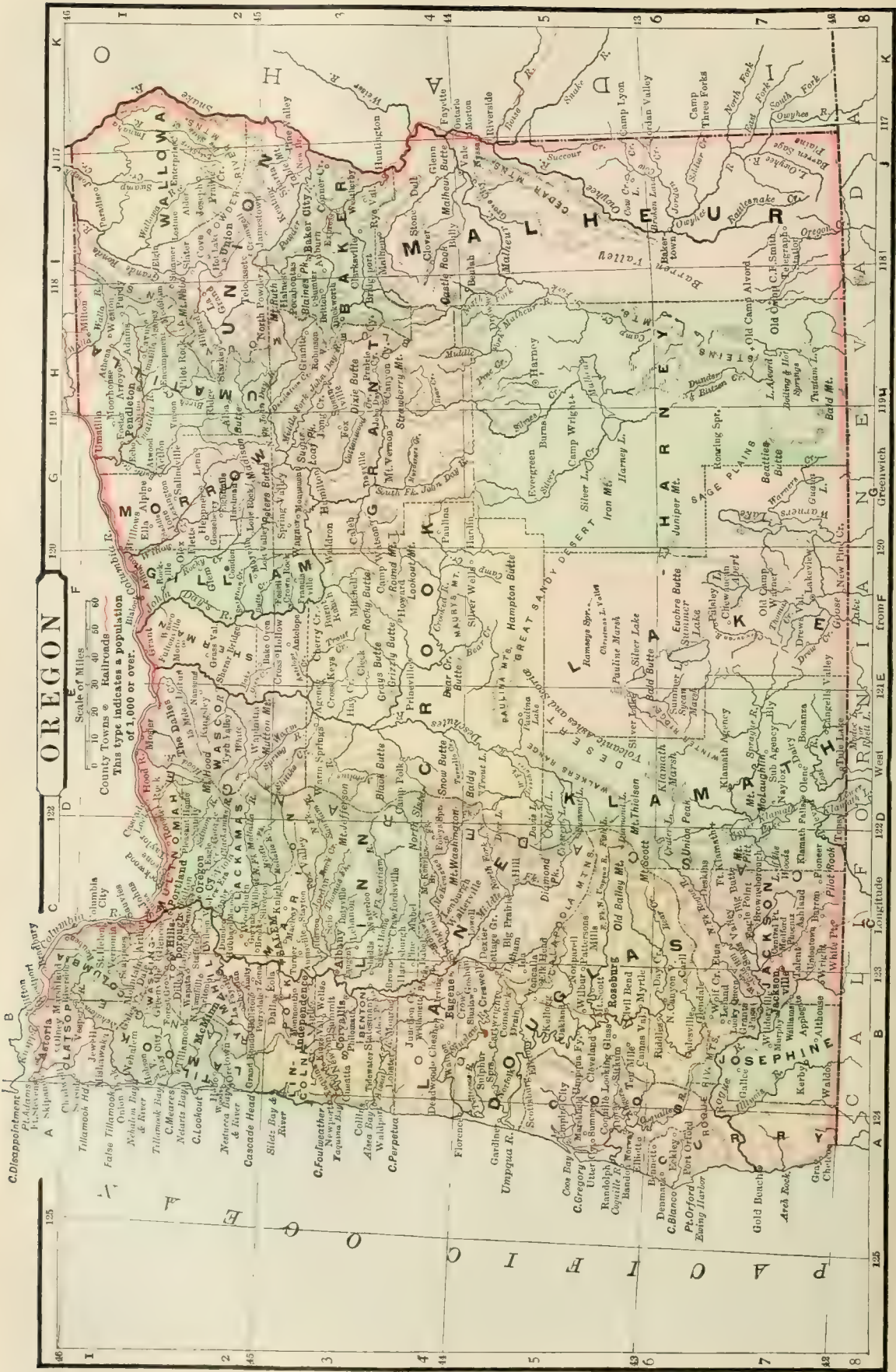
In many localities iron ore is deposited in marshes and on the bottoms of lakes. The ore is a variety of limonite called bog ore, and owes its origin to the action of decaying organic matter on ferric oxide, producing soluble ferrous carbonate, which, on entering the aerated waters of a lake, is oxidized and sinks. Such a deposit is worked in a lake near Radnor Forges, Canada.

Concerning the genesis of ore-deposits, renewed interest has been aroused through the researches made by Fridolin Sandberger, of Würzburg, who advanced what is known as the lateral secretion theory. He found by painstaking chemical analyses that the mica, olivine, augite, and hornblende of country rock contain minute quantities of the useful metals, and claimed that the filling of ore deposits is derived through chemical solution from the surrounding country rock. Other economic geologists, notably Posepny, hold that the chief agency for the accumulation of useful minerals is the underground circulation of water. He makes a sharp distinction between what he calls vadose, or shallow underground circulation, and deep underground circulation, relying upon the solvent power of water, with increasing temperature and pressure.

Relative Values of Deposits.—Fissure-veins, as a rule, are more trustworthy, because of the continuity of the fissures and the consequent facility offered the miner for underground prospecting. The same may be said of certain beds, while the other forms are of the most uncertain character; any given one may be an isolated occurrence or one of many, but from their nature they rarely offer clews by which the miner can work from one to another. The most productive mines of iron ore are beds and irregular masses. The most productive copper mine is at present the Calumet and Hecla on Lake Superior, which is a bed of conglomerate impregnated with native copper. The largest production of lead has probably been from the quickly exhausted but innumerable deposits in limestones and dolomites. The greater proportion of tin and native gold is derived from surface deposits. On the other hand, a great part of the silver of the world is wrought from true fissure-veins; and, if we except deposits of iron and some isolated deposits of other metals, the instances of permanent ore-mining industries are found to be established on fissure-veins.

LITERATURE.—General: Von Cotta, *Treatise on Ore Deposits* (1869), transl. by Fred. Prime from Cotta's *Erzlager-*





Scale of Miles
0 10 20 30 40 50 60
County Towns •
This type indicates a population of 1,000 or over.

OREGON

125 124 123 122 121 120 119 118 117 116 115 114 113 112 111 110 109 108 107 106 105 104 103 102 101 100 99 98 97 96 95 94 93 92 91 90 89 88 87 86 85 84 83 82 81 80 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Longitude

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Latitude

stätten Lehre; Joh. Grimm, *Die Lagerstätten der nützbaren Mineralien* (Prague, 1869); von Cotta and H. Müller, *Geoprospektion*; J. D. Whitney, *Metallic Wealth*. Special for U. S.: *Mining Industry*, vol. III, of the *Geol. Surv. of the 10th Parallel, for the Comstock Lode and many Deposits in Nevada, Utah, and Colorado*; R. W. Raymond, *Mineral Resources West of the Rocky Mountains*; Fridolin Sandberger, *Untersuchungen über Erzgänge* (Wiesbaden, 1885); A. von Groddeck, *Die Lehre von den Lagerstätten der Erze* (Leipzig, 1879); J. A. Phillips, *Ore Deposits* (1884); Kemp, *Ore Deposits of the United States* (New York, 1892); Fr. Posepuy, *The Genesis of Ore Deposits (Transactions of the American Institute of Mining Engineers, vol. xxiii.)*; John A. Church, *The Comstock Lode: its Formation and History* (New York, 1879). Numerous descriptions of American and foreign deposits are published in the *Transactions of the American Institute of Mining Engineers* (New York, vols. I. to xxiii.), the publications of the U. S. Geological Survey, and of the Geological Surveys of Pennsylvania, New Jersey, Ohio, Michigan, Missouri, Wisconsin, and Minnesota.

R. PEMPELLEY. Revised by C. KIRCHHOFF.

Oregon: one of the U. S. of North America (Western group); the twentieth State admitted to the Union; capital, Salem.

Location and Area.—It lies between lat. 42 and 46 18' N. and lon. 116° 33' and 124° 25' W.; is bounded N. by



Seal of Oregon.

Washington, E. by Idaho, S. by California, and W. by the Pacific Ocean; length E. to W. about 360 miles, breadth N. to S. 290 miles; coast-line about 300 miles; area, 96,030 sq. miles, of which 1,470 are water.

Physical Features.—Three ranges of mountains divide the State from N. to S., the Coast Range, from 10 to 30 miles from the ocean; the Cascade Mountains, from 110 to 150 miles inland; and the Blue Mountains, near the eastern boundary. The Cascades and Coast Range are united by four lateral ranges—the Callapooia, Umpqua, Rogue River, and Siskiyou Mountains. The Coast Range has an extreme altitude of 4,000 feet, and is covered to its summit with dense forests. The Cascade Mountains are a continuation of the Sierra Nevada Mountains; the extreme height is 7,000 feet, with a number of peaks rising from 2,000 to 5,000 feet higher. The most noted of these are Mt. Hood, 11,500 feet; McLoughlin or Pitt, 11,000; Jefferson, 10,500; and Three Sisters, 9,500. The Cascades are densely timbered to the snow line. The Blue Mountains have an extreme height of about 3,000 feet, with no high peaks, and are well covered with timber, especially at the north end of the range. Toward the S. the mountains recede and shoot off in lateral spurs W. to the interior table-land. Along the river courses and between the various mountain ranges and spurs are numerous fertile valleys. The largest is the Willamette, lying between the Coast Range and Cascade Mountains and the Columbia river and the Callapooia spur. It is 150 miles long and from 90 to 70 wide, is extremely fertile, and contains the densest population of the State. S. of it, between the lateral ranges, are the Umpqua and Rogue River valleys. The region E. of the Cascade Mountains, embracing two-thirds of the State's area, is known as Eastern Oregon. That portion of it between the Cascade and Blue Mountains is in the main a high table-land, with little rainfall, and is sparsely populated. There are fertile valleys along the water-courses and in the vicinity of the numerous lakes in the southern part, the largest being Harney and Goose Lakes, while at the northern extremity, near the base of the Blue Mountains, the land is rolling and extremely fertile. In the Blue Mountains and between it and Snake river, the eastern boundary, are numerous fertile valleys, the largest being Grand Ronde and Wallowa on the N., Powder and Burnt rivers in the middle, and Malheur and Owyhee on the S. The mountains are

well covered with soil, especially the Coast Range, and large areas are being brought under cultivation by removal of the timber.

The rivers flowing into the ocean are the Nehalem, Nestucca, Yaquina, Alsea, Siuslaw, Umpqua, Coquille, Rogue, and Chetco; those flowing into the Columbia are the Lewis and Clarke, Young's, Clatskanie, Willamette, Sandy, Hood, Deschutes, John Day, and Umatilla; and those flowing into Snake river, itself a branch of the Columbia, are Grand Ronde, Powder, Burnt, Malheur, and Owyhee. The chief tributaries of the Willamette are the Clackamas, Tualatin, Yamhill, Santiam, Molalla, Luckiamute, Mary, Long Tom, the river itself dividing into the Mackenzie and Middle and Coast Forks. The large lakes are all in the southern portion of the central division, some of them being saline. They are the Klamath, upper and lower, Goose, Warner, Salt, Christmas, Abert, Summer, Silver, Harney, and Malheur. Crater Lake lies in the Cascades, 8,000 feet above sea-level, in the crater of a huge extinct volcano 10 miles in circumference and surrounded by bluffs 2,000 feet high. It is the deepest fresh water in America. The chief harbor is the Columbia river, improved by the U. S. Government so that its entrance has 28 feet at extreme low tide. Minor harbors are Tillamook Bay, Yaquina Bay, Alsea river, Siuslaw river, Coos Bay, Coquille river, Rogue river, and Port Orford. The principal capes and headlands are Point Adams, at the mouth of the Columbia, Tillamook Head, Cape Foulweather, Cape Lookout, Cape Perpetua, Cape Blanco, and Umpqua Head. The coast-line is very abrupt and rocky, and but slightly indented.

The fauna embraces the huge grizzly, black, and cinnamon bears, cougar, mountain lion or panther, catamount, wildcat, polecat, raccoon, porcupine, beaver, otter, muskrat, several varieties of wood and ground squirrels, silver and red foxes, martens, hares or "jack rabbits," rabbits, deer, elk, antelope, mountain-sheep, and mountain-goat. Seals and sea-lions enter the Columbia, and the latter have rookeries off the coast. Salmon enter all the streams in great quantities, and millions are caught annually. The chinook, or quinnat, is the leading variety. Sturgeon are caught in great numbers in the Columbia and Willamette. The streams teem with salmon-trout and mountain-trout. In the spring swarms of smelt and herring enter the rivers. Many less valuable fish, including transplanted carp, are found in the rivers and lakes. Transplanted shad are becoming plentiful. Oysters of a small but finely flavored variety are found in Yaquina Bay, and crabs and lobsters along the coast. The birds include the golden and baldheaded eagle, several varieties of hawks, cormorant, sea-gull, pelican, albatross, vulture, buzzard, pigeon, mountain-quail, grouse, imported Chinese pheasants of five varieties, American and trumpeter swans, brant, Canada goose, many varieties of ducks, including canvasback, the robin, field-lark, skylark, jay, woodpecker, yellowhammer, blackbird, grosbeak, bullfinch, greenfinch, chaffinch, nightingale, goldfinch, song-thrush, starling, and several other varieties of song-birds.

Mineral Productions.—Oregon has a great variety of minerals. Gold, both placer and quartz, is mined in Jackson, Josephine, Douglas, Linn, Grant, Baker, and Union Counties. Placer-mining began in Jackson and Josephine Counties in 1851, and in Baker and Grant Counties in 1861-62. Hydraulic mining is carried on extensively in both Southern and extreme Eastern Oregon. The most recent quartz discoveries are in the Cascade Mountains near the Santiam river, and in the Pine Creek Mountains, between the Blue Mountains and Snake river. Gold is found also in the sands of the ocean beach at various places. Silver ore is found almost coextensive with the gold, though predominating in Eastern Oregon; copper and lead occur frequently with the silver; and cinnabar is found and worked in Josephine County. Douglas County has the most extensive deposit of nickel ore yet discovered in America. Iron ore of a superior quality is mined near Portland, yielding upward of 50 per cent. of magnetic iron. It is reduced at a blast furnace at Oswego. Unworked deposits of iron ore exist in other counties. Coal is found in various places in Western Oregon, and is extensively mined on Coos Bay. Outcroppings have also been discovered on the western slope of the Blue Mountains. Other minerals are chalcedony, agate, carnelian, and jasper. Salt is extracted for local use in Jackson and Douglas Counties.

Soil and Productions.—The soil of Oregon is volcanic in origin and the valleys are alluvial. It is extremely fertile. The entire region W. of the Cascades and the northern portion E. of them have ample rainfall for crops. Large areas

of the central and southeastern portion of the State depend largely upon irrigation in farming. The chief product is wheat, that of the Willamette valley commanding the highest market price. Millions of fruit-trees have been set out. The Oregon prunes are acknowledged to be the largest and finest in the world. Vineyards produce abundantly. The wool-growing industry is very large.

The following summary from the U. S. census reports of the 1880 and 1890 shows the extent of farming operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms	16,217	25,530	57.4
Total acreage of farms	4,214,712	6,909,888	63.9
Value of farms, with buildings and fences.....	\$56,908,575	\$115,819,200	103.5

* Increase.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1893:

CROPS.	Acreage.	Yield.	Value.
Corn.....	13,132	324,360 bush.	\$152,149
Wheat.....	616,622	10,790,885 "	5,934,987
Oats.....	232,455	6,624,968 "	2,451,298
Rye.....	7,191	75,506 "	55,119
Barley.....	37,360	975,096 "	390,098
Potatoes.....	16,772	2,130,044 "	1,001,121
Hay.....	605,946	1,139,178 tons	9,227,342
Totals.....	1,529,478		\$19,212,294

Climate.—Each of the three natural divisions of the State has a climate peculiar to itself, and throughout the State the seasons are distinguished as the wet and dry. The dry season usually extends from May 1 to Oct. 15, and during the wet season about 75 per cent. of the precipitation occurs. In Eastern Oregon the temperature ranges from 90° in summer to 10° in winter, with an occasional summer rise to 100° and a winter fall to 0°. The summer is drier and the winter colder than in Western Oregon. The rainfall of the year averages about 20 inches. In Western Oregon the average spring temperature is 52°, summer 67°, autumn 53°, and winter 39°. The rainfall averages 44 inches in the Willamette valley, and is sufficient to prevent drought in the other valleys. In Southern Oregon the mean average temperature of July is 68°, of January 45°, and the temperature seldom exceeds 95° in summer and 16° in winter. The average rainfall is 23 inches.

Divisions.—For administrative purposes the State is divided into thirty-two counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES	* Ref.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Baker.....	3-I	4,616	6,764	Baker City.....	2,604
Benton.....	3-B	6,403	8,650	Corvallis.....	1,527
Cleekamas.....	2-C	9,260	15,233	Oregon City.....	3,062
Clatsop.....	1-B	7,222	10,016	Astoria.....	6,184
Columbia.....	1-B	2,042	5,191	St. Helen.....	320
Coos.....	6-A	4,834	8,874	Empire City.....	252
Crook.....	4-E		3,244	Prineville.....	460
Curry.....	7-A	1,308	1,709	Gold Beach.....	
Douglas.....	6-B	9,596	11,864	Roseburg.....	1,472
Gilliam.....	2-F		3,640	Condon.....	
Grant.....	3-G	4,303	5,080	Canyon City.....	304
Harney.....	5-H		2,559	Harney.....	240
Jackson.....	7-C	8,151	11,455	Jacksonville.....	743
Josephine.....	7-B	2,185	4,878	Grant's Pass.....	1,132
Klamath.....	7-D		2,444	Klamath Falls.....	
Lake.....	6-F	2,801	2,604	Lakeview.....	
Lane.....	4-C	9,411	15,198	Engene.....	
Lincoln.....	3-B			Toledo.....	
Linn.....	8-C	12,676	16,365	Albany.....	3,079
Malheur.....	6-I		2,601	Vale.....	131
Mason.....	2-I	14,576	22,941	Salmon.....	
Morrow.....	2-G		4,205	Hoppper.....	675
Multnomah.....	2-C	25,203	74,884	Portland.....	46,385
Polk.....	2-B	6,601	7,858	Dallas.....	848
Sherman.....	1-F		1,792	Moro.....	
Tillamook.....	2-B	950	2,932	Tillamook.....	
Umatilla.....	3-H	9,607	13,341	Pendleton.....	2,506
Union.....	2-I	6,650	12,044	Union.....	604
Wallowa.....	1-J		3,661	Enterprise.....	242
Wasco.....	2-E	11,120	9,193	The Dalles.....	
Washington.....	2-B	7,082	11,952	Hillshoro.....	
Yamhill.....	2-B	7,945	10,692	McMinnville.....	1,368
Totals.....		174,768	313,767		

* Reference for location of counties, see map of Oregon.

† Formed since 1880.

‡ Formed since 1890.

Principal Cities and Towns, with Population for 1890.—Portland, 46,385; East Portland, 10,532; Astoria, 6,184; Albina, 5,129; Albany, 3,079; Oregon City, 3,062; Baker, 2,604; Lagrande, 2,583; Pendleton, 2,506; Ashland, 1,784; Corvallis, 1,527; Roseburg, 1,472; Marshfield City, 1,461; Grant's Pass, 1,432; and McMinnville, 1,368.

Population and Races.—In 1860, 52,465; 1870, 90,923; 1880, 174,768; 1890, 313,767 (native, 256,450; foreign, 57,317; male, 181,840; female, 131,927; white, 301,758; colored, 12,009, including 1,186 persons of African descent, 9,540 Chinese, 25 Japanese, and 1,258 civilized Indians).

Industries and Business Interests.—The census returns of 1890 showed that 1,523 manufacturing establishments reported. These had a combined capital of \$32,122,051, employed 18,798 persons, paid \$11,535,229 for wages and \$21,793,578 for materials, and had products valued at \$41,432,174. The State is exceptionally favored in the provision of water-power for manufacturing purposes, there being hardly a section in which it does not exist in almost unlimited amounts. The census reports on the fisheries of the State showed: Capital invested, \$2,896,632; persons employed, 4,682; vessels and boats employed, 1,558; value of apparatus used, \$437,943; and value of products, \$1,033,574. The salmon-canning industry had 34 canneries, employed 1,584 persons, and had an output of 21,390,648 lb. of canning valued at \$889,772, and 320,822 cases of prepared canned salmon valued at \$1,901,617.

Commerce.—Besides a large internal traffic, the State has a considerable direct foreign trade through the ports of Oregon and Willamette. In the calendar year 1892 the imports of merchandise amounted in value to \$1,416,813 and the exports to \$6,941,278, and in 1893 the imports were \$1,105,870 and the exports \$4,754,497.

Finance.—The constitution prohibits the State from becoming interested in the stock of any corporation, and the Legislature from loaning the credit of the State or creating a debt which singly or in the aggregate with previous debts shall exceed \$50,000, excepting in case of war, to repel invasion, or to suppress insurrection. Counties, towns, and other municipal corporations are under similar prohibition, excepting that the maximum of county indebtedness is fixed at \$5,000, with the above exceptions. As a result of these restrictions Oregon in 1894 had practically no public debt. There were outstanding obligations aggregating less than \$2,000, for which the State had called frequently. The assessed valuation in 1893 as equalized by the State board was \$168,088,905, and the amount to be raised by taxation in 1894 was \$722,782.

Banking.—Owing to the panic in 1893 sixteen banks suspended in the first eight months. In December there were 38 national banks with capital of \$3,595,000, surplus and profits \$2,224,691, and individual deposits \$6,278,152. The State banks on June 30 numbered 12, with capital of \$553,800, surplus and profits \$50,305, and deposits \$429,726.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 775 post-offices, of which 23 were presidential (1 first-class, 4 second-class, 18 third-class) and 752 fourth-class, with 175 money-order offices, 2 money-order stations, and 23 postal-note offices. Of newspapers and periodicals there were 18 daily, 4 semi-weekly, 141 weekly, 1 semi-monthly, and 21 monthly publications—total, 185.

Means of Communication.—The transportation system consists of railways and navigable rivers. Steamers ply on the Columbia and Willamette and for short distances on some of their tributaries. Navigation on the Columbia is broken at the Cascades, 140 miles from the ocean, and again at The Dalles, 50 miles farther. Around the Cascades the State has built a portage railway, and the U. S. Government has nearly completed a canal and locks there, upon which it has been working since 1876 and has expended about \$2,000,000. No plan for overcoming the obstructions at The Dalles has yet been adopted. The Willamette is obstructed at Oregon City by falls 41 feet high, around which a canal and locks have been constructed by the State. The railway system consists of the lines of the Southern Pacific from Portland S. to California, there being four distinct lines running up the Willamette valley: the Oregon Railway and Navigation Company's line, leased by the Union Pacific, running up the Columbia from Portland to the boundary-lines of Washington and Idaho; the Northern Pacific, running down the Willamette and Columbia from Portland 39 miles and crossing into Washington, and a leased line of the same road from the Washington boundary S. to Pendleton; the Oregon Pacific, running E. from Yaquina Bay to the Cas-

cade Mountains; and a railway under construction from Coos Bay to Roseburg. The mileage of the railways in the State in 1894 was as follows: Southern Pacific, 698.87; Oregon Railway and Navigation, 533.53; Northern Pacific, 38.82; Oregon Pacific, 141.36; Astoria and South Coast, 15.78; Rogue River Valley, 5.50; and Independence and Monmouth, 2.50—total, 1,481.04.

Churches.—The census of 1890 gave the following statistics of the religious bodies having a membership of 800 and upward in the State:

DENOMINATIONS.	Churches (count)	Church members	Members.	Value of property.
Roman Catholic	95	95	30,231	\$260,000
Methodist Episcopal	243	291	9,439	614,625
Baptist	108	108	5,306	311,425
Disciples of Christ	74	42	4,067	77,700
Presb. in the U. S. of America	53	70	3,935	416,700
Congregational	35	38	2,436	160,200
Methodist Episcopal South	50	62	1,936	50,800
Protestant Episcopal	31	26	1,849	361,930
United Brethren, Old Constitution	49	46	1,203	24,700
Evangelical Association	25	24	1,199	63,900
Cumberland Presbyterian	23	21	897	22,200
Unitarian	5	5	890	170,500

Schools.—The number of children of school age in the State Aug. 1, 1894, was 123,786; the number enrolled in the public schools, 81,632. The number of teachers employed in 1892 was 2,694; number of schoolhouses, 1,701; value of school property, \$2,494,233. The State payments from the interest on the irreducible school fund aggregated \$162,066 in 1892. Normal schools were maintained by the State at Ashland, Drain, Monmouth, The Dalles, and Weston. There were seventeen endowed academies and private secondary schools. The institutions for higher education comprised Blue Mountain University, at La Grande (non-sectarian, opened 1876); Christian College, at Monmouth (Christian, chartered 1865); Corvallis College, at Corvallis (Methodist Episcopal South, opened 1865); McMinnville College, at McMinnville (Baptist, chartered 1859); University of Oregon, at Eugene City (non-sectarian, chartered 1872); Pacific University, at Forest Grove (Congregational, opened 1848); Philomath College, at Philomath (United Brethren, chartered 1865); Willamette University, at Salem (Methodist Episcopal, opened 1844); and Portland University, at Portland. The State Agricultural College is a part of Corvallis College.

Libraries.—According to a U. S. Government report on public libraries of 1,000 volumes and upward each in 1891, Oregon had 17 libraries, containing 68,544 bound volumes and 18,519 pamphlets. The libraries were classified as follows: General, 3; school, 5; college, 5; college society, 2; scientific, 1; and Masonic, 1.

Charitable, Reformatory, and Penal Institutions.—These include the Oregon School for Deaf Mutes, Oregon Institute for the Blind, Oregon State Prison, Oregon State Reform School, Oregon State Insane Asylum, county and city jails, and county almshouses. According to a provision of the State constitution all public institutions provided for by the Legislature must be at the seat of government. In 1893 the Legislature provided for the establishment of a State Soldier's Home and for a branch asylum for the insane in Eastern Oregon.

Political Organization.—Oregon was admitted into the Union in 1859, and its constitution, adopted in 1857, remains unchanged. State officers are elected for terms of four years and county officers for two, the election occurring in June. The Legislature consists of thirty senators, holding office for four years, one-half elected every two years, and sixty representatives, holding office two years. They draw pay only for forty days for each biennial session. Suffrage is enjoyed by every citizen or person who has declared his intention to become such, who has resided in the State six months. The secretary of State acts as auditor. All State institutions are governed by boards of three State officers, selected from the Governor, secretary, treasurer, and superintendent of public instruction, except the deaf and dumb school, agricultural society, State university, normal schools and soldier's home, which have special boards of trustees or regents. The penitentiary, insane asylum, blind school, and reform school have superintendents appointed by the State boards.

History.—The first recorded exploring voyages along the coast of Oregon were those of the Spaniard Ferrelo, in 1543;

Sir Francis Drake, the English freebooter, in 1578; the probably mythical De Fuca, in 1592; Aguilar, the Spaniard, in 1603; the certainly mythical Fonte, in 1640; the Spaniard Perez, in 1774; the Spaniard Heceta, in 1775, when the mouth of the Columbia was first observed; Capt. Cook, an Englishman, in 1777; and numerous other Spanish, English, and American explorers and traders in the ensuing fifteen years. Yet none set foot on land or knew much about even the coast-line, until Capt. Robert Gray, a trader from Boston, in the ship *Columbia*, entered the mouth of the Columbia May 11, 1792, and laid the foundation of the American title to Oregon. The U. S. purchased Louisiana in 1803, and acquired all the French title W. of the Missouri river, and in 1819 secured the entire Spanish title N. of lat. 42° by the Florida purchase. In 1804-05 Lewis and Clarke explored the country from St. Louis to the mouth of the Columbia for the U. S. Government. Nathan Winship, from New England, entered the Columbia in the *Albatross* May 10, 1810, and built a trading-post at Oak Point, 40 miles inland, the first settlement in Oregon, but abandoned it in a few weeks. Astoria was founded by the Pacific Fur Company Mar. 22, 1811, and named after John Jacob Astor, president of the company. It was captured by the British and named Fort George Dec. 12, 1813, and was restored to U. S. jurisdiction in Oct., 1818. In 1818 the U. S. and Great Britain made a treaty of joint occupation of Oregon, which was terminated in 1846 by a treaty confirming the title of the U. S. The Hudson Bay Company was in practical possession after 1813 until enough citizens of the U. S. arrived to create a provisional government in 1843. A Methodist mission was founded by Jason Lee in 1834, and a Presbyterian mission by Dr. Marcus Whitman in 1836. The first large immigration was in 1843, overland from the Mississippi valley. Oregon was made a Territory Aug. 12, 1848, and the territorial government superseded the provisional government Mar. 3, 1849, Gen. Joseph Lane being the first territorial Governor, the provisional Governor having been George Abernethy. A State constitution was framed in 1857, and the State admitted to the Union Feb. 14, 1859. There were Indian wars in 1849, 1851, 1852, 1853-56, 1866-67, 1872-73, 1877, and 1878. There are now but few Indians in the State, and these are peacefully settled on reservations.

GOVERNORS OF OREGON.

Provisional.		
George Abernethy	1845-49	Addison C. Gibbs..... 1862-65
		George L. Woods..... 1866-69
		Lafayette Grover..... 1870-77
		S. F. Chadwick..... 1878
Territorial.		
Joseph Lane	1849-50	William W. Thayer..... 1879-82
John P. Gaines	1850-52	Zenas F. Moody..... 1882-86
Joseph Lane	1853	Sylvester Pennington..... 1887-95
George L. Curry	1853	William P. Lord..... 1895-
John W. Davis	1853-54	
George L. Curry	1854-59	

State.

John Whiteaker..... 1859-62

Authorities.—*Irvine, Astoria; Green, W. Oregon and California* (1845); *Thornton, Oregon and California in 1848*; *Johnson, California and Oregon* (1851); *Bullfinch, Oregon and Eldorado* (1866); *Ludlow, Heart of the Continent* (1870); *Victor, All over Oregon and Washington* (1872); *Nordhoff, Northern California, Oregon, and the Sandwich Islands* (1874); *Bancroft, Oregon* (2 vols., 1886-89); *Transactions of the Oregon Pioneer Society* (1872-94).

H. W. Scott.

Oregon: city; capital of Ogle co., Ill. (for location, see map of Illinois, ref. 2-E); on the Rock river, and the Chi., Burl. and Quincy Railroad; 100 miles W. of Chicago. It is a summer resort, is principally engaged in agriculture and manufacturing, and has a national bank with capital of \$50,000, a private bank, and three weekly newspapers. Pop. (1880) 1,088; (1890) 1,566.

Oregon City: city; capital of Clackamas co., Ore. (for location, see map of Oregon, ref. 2-C); on the Willamette river and the S. Pacific Railroad; 12 miles S. of Portland, with which it is connected by steamboats and by an electric railway. The city is the center of a rich agricultural region, with a prolific fruit country tributary to it. The river here falls 40 feet, affording unlimited water-power, and boats pass from one level to the other by means of locks constructed in 1874. Among the large manufacturing establishments are woolen, flour, paper, pulp, and sawmills, sash and door factories, and ice-works. There are the U. S. land-office for the northern district of Oregon, a State bank,

with capital of \$100,000, a private bank, and three weekly newspapers. Pop. (1880) 1,263; (1890) 3,062; (1894) by school census, 5,635. EDITOR OF "ENTERPRISE."

Oregon River: See COLUMBIA.

O'Reilly, JOHN BOYLE: journalist and poet; b. at Dowth Castle, County Meath, Ireland, June 28, 1844. At the age of eighteen he went to England and enlisted in the British army, where he acted as a secret agent of the Fenian Society. He was convicted of high treason in 1866, and sent to Australia under a twenty years' sentence, but escaped after a year's imprisonment, and went to the U. S. in 1869. In 1870 he became editor of the *Boston Pilot*, with which he was connected till his death. D. at Hull, Mass., Aug. 10, 1890. His published writings include *Songs of the Southern Seas* (1873); *Songs, Legends, and Ballads* (1878); *Moon-dyne* (1879); *Statues in the Block* (1881); *In Bohemia* (1886); *Stories and Sketches* (1888). H. A. BEERS.

Orel': government of Russia, between lat. 51° 50' and 54° N., and lon. 33° and 39° E. Area, 18,042 sq. miles. The surface is mostly level. The soil is fertile and well watered by the Desna, an affluent of the Dnieper, the Oka, an affluent of the Volga, and the Sosna, an affluent of the Don, all of which are navigable. The climate is mild. Agriculture is the chief industry. Large quantities of wheat are exported, in grain and flour, to Riga and St. Petersburg. About one-third of the surface is covered with forests. Hemp is extensively cultivated, and oil of hempseed, sailcloth, rope, and yarn are manufactured. Some iron mines are worked and many horses and cattle are reared. Pop. (1893), 2,140,130.

Orel: town of Russia; capital of the government of the same name; on the Oka; 222 miles S. S. W. of Moscow (see map of Russia, ref. 8-D). It is mostly built of wood, and was almost destroyed by fire in 1848 and again in 1858. It has many educational institutions, breweries, distilleries, ropewalks, tallow-houses, and other manufactures, and an important trade in grain with St. Petersburg and Riga. It formerly formed a stronghold against Tartar invasions. Pop. (1890) 79,135.

O'Rell, MAX: See BLOUET, PAUL.

Orellana, ̄-r̄l̄-yaa-nāa, FRANCISCO, de: first explorer of the Amazon; b. at Truxillo, Spain, about 1490. He was intimate from boyhood with the Pizarros, and joined them in Peru about 1535; in 1537 he founded Guayaquil. Later he was the lieutenant of GONZALO PIZARRO (q. v.) in his expedition to the "Land of Cinnamon," about the head-waters of the Coca and Napo. The expedition left Quito (according to lately discovered documents) in Feb. or Mar., 1541, and crossed the Andes to the Coca; here a small vessel was built to descend the river, while the army followed along the shore to the junction of the Napo. Thence Orellana and fifty men were sent ahead in the boat, with orders to bring back provisions from the villages farther down. Floating on the swift current they reached the junction of the Napo with the Amazon in a few days, but Orellana could find no provisions and, unable or unwilling to return, he resolved to go on down the Amazon. This scheme was carried out after a new and better vessel had been built. In the course of their voyage the Spaniards had many skirmishes with the Indians. They heard of a tribe of female warriors, or Amazons, and claimed to have fought with them near the mouth of the Trombetas. Probably the story of these women was an aboriginal myth or wonder-tale, traces of which are still found in South America. The account of the Amazon tribe was readily believed in Europe, however, and eventually gave its name to the river. Orellana reached the sea after a voyage of eight months, made his way to the Spanish settlements of Venezuela, and thence went on to Spain. In 1544 he received a grant to conquer and govern the regions he had passed through. He sailed for the Amazon in 1545 (or in 1549, according to Acuña) with 500 men; but many soldiers perished during the voyage; the enterprise was abandoned after they had ascended the river for a short distance, and Orellana died soon after, probably on the island of Margarita. HERBERT H. SMITH.

Orelli, JOHANN KASPAR: classical scholar; b. at Zurich, Switzerland, Feb. 13, 1787; studied theology, but especially ancient and modern languages and literature, and was appointed *professor eloquentiæ* in 1819, and Professor of Classical Philology in the newly founded University of Zurich in 1833. Author of a celebrated edition of *Cicero* in 8 vols., including the *Scholia* and an *Onomasticon Tullianum* (3 vols., 2d ed. by Halm and Baiter, 1861); a justly

esteemed commentary of *Horace* (4th ed. 1892, with *Lexicon Horatianum*), and of *Tacitus* (new edition by various scholars, 1879-94). His *Inscriptionum Latinarum Selectarum Collectio* (3 vols., 1856; 2d ed. by W. Henzen, with copious indexes) is still a valuable aid for the study of Roman history, antiquities, and language. See Adert, *Essai sur la vie et les travaux de J. G. Orelli* (Geneva, 1849); Bursian, *Gesch. der class. Philol. in Deutschland*, pp. 850-857. D. at Zurich, Jan. 6, 1849. Revised by A. GUDEMAN.

O'renburg: government of European Russia; bounded N. and N. W. by Perm, Ufa, and Samara. Area, 73,816 sq. miles. The central part of the government is mountainous, covered with branches of the Ural Mountains which are very rich in iron, copper, and gold; the crown mines yield over 1,000 lb. of gold annually, and the private double as much. On both sides of the mountains are extensive steppes, in many places barren and dotted with salt lakes, but in others presenting good pasture-grounds, where immense herds of cattle, sheep, horses, and camels are reared. Besides the breeding of cattle, in which the Ural Cossacks are engaged, and mining, fishing and preparation of caviare form an important branch of industry. Pop. (1890) 1,372,800.

Orenburg: town of European Russia, capital of the government of Orenburg; on the Ural; 727 miles E. S. E. by rail from Moscow (see map of Russia, ref. 8-H). It was founded as a frontier fortress in 1743, but is now of importance for its trade only. Tea from China, shawls and silks from Persia, skins, tallow, and cattle from the Khirgheez and Cossacks, and metals from the Ural Mountains are brought here and exchanged. Pop. (1891) 62,534.

Oren'se: town of Spain, capital of the province of Orense; on the left bank of the Minho, which is crossed here by a magnificent bridge, 1,400 feet long, 145 feet high, built in 1230, spanning the river with seven arches (see map of Spain, ref. 13-B). At the foot of the hill on which the city is built are the famous hot sulphur springs, Las Burgas. The town is the seat of a bishopric and is celebrated for its chocolate, hams, and wine. Pop. (1887) 14,168.

Oreodon'tidae [Mod. Lat., named from *Ore'odon*, the typical genus; Gr. *ὄρος*, *ὄρος*, mountain + *ὀδούς*, *ὀδόντος*, tooth]: a family of extinct mammals belonging to the order *Ungulates* and sub-order *Artiodactyles*, intermediate between the typical ruminants and hogs.

Ores'tes (in Gr. *Ὀρέστης*): in Grecian mythology, a son of Agamemnon and Clytemnestra; avenged the murder of his father by killing his mother and her paramour, Ægisthus, but was immediately attacked by the Erinyes, who drove him mad, pursuing him from place to place. He sought refuge with Apollo in Delphi, but the manner in which the Erinyes were finally appeased is variously related by the Attic tragedians, who frequently treated this myth and developed it differently. According to one version, Orestes went to Athens, where the court of the Areopagus declared him innocent through the influence of Athene. According to another, Apollo sent him to Tauri, whence he succeeded, by the aid of his sister, Iphigenia, who was a priestess there, in carrying away the image of Artemis. Of the tragedies which treated the myth, the trilogy *Orestea* by Æschylus, *Electra* by Sophocles, and *Electra, Orestes*, and *Iphigenia in Tauris* by Euripides, are extant.

Revised by J. R. S. STERRETT.

O'reus: See HISTLEA.

Orfa, Orfah, or Urfah (Gr. *Edessa*; Arab. *Rouha*): city in Asiatic Turkey; in the vilayet of Aleppo; lat. 37° 8' N.; about 40 miles E. of the Euphrates (see map of Turkey, ref. 6-H). Improbable tradition makes Nimrod its founder. The Jews identify it with Ur of the Chaldees; this was apparently the opinion of St. Stephen, who located Ur in Mesopotamia (Acts vii. 2). The Arabs also associate it with Abraham, calling their chief sanctuary in the city the Mosque of Abraham, while the pond containing the sacred fish is the Pool of Abraham. As EDESSA (q. v.), it was important in the crusades. The town, surrounded by a wall, is partly built on the side of a hill, 1,650 feet high, overlooking an extensive plain. Its gardens are large and luxuriant and its narrow streets unusually clean. The river Kara Kuzu, spanned by three bridges, flows through it. As the central station on the great route between Aleppo and Diarbekir, its transit trade is extensive. Pop. about 30,000, nearly a quarter of whom are Christians and Jews.

E. A. GROSVENOR.

Orford, EARLS OF: See WALPOLLE.

Orford, Cape: See CAPE BLANCO.

Organ [O. Eng. *organ*, from Lat. *organum* = Gr. *ὄργανον*, implement, tool, organ of the body, a musical instrument; cf. *ἔργον*, work, Eng. *work*; a musical instrument in which sounds are produced by the passage of wind through pipes. Its capabilities are due to three principal properties. First of all, it includes a large number of distinct pipes, each of which is, in a sense, an independent instrument. Second, it contains peculiar arrangements, of which the chief is the keyboard (clavier), by which numbers of these pipes very remote from one another may be simultaneously operated on. Third, it substitutes for the natural production of the moving force (namely, air-currents) by the human lungs an artificial production of the same by means of a bellows, which substitution not only relieves the performer of the most fatiguing part of his work, but also increases in a vast measure the power of the instrument. By means of this large bellows, of a structure similar to that which is seen in an accordion, and worked by a lever-handle, water motor, or electric motor, air is forced into a closed chest or reservoir, where it can be stored up in a compressed state. In the modern bellows, the horizontal as distinguished from the old-fashioned diagonal, there are two divisions—a feeder and a temporary air-chest. The air is unable to return by the way it came, and can only find vent above through its upper floor, called the sounding-board. This sounding-board separates the air-chest from the organ-pipes, which are arranged above it. The air is admitted to the pipes by the action of certain slides and valves which are set in motion by drawing out the registers and by pressing down the keys or pedals. The drawing out of a slide partly opens up to the air a whole set of pipes of one peculiar quality or tone, so that when any of the keys is pressed down the air finds its way into the appropriate pipe of this particular series. Of course, when more than one stop is drawn out the air is admitted simultaneously into several distinct groups of pipes. The larger organs consist of three or more distinct partial organs, each of which has its peculiar keyboard, and a separate air-chest and sounding-board for its pipes.

The sound of an organ is produced by the vibrations of the column of air within the pipe. The compressed air of the air-chest, as soon as obstacles are removed by the action of the stop and of the key, rushes upward into the pipe, and so produces the tone. The shape of a metal organ-pipe is very much the same as that of a common tin whistle. The stem or "body" of the pipe is cylindrical. The lower part or "foot" is an inverted cone with its apex cut off. At the juncture of the body and the foot there is an opening in the side of the pipe called its "mouth." There is also a horizontal plate termed the "languid" or "language," which partially divides the foot from the body, and leaves a narrow egress for the air coming from below close to the mouth of the pipe. The wooden pipes are of a slightly different structure, being commonly square instead of round, but their mode of action is not materially different. When the air rushes up into the pipe it is driven against the upper edge or "lip" of the mouth-hole. Breaking against the sharpened edge, it produces a peculiar hissing or rushing noise, which is all we hear when the pipe does not "speak." The agitation thus set up at the mouth communicates itself to the column of air within the body of the pipe, which is thus made to vibrate with a rapidity determined by its length. The shorter the pipe the more rapid the series of vibrations, and the higher consequently the pitch of the note produced. Organ-pipes are of a great many varieties, according to the material used and the shape of their several parts. Metal pipes are made of tin, "metal" (a mixture of tin and lead), zinc, etc., while wooden pipes are generally constructed of cedar, deal, or pine. The shape of pipes also varies considerably. Thus among metal pipes we have the forms of cylinder, cone, and inverted cone, while among wooden pipes we have the forms of quadrilateral, trilateral, cylinder, pyramid, and inverted pyramid. Further, there is a distinction between pipes which are open and those which are stopped or plugged at their upper extremity. An open pipe produces a tone with a wave of air twice as long as the body of the pipe, and a stopped pipe produces a tone with a wave four times the length of its body. Thus a stopped pipe is always an octave deeper than an open pipe of the same length.

The peculiar quality of sound belonging to an organ-stop

is due to the structure of the pipes belonging to the stop. According to the researches of Prof. Helmholtz, the *timbre* of a musical instrument is determined solely by the number and strength of the upper partial tones which enter into the tones of the instrument. Thus he found that wide-stopped organ-pipes have scarcely any upper partial tones at all, and that all stopped pipes are wanting in the even members of the series of upper tones. Hence stopped pipes give a soft hollow sound, while open pipes produce a sharp brilliant style of tone. The number of partial tones, and so the timbre of a pipe, vary with the shape and size of the pipe, and also with the material of which it is made. Certain stops called "reeds" owe their peculiar character to the addition of a vibrating tongue, like those of a harmonium, to the pipe. This tongue is a thin, oblong brass plate fitted into the aperture of a cylindrical tube called a reed. The tongue in its oscillations alternately opens and closes the aperture of the tube through which the air seeks to pass. The consequence is that the stream of air is separated into a series of individual pulses. The sound of a reed pipe is the result of these interrupted pulses of air, together with the vibrations of the metal tongue itself. Other stops having a peculiar quality of tone are in reality compound stops; that is, they bring into simultaneous action a plurality of pipes of different pitch. The twelfth, fifteenth, sesquialtera, and mixture are among the best-known compound stops. The notes of these combined pipes have the same relation to one another as the partial tones of a single musical tone. Thus it is usual to connect the upper octave with the prime tone, and after that the twelfth. Some of these compounds give as many as the first six partial tones. The number and strength of the combining tones in the note of one of these compound stops give to it a peculiarly bright, and in some cases a dazzling and overpowering character.

The names of the several organ-stops point partly to the quality of the sound produced, partly to the range or compass of the pipes belonging to it, and to other circumstances. Thus the trumpet and the oboe, which are both reed-stops, are so named from the resemblance of their tones to those of these instruments. The diapason-stops again are so called because their pipes extend through the whole compass of the organ. The stop "principal," which is an octave higher than the open diapason, is so named from the fact that it is the first stop tuned, and the standard, therefore, for the pitch of the remaining stops.

Many mechanical aids to registration have been furnished, whereby the organist may radically change his stop-combinations to a degree never before attainable by simply touching a knob or pedal. The application of electricity is also beginning to do away with much cumbersome machinery connecting key with pipe. The principle of the swell is being largely developed and applied to extensive portions of the organ formerly lacking in this respect—this to the great gain of the instrument from the standpoint of *expression*.

History.—The history of the organ forms an important branch of the history of music as a whole. We are able to trace back the pedigree of this instrument to an humble ancestry: the pipes of Pan and the bagpipe. It is difficult to fix the date of the first organs referred to in ancient writers, owing to the ambiguity of the word *organ* (*ὄργανον*), which was properly fitted to denote any musical instrument. The organ, properly so called, originated among the Greeks of Alexandria in the second century B.C. The first species of organ of which we have a description is the water-organ, *ὕδραυλος* (literally, water-flute). It is described by Vitruvius and Athenæus as sweet, though not powerful. This instrument was designed for domestic amusement. On a Roman monument we have a bas-relief representation of a domestic organ. It contains sixteen pipes, and the performer, a lady, plays with both hands on the keyboard. It is placed on a table, and looks easily portable.

The organ is said to have been introduced into the Church by Pope Vitalian in the seventh century, but its employment in church services probably dates from a much earlier period. Organs were certainly used in churches very commonly in the time of the Carolingians. We read of organs being sent to King Pepin and Charlemagne as presents by the Byzantine emperors. The first of these is described as a wonderful structure of the form of a tree, in the branches of which were birds of various species, each bird giving forth the note peculiar to its species. At a much later period than this we find the structure of the organ to be exceedingly rude. The keys were often from 4 to 6 inches broad, and

were struck with the closed fist or in some cases with the elbow, so that only two tones could be produced simultaneously. The compass was sometimes as great as twenty-one notes, the series being that of our diatonic scale (the white notes of a piano). In addition to these more common instruments, we read of gigantic organs, such as that built for Winchester in the year 951, which is said to have contained 400 pipes and 26 bellows, requiring 70 strong men, and to have been played by two performers or four fists. From the twelfth century on we read of a light portable organ named "portative," which was distinguished from the fixed organ or "positive." The performer, who carries the instrument by means of a belt, plays with one hand, and manages the bellows with the other. Italian painters of the fourteenth and fifteenth centuries were fond of representing the instrument in the hands of saints and angels. In the fourteenth century the structure of the organ underwent certain improvements. A step had been taken before this toward enabling the organist to produce a larger number of simultaneous tones. By the invention of mixture or compound stops—which seem to have been arrived at at a very early date—two or three notes could be sounded by means of one key, the combinations being selected according to the strange ideas respecting sequence of accords prevalent at this age (as illustrated in the *Organon* or mode of harmony of Hucbald and his successors). In the fourteenth century this capability of uttering simultaneous tones was much further increased by the reduction of the size of the keys, so as to make them workable by means of the fingers. This change also involved a large extension of the compass of the keyboard. We read of organs of this period having three octaves, including semitone intervals.

The period of the supremacy of the polyphonic music of the Netherlands (1450–1550) was marked by considerable improvements both in the structure and in the art of performance of the organ. The development of the contrapuntal or fugue style of music, which was diffused from the Netherlands through Germany, Italy, England, etc., gave a great impetus to the art of organ-playing. There are still preserved volumes of organ compositions used by the German performers of this time, from which we see that organ pieces were now growing into independent productions. In Germany the art of organ-playing was diligently cultivated by a series of musicians, of whom the family of the Bachs were among the most distinguished. Thus were laid the foundations of the art which Sebastian Bach was afterward to carry to so high a degree of perfection. In Italy, during the sixteenth century and at the beginning of the seventeenth, organ compositions very ornamental in design and containing the germs of our modern harmony became common. The seventeenth century, too, was marked by great progress in organ-building and in organ-playing. Germany and Holland trained builders of great eminence, whose works may be found in other countries besides, including England. Some of the finest old organs of England, including those of Westminster Abbey, the Temple church, and Durham Cathedral, were erected by a German named Schmidt. The style of organ composition was greatly elevated in that century by the addition of harmony in the modern sense, of which Palestrina had laid the foundations in Italy.

From the beginning of the eighteenth century the organ has undergone a vast though gradual improvement of structure, which has served to increase its scope and variety by lessening the mechanical difficulties of performance. In this way it became possible to execute such rich and elaborate works as later composers have produced. The principal mechanical additions to the instrument have been directed to a more varied combination of pipes by compound stops, to a diminution of the labor of the manual performance by means of arrangements which facilitate the drawing of stops and the depression of keys. Among the methods used to lessen this last ingredient in the labor of the organist are pneumatic action which is commonly adopted in the best modern organs.

Among the largest European organs still to be seen, the following may be mentioned: The Weingarten organ (66 stops and 6,666 pipes), the Haarlem organ (60 stops), the organ of the Church of the Cavalieri di San Stefano at Pisa (over 100 stops), that of the Church of S. Alessandro in Colonna (100 stops, circa), the Crystal Palace organ, London (65 stops), and the transept organ of St. Paul's, London (60 stops). In Paris, the organs of St. Eustache, St. Sulpice, the Madeleine, the Trocadéro, etc. In the U. S. there are now a number of large and fine organs well worthy of comparison with

anything of European construction. The concert-organ in the Chicago Auditorium is one of the largest in the world.

The reader is referred to the following works on the structure and history of the organ: *The Organ, its History and Construction*, by Edward J. Hopkins, with a new history of the organ by Edward F. Rimbault (London). This is by far the most complete treatise on the subject. The nature of the sounds of organ-pipes is elucidated by Prof. Helmholtz in his great work on *The Sensation of Tones (Die Tonempfindungen)*, translated by A. J. Ellis (London). Many curious chapters in the history of the organ and of organists may be found in the histories of music of Dr. Burney and Sir John Hawkins, and of the German historian Kieseewetter, Forkel, and especially A. W. Ambros.

Revised by DUDLEY BUCK.

Organic Chemistry: a term that came into use formerly to express that branch of chemistry which dealt with the substances that occur in living things. A distinction was then made between these constituents of animate things and the mineral substances, the constituents of the inanimate portions of the earth. That branch of chemistry which had to do with the latter was called inorganic chemistry. As investigation advanced it was found that there is no essential difference between the compounds treated of in the two branches. They are all chemical compounds; and many of the substances found in plants and animals can be made artificially in the laboratory without the intervention of the life-process. (See CHEMISTRY.) That which chiefly characterizes organic compounds is the fact that they all contain carbon, and therefore the term chemistry of the compounds of carbon has been generally adopted in place of organic chemistry. This name is not strictly correct, for the reason that the carbonates, such as limestone, marble, dolomite, etc., would be included, and it is not usual to treat of them under the head of compounds of carbon. Another name that has been proposed is chemistry of the hydrocarbons and their derivatives. This is based upon the conception that the great majority of so-called organic compounds are either hydrocarbons or are derived from these hydrocarbons. The truth is, the separate treatment of the compounds of carbon is merely a matter of convenience. The large number of these compounds and their great variety make special treatment necessary. It would, perhaps, be best to include all compounds of carbon, no matter what their origin, and keep the name chemistry of the compounds of carbon. In the same way there is a chemistry of silicon and of oxygen, and of every other element, but thus far there has been no occasion for making other subdivisions of the subject of chemistry.

IRA REMSEN.

Organic Radicals: See RADICALS.

Organism: See BIOLOGY.

Organ Mountains (Port. *Serra dos Orgãos*): a group of mountains facing the northern end of the bay of Rio de Janeiro, Brazil. They are the culminating portion of the Serra do Mar, attaining an altitude of 7,322 feet. In clear weather they are plainly visible from the city of Rio de Janeiro, and their grandeur and singularity are noted by every traveler. One of the numerous sharp pinnacles is called the Dedo de Deus (finger of God); it resembles a gigantic finger, pointing upward. Petropolis, Theresopolis, and other favorite summer resorts are in or near these mountains, and are easily accessible for tourists.

H. H. S.

Organ of Bojanus: a name formerly applied, from its discoverer, to the excretory organ of Molluscs and Tunicates. These organs are now known to be homologous with those of most other animals, and the term NEPHRIDIUM (*q. v.*) should be used for them.

Organ of Corti: See HISTOLOGY (*Organs of Special Sense*).

Organ-point [cf. Fr. *point d'orgue*]: in music, a series of harmonious combinations having for its bass one long, sustained, and unvarying note. As the organ is the only instrument on which these passages can be performed with full effect, the origin of the name and of its substitute, "pedal" or "pedale," is readily explained. This holding or pedal note is usually either the dominant or the keynote of the piece, and the upper parts consist partly of harmonies related to the bass, and partly of accidental or passing chords, serving as links in the general course of the harmony. Organ-points are of great variety in structure and duration, occupying sometimes as many as twelve or sixteen bars, and seldom less than three. They generally

terminate with the perfect or imperfect cadence, or with a chord of the seventh and a pause, and may be classified as follows: (1) Those consisting of a train of simple chords, chiefly derived from the bass; (2) those formed of plain harmonies with suspensions; (3) those which consist of a number of deceptive or interrupted cadences; (4) those formed of sequences variously elaborated; and (5) those of a more abstruse character, in which harmonies of a foreign, and even discordant, nature are introduced. An organ-point is sometimes *double*, the former part having the dominant for its bass, and the latter part the tonic or keynote. Instances are occasionally found of *inserted organ-points*, or those in which the holding-note is not in the bass, but in one or more of the upper parts.

Organum: See NOVUM ORGANUM.

Orgetorix: a Helvetian of noble birth, who instigated the migration of the Helvetii, described by Cæsar in the first book of his *Gallie War*.

Oriani, ô-rêe-aa'nêe, BARNABA: astronomer, count, and senator of Italy; b. at Garegnano, near Milan, July 17, 1752. His teacher in mathematics was Lagrange, to whom he succeeded as astronomer, and he continued the *Effemeridi Astronomiche*, which had been begun by his great master. He prepared a map of the kingdom of Italy, and the observatory of Milan is largely indebted to him. Oriani was a man of very noble character, was honored with various decorations and the membership of many learned societies, and was especially noticed by Napoleon. His principal publications are *Lettera ad un Amico Astronomo*, etc.; *Lettere Astronomiche*, etc.; *Risposta alle Note che l'Abate Frisi fece*, etc.; *Oblitività dell' Eclittica dedotta dalle Osservazioni solstiziali*, etc.; *Distanza dallo Zenite del Sole e delle Stelle fisse presso il Meridiano; Rifrazione osservata*, etc.; *Elementi di Trigonometria Sferoidica*. D. in Milan, Nov. 12, 1832. Revised by S. NEWCOMB.

Oribasius (in Gr. Ὀρειβάσιος) of Pergamus: physician to Julian the Apostate, whom he accompanied on his fatal expedition against the Persians (363). He was banished by the successors of Julian, but afterward recalled with honor, and lived to the end of the century. Of his medical encyclopædia (in seventy books), ἱατρικῶν συναγωγῶν ἐβδουηκοντά-βιβλος, considerable portions remain. His two abridgments have been published only in Latin translations. There is an edition by Boussemaker and Daremberg, with a French translation (6 vols., Paris, 1851-76).

Revised by B. L. GILDERSLEEVE.

Oribe, ô-ree'bā, MANUEL: soldier and politician; b. in Uruguay about 1802. He was a leader of the *gauchos*, attained high military rank under Frutos Rivera, was his Minister of War and Marine 1833-35, and succeeded him as president Mar. 1, 1835. About this time the parties called *Colorado* and *Blanco* were formed, Oribe being chief of the latter, while Rivera led the former. Rivera and the Colorados revolted in 1837, and, though at first unsuccessful, eventually defeated Oribe and forced him to leave Montevideo (Oct. 25, 1838) four months before the end of his term. Oribe took refuge with the dictator Rosas, at Buenos Ayres, and soon after agreed to support a scheme for reducing Uruguay to his rule. Rosas furnished him with troops and arms; he invaded Uruguay and besieged Montevideo intermittently from 1842 to 1851, holding a large part of the interior of the country. This is known as the nine years' siege. For a time France supported the legal or Montevidean government, and in 1851 Brazil and Entre Rios interfered in its favor. Oribe finally capitulated Oct. 10, 1851, and Rosas was defeated and deposed soon after. In Sept., 1855, Oribe led the revolt which drove Flores from Montevideo, but he was prevented from seizing the presidency by the interference of foreign powers. D. at Montevideo, Nov., 1857.

HERBERT H. SMITH.

Oriel Window; called also **Bow** (or **Bay**) **Window** [*oriel* is from O. Fr. *oriel*, gallery, corridor < Late Lat. *oriolum*, portico, hall; cf. Lat. *aurêolus*, golden, gilded]; a window which projects from the side of the house, has three glazed sides, and is often divided by mullions. It is one of the most picturesque features in the domestic architecture of the Middle Ages and the age of Elizabeth. Some writers discriminate between the oriel window, carried on corbels and projecting from an upper story, and the bay window resting on the ground.

Revised by RUSSELL STURGES.

Orien'te: a province of Ecuador, embracing all the territory E. of the Andes. As claimed by Ecuador, it has an

extent of 96,000 sq. miles; but the greater part of this is also claimed by Colombia and Peru, and the southern portion, along the upper Amazon, is actually held by the latter. The province includes the lower slopes of the Andes, and vast, forest-covered plains bordering the Napo and other branches of the Amazon; the only roads are almost impassable mule-tracks and footpaths, and the inhabitants, nearly all Indians, do not exceed 80,000. The streams are said to be rich in gold, and a little is obtained by primitive methods. Capital, Archidona.

II. H. S.

Orien'tius: a Christian Latin poet from Gaul, of the fifth century; perhaps to be identified with the Bishop of Auch, who about the year 439 acted as ambassador of Theodor I. to the Roman generals Aëtius and Litorius. His poem, in two books, containing 1,036 elegiacs, is entitled *Commonitorium*, an earnest admonition to the Christian to avoid besetting sins, which are enumerated. Of twenty-four prayers only two, in Senarii, are preserved. The authenticity of other poems attributed to Orientius is doubtful. There is an edition by Robinson Ellis (Vienna, 1888). See Manitius, *Geschichte der Christlich-Lateinischen Poesie* (pp. 192-201).

M. WAKKEN.

Oriflamme [= Fr. < O. Fr. *oriflamme* < Late Lat. *auriflamma*; *au'rūm*, gold + *flam'ma*, flame]: the ancient battle-standard of France, once a banner belonging to the abbey of St. Denis. After 1124, when it was adopted as a royal standard by Louis VI., it was often borne in battle, but seems never to have been employed after the battle of Agincourt in 1415. The accounts of its form and color differ considerably, but it was of flame-colored silk beautifully adorned.

Or'igen, surnamed ADAMANTIOS, from his untiring energy; one of the most learned and spirited of the Christian Fathers; b. at Alexandria in 185 A. D.; was early initiated both in Christianity by Clemens Alexandrinus and in Greek wisdom by his father, Leonides, who was a teacher of rhetoric. During the persecutions which took place in the reign of Severus, Leonides suffered martyrdom, and the son undertook to maintain the family by opening a school, in which at first he simply taught the Greek language and literature, but soon also began to expound the doctrines of Christianity with great success. Bishop Demetrius appointed him master of the famous catechetical school of Alexandria, and in order to maintain himself in this position he sold his library and subjected himself to the severest asceticism, at the same time pursuing his mental development with unflagging vigor. He made an exhaustive study of Greek philosophy, and became a pupil of Ammonius Saccas, and during a visit to Rome he acquired a mastery of the Hebrew language. His school, which he still continued, prospered in spite of occasional disturbances by the pagans, and his fame increased. In 228 he was called to Greece to dispute some heresy which had lately arisen there. On his way he visited Palestine, was everywhere received with great attention and invited to preach, and at Casarea he was ordained a presbyter. This ordination Bishop Demetrius of Alexandria refused to recognize as valid, partly because it was not given by himself as Origen's proper diocesan bishop, and perhaps partly because he knew that Origen, misunderstanding the passage in Matt. xix. 12, had mutilated himself. Two synods held in Alexandria supported the bishop; and as the broad and liberal views which Origen held on many points, and the critical examination and allegorical explanation to which he subjected the Scriptures, had made him many enemies, the second synod even condemned several of his ideas as heretical, and excommunicated him (231). In the West, where his writings were very little known, the case attracted no attention, but the bishops of the East—of Palestine, Phœnicia, Achaia, and Arabia—declared for him, and he found refuge in Casarea, where he reopened his school with still greater success. During the persecutions under Maximinus he fled to Cappadocia, where he lived for two years. Under Gordianus he returned and continued his beneficial activity, but the sufferings and torture to which he was subjected during the Decian persecution broke his strength, and he died at Tyre in 254. Origen is considered unsound in his eschatology, and his teaching of restorationism, even of demons, is the chief count against him, but he ranks with the best of the Fathers and the holiest men of the Church. Of his many writings (6,000, it is said) only a few have come down to us. Of his *De Principiis* of the Principles of Christianity exists only a free and even interpolated translation into Latin by Rufinus, edited by E. R. Redepenning (Leipzig,

1836) and by K. F. Schnitzer (Stuttgart, 1836). Of his *HEXAPLA* (q. v.), an edition of the Old Testament in six parallel columns in Hebrew, Hebrew text in Greek letters, and in the four versions by Aquila, Symmachus, the Septuagint, and Theodotion, and in parts other versions in parallel columns, we have only fragments, edited by B. de Montfaucon (2 vols. fol., Paris, 1713), but best by F. Field (Oxford, 1875). The beautiful treatise on martyrdom and the celebrated eight books against Celsus, which are an apology for Christianity, are entire. His works were among the earliest printed; his homilies appeared in 1475, and editions of his complete works appeared at Paris (2 vols. fol., 1512-19, and another in 1522-30); later and better editions in Basel, edited by Erasmus (2 vols. fol., 1545); in Paris (1572-74, 2 vols. fol.); by C. and V. de la Rue (4 vols. fol., Paris, 1733-59; also in Migne's series, vols. xi.-xvii.); by C. H. E. Lommatsch (25 vols., Berlin, 1831-48); and an English translation of his treatises *On the Principles and Against Celsus*, with a few other writings, in Clark's Ante-Nicene Christian Library. See E. R. Redepenning, *Origenes, eine Darstellung seines Lebens und seiner Lehre* (Bonn, 1841-46).

Revised by SAMUEL MACAULEY JACKSON.

Original Burgher Synod: a Scottish Presbyterian body. See PRESBYTERIAN CHURCH.

Original Sin (Lat. *peccatum originale*): in theology, that act or state of sin from which all other sins originate. It is distinguished into *original sin imputed*—e. g. the guilt of Adam's apostasy charged to his descendants (see IMPUTATION)—and *original sin inherent*—that innate subjective moral corruption which is inherited by all men at birth, and which is the immanent cause of all actual transgression. The term is taken in the latter sense in this article, the *peccatum habituale* as distinguished from the *peccatum actuale*. It is proposed to state in historical order the principal opinions which have been entertained, first, as to its *nature* and *extent*, and, second, as to the manner of its propagation.

1. *Its Nature and Extent.*—(A) *Opinions prevalent before the Controversies of Augustine with Pelagius.*—There prevailed no definite and generally accepted views as to the nature and extent of the moral ruin wrought in human nature in consequence of Adam's sin. All agreed in the fact of a sinful taint, and of the need of redemption. The Eastern portion of the Church generally, and more particularly the Alexandrian school founded by Origen, in extreme reaction alike from Gnostic and from Neo-Platonic dualism, emphasized the self-determining power of the human will and man's responsibility, and consequently his ability to co-operate with any divine assistance vouchsafed for his recovery. On the other hand, the Latin Fathers, especially Tertullian, Hilary, and Ambrose, the immediate teacher of Augustine, emphasized hereditary sin and guilt, and the absolute dependence of the soul upon grace.

(B) *The Opinions entertained by the several Parties to the Anthropological Controversies of the Fifth Century.*—(1) Pelagius and his party held that Adam's sin injured only himself; that men are now born in the same moral state in which they were created; that *liberum arbitrium*, the power to choose indifferently good or evil, is essential to moral responsibility in every stage of action, and an inalienable prerogative of human nature. Hence man is morally well. (2) The *Semi-Pelagians* held that human nature is seriously injured by Adam's sin, and that hereditary corruption is a fault or disease, rather than a sin properly so called, since it involves no guilt (either *reatus pœnæ* or *culpæ*) previous to actual transgression. Man can choose and attempt the good, but through weakness is unable to effect it. Hence they denied *gratia preveniens*, predisposing grace, but admitted the necessity of *gratia co-operans*, which is rendered efficient by the spontaneous co-operation of the human will. (3) Augustine taught that the apostasy of Adam, in whom all men sinned, is the common guilt of all his natural descendants, who, while retaining freedom in the sense of rational spontaneity, come into being spiritually dead, unable either to begin or to effect any really good act before God—free only to sin, and dependent for salvation upon unmerited, sovereign, omnipotent grace. Before regeneration the soul can only resist grace; afterward, by the assistance of grace, it may co-operate with grace. Hence the necessity of *gratia preveniens*, disposing grace, *gratia operans*, regenerating grace, and *gratia co-operans*, grace assisting the regenerated to every holy act. See G. F. Wiggers, *Hist. of Augustinianism and Pelagianism*, part i. and part ii. For the history of the condemnation of Pelagianism and the

adoption of Augustinianism in the Roman Catholic Church, see ARMINIUS and CALVINISM.

(C) *The Tridentine doctrine*, or the later Catholic doctrine formulated by the Council of Trent (1545-63). It is admitted that human nature bears the guilt of Adam's sin, is morally corrupted, and without grace helpless. It distinguishes, however, between the *dona naturalia*, the soul with its constitutional faculties, and the *dona supernaturalia*, the superadded gift of supernatural righteousness. In the original creation all Adam's faculties, physical, intellectual, and moral, were in perfect equilibrium, the lower held in due subordination to the higher. To confirm this equilibrium, God added the gift of original righteousness. This supplementary gift Adam lost for himself and his descendants, and this loss (1) involves guilt; (2) leaves the natural powers in a state of instable equilibrium, so that the free will certainly falls into actual transgression as soon as moral agency begins. Yet man may seek the grace offered in baptism, which effects justification *ex opere operato* in all non-resistants (*non ponentibus obicem*). "Original sin" in the Roman Church consists, therefore, in the loss of "original righteousness," which nevertheless involves "obliquity of will from God"; and yet free will must co-operate with grace. See *Counc. of Trent*, sess. 6, 1, 3, 5, 7; Bellarmine, *Amiss.*, gr. iv. 3 and v. 17.

(D) *All the original Protestant Churches, Lutheran and Reformed*, agree, as to "original sin," that it includes (1) moral corruption of the whole man as well as the loss of "original righteousness." (2) This implies no physical change in the substance of the soul, but a depraved moral habit. (3) All the faculties, intellectual as well as emotional or volitional, as far as they relate to moral objects, are depraved. (4) This depravity, although admitting many civil virtues, is called total, because (1st) the whole man is involved; (2d) the breach with God is complete, and, without supernatural aid, irremediable; (3d) the tendency is ultimately to all sin. (5) This condition involves guilt (both of blame and punishment). Some say, because all sin is inherently blameworthy; others say, because it originated in Adam's abuse of free will, for which we are all responsible. (6) Man is morally impotent to change his own general disposition to evil. Hence he can not co-operate with grace before regeneration, but afterward by the continued operation of grace the free will acts graciously. See *Form of Concord* (Hase), pp. 639, 640, 645, 662, 681; *Gal. Conf.*, art. ii.; *Heidel. Cat.*, ques. 7-10; *West. Conf. Faith*, chs. vi., ix.; *Thirty-nine Articles*, art. 9.

(E) *The Arminian doctrine*, as held by the Dutch Remonstrants, regarded "original sin" rather as a fault or defect of nature than a sin. As held by the Wesleys, it admits that man's nature is corrupted, indisposed, and disabled from all spiritual good; but both parties differ from the Lutheran and Reformed Churches in holding (1) that it involves no guilt, since it is not brought upon us by our own agency; and (2) that every soul retains power to co-operate with the grace with which God for Christ's sake endows every soul. *Conf. Remonstr.*, pp. 84 and 162, and Dr. D. D. Whedon in *Bib. Sacr.*, Apr., 1862.

(F) *The Socinian and Rationalistic doctrine* is nearly the same with that of Pelagius, above stated. There is no innate corruption. Sin is propagated by example. Man always retains plenary power to do all God requires of him. There is no grace beyond providential advantages and objective instruction. *Racov. Cat.*, pp. 294 and ques. 428-430.

II. *The Mode of its Propagation.*—(1) Origen taught the doctrine of the pre-existence of human souls, and their personal sin and self-corruption in a previous state of probation. This view, which denies the propagation of inherent corruption from Adam altogether, was revived by Dr. Edward Beecher in his *Conflict of Ages* (1853). (2) Tertullian taught the doctrine that souls as well as bodies are derived by generation from parents, and that sin, like every essential quality and many acquired accidents of nature, is propagated *ex traduce*. Augustine hesitated to decide between this origin of souls and their immediate creation. Many of the Greeks were creationists, and many of the Latins traducianists. Since the Reformation most of the Lutherans have been traducianists, and most of the Reformed creationists. (3) Jerome held that each soul was immediately created by God. Creationists account for inherent moral corruption either (a) *per corpus*—that is, from the union of the soul with a body in which sin is propagated by generation (*Lampe* [Utrecht, 1683-1729], vol. i., p. 572)—or (b) *per culpam*—from the judicial withholding from the new-created soul

of the life-supporting influence of the Holy Ghost, as the punishment of Adam's first sin. See Dr. R. Ridgely (London, 1667-1734); Turretine (L. IV., ques. 12).

Revised by F. H. FOSTER.

Orihuela, *ō-rēē-wā-lāā*: town of Spain; in the province of Alicante; on the Segura; 36 miles S. W. of the city of Alicante; in the middle of a most fertile plain (see map of Spain, ref. 18-II). It has a cathedral, a college, and manufactures of hats, linen and silk fabrics, and paper, and many flour and oil mills. Pop. (1887) 24,364.

Ori'lia: post-village of Simcoe co., Ontario, Canada; on Lake Couchiching, and on the Grand Trunk Railway; 90 miles from Toronto (see map of Ontario, ref. 3-D). It is the seat of a provincial asylum for lunatics. The town is connected by steamboat with Lake Simcoe and the Muskoka country. It has a good trade, important manufactures, and two monthly and three weekly papers. Pop. (1891) 4,752.

Orino'co: one of the largest rivers of South America; lying entirely in Venezuela, but with branches in Colombia. In the article AMERICA, SOUTH (*q. v.*), it was shown that three great river-depressions extend from the Atlantic far into the interior of the continent, becoming confluent toward the W. The Orinoco depression is the northernmost and smallest of the three; separating the highlands of Guiana from the Venezuelan coast mountains, it runs into the Amazonian depression southwestward, thus leaving Guiana like an island, cut off from the rest of South America by comparatively low lands. (See GUANA.) The southwestern part of the Orinoco depression is about 1,000 feet higher than the eastern part, forming an interior basin largely covered with forest, and quite different in character from the broad open plains near the Atlantic. On leaving this upper basin the river flows down in a series of rapids, which occupy a comparatively small space, and separate the navigable upper part from the wide lower channels. The Orinoco rises on the southeastern side of the highlands of Venezuelan Guiana, and follows their edges around in a broad curve northward, finally turning E., still near the edges of the highlands, until it reaches the Atlantic. Hence the right bank of the river is generally high, or the lowlands on that side are of small extent, and the tributaries are navigable for comparatively short distances; the great plains and the most important navigable branches are on the left side. Near and above the rapids there are isolated hills or mountains in the upper basin, on the left side of the river. We know almost nothing of the vast tract to the S. W., about the Meta and Guaviare branches; and it is quite possible that the upper basin in this direction is broadly continuous with the Amazonian depression. That the two river-basins are confluent, at least for a small space, is shown by their actual water connection through the Cassiquiare and Rio Negro; but this connection is 920 feet above sea-level. The sources of the Orinoco (discovered by Chaffanjon in Dec., 1886) are in the Sierra de Parima, close to the frontier of Brazil. Descending rapidly to the W. N. W. the river enters the upper basin, where it becomes navigable for small vessels. In this region is the remarkable and unique channel which connects it with the Rio Negro and Amazon. The Orinoco bifurcates; about one-sixth of its water takes the left-hand channel, which is here about 50 yards wide, and after a course of 190 miles enters the upper Rio Negro. Below the Cassiquiare the Orinoco receives the Ventuario on the right and the Guaviare on the left. It then turns N., and enters the region of the *raudales* or rapids. The most important of these are the Raudales de Maypures, 4 miles long, and the Raudales de Aturés, 6 miles long. The river, strained by opposing hills, rushes foaming through numerous small channels between rocky islets, forming a scene of almost unsurpassed grandeur. The Indians drag their canoes through these rapids with great difficulty and danger, but they are impassable for large vessels. From the Raudales de Atures downward the river is freely navigable, though its shifting sandbanks and bewildering channels require an experienced pilot. It receives the Meta and Apure, its two most important tributaries, from the W., then turns directly E., flowing between the highlands of Guiana and the broad open plains of the LLANOS (*q. v.*). The river here is so near sea-level that its waters rise and fall regularly with the tide as far up as Ciudad Bolívar, 270 miles from the mouth. On approaching the sea it forms an immense swampy and forest-covered delta, dividing into more than fifty channels, which spread out over 180 miles of coast. The islands are haunted by fevers, and swarm with mosquitoes. The few Indian in-

habitants often build their houses on platforms to escape the river floods. Only one of the channels is used by large vessels. The whole length of the Orinoco is about 1,550 miles; it is navigable for 870 miles to the rapids, and above them to within 150 miles of its source. It receives eight large tributaries and an immense number of smaller ones; the Meta and Apure are navigable to the base of the Andes. The area drained by it is roughly estimated at nearly 400,000 sq. miles of very thinly inhabited country. Steamers from Trinidad ascend the main river regularly, and some attempts have been made to open up the tributaries. Diego de Ordaz navigated the Orinoco to the junction of the Apure in 1531-32, and subsequently the region was traversed by many adventurers in search of El Dorado. Humboldt (1800) was the first to describe the Cassiquiare channel, though it had long been known to missionaries. The latest and best survey is that of Chaffanjon (1885-87). See Humboldt's *Travels*; Michelena y Rojas, *Exploración Oficial* (1867); Schomburgk, *Reisen in Guiana und am Orinoko* (1841); Chaffanjon, *Découverte des sources de l'Orénoque ou Comptes rendus de la Société de Géographie de Paris*, Dec., 1887). HERBERT H. SMITH.

O'riole [from O. Fr. *oriol* > Fr. *loriot* (for *loriol*, the oriole) < Lat. *aureolus*, dimin. of *au'reus*, golden, deriv. of *aurum*, gold]; a name properly belonging to bright-colored Old World birds of the genus *Oriolus* and the family *Oriolidae*; but in the U. S. the name is given to birds of the family *Icteridae*. The name was probably transferred to these birds of the New World on account of their color, which is usually black and yellow, like that of the true orioles. (See BALTIMORE ORIOLE.) The only European oriole is the *O. galbula*, or golden oriole. Its name it derives from its color, which in the adult male is bright yellow over the whole of the head, neck, and body, with the exception of the wings, the two central tail-feathers, and the basal portions of the remaining feathers, which are jetty black, the two colors contrasting finely with each other. Across the eye runs a dark stripe, and the eyes themselves are reddish. The bird has a very peculiar note, loud, flute-like, and so singularly articulate that the Italian peasantry believe it speaks their language. Its nest is a very elegantly formed and well-constructed edifice of a shallow cup-like shape, and is usually placed in a horizontal fork of a convenient branch. The materials of which it is made are mostly delicate grass-stems so firmly interwoven with wool that the whole structure is strong and warm. The eggs are generally four or five in number, and their color is purplish white, sparsely marked with blotches of a deep-red and ashen gray. Its food consists chiefly of insects; and, as the bird is rather a voracious creature, it is very serviceable in clearing away caterpillars and other fruit-devouring insects. It is an exceedingly shy and timorous bird, and, as it always takes the trouble to set sentries on guard, it can not be approached without the greatest patience and wariness on the part of the sportsman or the observer. It is quite common in Italy, and it is also found in the other countries of Southern Europe. It is gregarious in its habits, generally associating in little flocks and frequenting lofty trees and orchards, where it finds plenty of food.

Revised by F. A. LUCAS.

Ori'on [= Lat. = Gr. *Ὠρίων*, Orion, fabled to have been a hunter transferred to the sky]; one of the constellations. It is mentioned (Job ix. 9; xxxviii. 31) by the Hebrew word *cesil*, which signifies a "fool," and also an "impious, godless man," called by the Arabs "the giant." The giant of ancient astronomy was Nimrod, who was fabled to have been bound to the sky for his impiety. The Greek mythology in various ways represent him as a giant who was slain by Diana, who in remorse placed him among the stars. The constellation is represented by the figure of a man with a sword by his side. Though a southern constellation with regard to the ecliptic, the plane of the equator passes through its middle. Its contains seven conspicuous stars; the three forming the belt are also called "Jacob's staff" and the "yard wand." One of the most remarkable nebulae of the heavens is situated in the sword-handle of Orion.

Orissa [Sanskrit. *Odra*, northern]: formerly the northern part of the old province of Kalinga, now the southeast portion of the province of Bengal, India. Its coast region is an extremely fertile, alluvial delta formed by the numerous branches of the Mahánadi, Bráhmni, and Baitarani rivers. Behind this densely populated coast region is the hill country, rather sparsely peopled and comprising two-thirds of

the total area of the district, which is 24,140 sq. miles. Rice is the chief product, agriculture is almost the only pursuit, and nearly all the inhabitants are Hindus. Pop. (1891) 3,865,020. C. C. ADAMS.

Orizaba, *ō-rē-thaa'baā* (called *Citlaltepētli*, or Mountain of the Star, by the Aztecs): a mountain of Mexico, on the confines of the states of Vera Cruz and Puebla, near the eastern edge of the plateau. The summit is covered with snow, and the ascent is difficult and dangerous. According to the careful measurements (partly by triangulation) made by Scovell and Bunsen in 1891-92, the highest point is 18,314 feet above sea-level; it is therefore the highest mountain in Mexico, and possibly the highest in North America. Orizaba is a quiescent volcano. In clear weather it is visible from the Gulf of Mexico, near Vera Cruz, presenting a magnificent sight. The railway from Vera Cruz to Mexico passes by its base. HERBERT H. SMITH.

Orizaba [corrupted from the Nahuatl *Ahanializapan*, liter., pleasant waters]: a town of the state of Vera Cruz, Mexico; on the railway from Vera Cruz to the capital; 17 miles S. E. of the mountain to which it has given its name (see map of Mexico, ref. 7-I). It is beautifully situated in a broad valley, 4,025 feet above sea-level; its delightful climate and magnificent scenery make it a favorite resort both for Mexicans and for foreigners. Maize, tobacco, and sugar-cane are extensively cultivated in the vicinity, and the town has several cotton-mills and other manufactories, the motive-power being derived from the Rio Blanco. Orizaba was an ancient Indian town. It was the headquarters of the French in 1862. Pop. (1894) about 25,000.

HERBERT H. SMITH.

Orkhan, *GHAZI*, the Victorious: first Ottoman sultan (1326-60); b. 1290; captured Broussa (1326) shortly before his father's death, and as his elder brother Alaeddin refused the throne, he succeeded to it. The brothers were devotedly attached to each other, and Alaeddin, who was a statesman and scholar, aided him as his grand vizier. Orkhan was an able soldier, and captured Nice, Nicomedia, and Pergamus, and by these and other conquests more than trebled his states, which Alaeddin organized. By the conquest of Tzampe and Gallipoli (1357) the Ottomans gained their first foothold in Europe. Orkhan married (1347) Theodora, daughter of John VI. Cantacuzenos, Byzantine emperor, but did not force her to adopt his creed. He died (1360) of grief at the death of his brother and his son Suleiman.

E. A. GROSVENOR.

Ork'ney Islands: a group of sixty-seven islands, of which twenty-nine are inhabited, lying off the northern coast of the mainland of Scotland, from which they are separated by the Pentland Firth. They comprise an area of 375 sq. miles, with a population in 1891 of 30,453. The largest is Pomona or the Mainland; the most remarkable among the others are South Ronaldshay, Hoy, Flotta, Rousay, and Sanda. With the exception of the Hoy, which is rocky and mountainous, its western coast reaching a height of 1,600 feet, the Orkney islands are low, presenting an irregular coast-line—in some places rocky, in others sandy. The climate is mild, considering the northern latitude, frosts are very rare, but the summers are often chilly, and always moist. The soil is remarkably fertile. The chief agricultural products are barley, oats, potatoes, and turnips, and sheep and cattle are extensively reared. Fishing, hunting for wild birds and eggs, rearing of poultry, and distilling are important occupations. There is regular steam communication between Kirkwall, the chief town, and Wick, Aberdeen, and Leith, and between Stromness (the next most important town) and Thurso on the mainland, and a small steamer connects Kirkwall with the North Isles. Communication with the other islands is by "packet." The tides rush with great rapidity through the numerous sounds and channels formed by the islands, and navigation is dangerous. In 1889 the Orkney islands were separated from the Shetlands and erected into a separate county. Orkney and Shetland together send one member to Parliament. The Orkney islands are mentioned by the ancient geographers Pliny and Ptolemy, and by other classical writers, under the name *Orcades*, whence the modern adjective "*Orcadian*." Little, however, is known of the inhabitants till the dawn of the Middle Ages. They were probably of the same stock as the British Celts. The islands, together with the Hebrides, were conquered by the Norwegians in 876, and formally annexed to the Norwegian crown in 1098. In 1397 they were united to Denmark, and in 1468 the Danish king, Christian I., gave them to the Scottish

king, James III., who married his daughter, as a security for her dowry. The dowry was never paid, and in 1590 the islands were formally turned over to Scotland. During their long connection, however, with Norway and Denmark all traces of the primitive Celtic population disappeared, and the present inhabitants are of pure Norwegian stock.

Revised by R. LILLEY.

Orlando: city; capital of Orange co., Fla. (for location, see map of Florida, ref. 5-J); on the Fla. Cent. and Peninsular and the Savannah, Fla. and West. railways; 90 miles S. of Palatka. It is in the heart of the orange, pineapple, and grape region; has 6 churches, street-railways, gas and water-works, large foundry and machine-works, 2 State banks, and a daily and 2 weekly newspapers; and is a noted winter resort. Pop. (1890) 2,850; (1895) 2,993.

EDITOR OF "REPORTER."

Orléanais, *ō'r'lā'āā'nā'*: an ancient province of France; situated nearly in the center of the country, bounded by the provinces of Île de France, Champagne, Burgundy, Berry, Touraine, Maine, Perche, and Normandy. It consisted of Orléanais proper, with the capital of Orleans; Beauce, comprising Pays Chartrain, Dunois, and Vendômois, with the capital of Chartres; Blaisois, with the capital of Blois; and Gatinais-Orléanais, with the capital of Montargis. Its territory constitutes the three departments of Loire-et-Cher, Eure-et-Loire, and Loiret, and parts of Indre, Indre-et-Loire, Nièvre, and Yonne.

Or'leans: city of France; capital of the department of Loiret; 75 miles by rail S. W. of Paris, on the right bank of the Loire, which is crossed here by a magnificent bridge of nine arches (see map of France, ref. 4-E). It has many fine promenades, handsome public squares, and elegant buildings, among which the cathedral is one of the most magnificent Gothic edifices of France; but generally the town is ill-built. Its educational institutions, especially its medical schools, and its museums are excellent, and its sugar-refineries and manufactories of vinegar and woolen fabrics are very extensive. The University of Orleans, founded in 1312, was suppressed in 1789. The city contains three beautiful statues of Joan of Arc, the Maid of Orleans, and its museums have numerous antiquities and monuments relating to her. During the Franco-German war Orleans was the center of the preparations made by the government of defense for the purpose of raising the siege of Paris, and for some time in 1870 the city was occupied by the Germans, though without suffering any harm. Pop. (1891) 63,705.

Orleans, *DUCHY OF*: an old division of France, consisting of Orléanais proper, with the capital, Orleans. It formed a countship under the Carolingian and Capetian dynasties, but was erected into a duchy in 1344 by Philip VI. of the house of Valois, and given to his son as an appanage. Subsequently it was held in the same way by different younger branches of the reigning families of Valois and Bourbon. Thus Louis, the second son of Charles V. of Valois, and for a time lieutenant-general of France during the insanity of his brother the king, Charles VII., received the duchy of Orleans in 1392 as a fief, and after his death, in 1407, his son Charles held it to 1465; but when, in 1498, his grandson, Louis, ascended the throne of France as Louis XII., it returned to the French crown. In 1626 it was bestowed on Jean Baptiste Gaston, brother of Louis XIII., the youngest son of Henry IV. of the house of Bourbon, famous in history for the unflinching steadfastness with which he formed one conspiracy after the other against Richelieu, and the cynical treachery with which he every time sacrificed his accomplices; he died in 1660, leaving no male heirs. The most remarkable of the several families which have held the title and possessions of the duchy is that descending from the younger brother of Louis XIV., Philip, a son of Louis XIII., b. in 1640, married in 1661 to Henrietta of England, and after her death, in 1671, to Charlotte Elizabeth of Bavaria; d. in 1701. This branch of the family, by virtue of its descent from Louis XIII., played a very prominent part in subsequent French history. In the Treaty of Utrecht (1713) the Duke of Orleans waived all rights to the throne of Spain, and the Duke of Anjou (Philip V.) all hereditary rights to the French succession. These provisions determined the rights of the Count de Chambord and the Count of Paris in the nineteenth century. During the administration of Richelieu as well as during the reigns of Louis XIV. and Louis XV. the family occupied a position of special prominence.

Revised by C. K. ADAMS.

Orleans, Prince Louis Philippe, Duke of: eldest son of the Count of Paris; b. Feb. 6, 1869. On attaining his majority (Feb. 6, 1890) he entered Paris, and expressed his desire as a Frenchman to perform his military service; was arrested in accordance with the Expulsion Act of 1886, which forbids the soil of France to the direct heirs. He was liberated after a few months' imprisonment.

Orleans, Louis Philippe Joseph, Duke of, better known as **Philippe Égalité**: revolutionist; b. at St.-Cloud, Apr. 13, 1747; married in 1769 Adelaide of Bourbon-Penthièvre, who brought him immense wealth; entered with zeal into the revolutionary agitation, and became on account of his rank and influence the center of the opposition to the court. He renounced his rank and titles, assuming the name of Citizen Égalité, and aspired to be the leader of the republican movement, but lacked the ability and force of character to command respect. Influenced by fear he voted for the death of the king, but neither this nor his subversive activity as the tool of the Jacobins saved him from the suspicion of complicity with his kinsmen, and he was tried and guillotined on Nov. 6, 1793.

Orleans, Philippe, Duke of: regent of France during the minority of Louis XV.; b. Aug. 4, 1674; distinguished himself as a soldier, especially while in command of the French army in Spain, where in 1707 and 1708 he conducted brilliant and successful campaigns; became sole regent on the death of Louis XIV., and showed himself in some respects an able ruler. The Stuarts left France, and an alliance was formed with Great Britain. On the other hand, his Government countenanced the financial folly of the Mississippi scheme. In his private life he was grossly licentious, and his excesses hastened his death, which occurred Dec. 2, 1723.

Orleans, Maid of: See **JOAN OF ARC**.

Orley, BERNARD, van: painter; b. in Brussels in 1490. Having studied art with his father and cousin, he went to Rome, where he became a pupil of Raphael, who employed him in his great compositions. After Raphael's death he returned to Brussels, where Charles V. commissioned him to paint several pictures of hunting scenes. He made cartoons for tapestries for the palaces of the emperor and of the princes of the house of Austria and of the Duchess of Parma. He painted a fine picture of the *Last Judgment* for the chapel of the Almoners in Antwerp, and a *St. Luke painting the Virgin* for the society of painters of Mechlin. He also made designs for the tapestries of the Castle of Breda for William of Nassau. D. in 1560. W. J. S.

Orloff: name of a Russian family, prominent since the seventeenth century, remarkable rather for courage and physical characteristics than for intellectual and moral qualities. (1) **IVAN:** one of the rebellious strelitzi, pardoned on the scaffold (1689) by Peter the Great, who was pleased by his undaunted bearing. He assumed the name Orloff.—(2) **ORLOFF, GREGORY:** soldier; son of (1), father of five sons and one daughter, the latter commonly revered as St. Catherine.—(3) **ORLOFF, IVAN:** author; son of (2); b. 1733; d. 1791.—(4) **ORLOFF, GREGORY:** general; son of (2); b. 1734; chief of the conspirators who deposed Peter III. (July 9, 1762) and made Catherine II. sole ruler. In consequence, he and his four brothers were made counts. By him Catherine had a son, Count Bobrinski. His brutality and arrogance finally alienated the empress; he was banished, then recalled, and on account of his courage during the pest at Moscow, partially restored to favor. Failing in a diplomatic mission and again disgraced, he became insane and died (1783) at Moscow.—(5) **ORLOFF, TCHESHMENSKI, ALEXIS:** general; son of (2); b. 1736; d. 1808; a man of gigantic stature but little intellect. Joining his brother's conspiracy, he is said to have strangled Peter III. with his own hands. He commanded the Russian squadron which won the great naval battle of Tcheshme (1770), whence he received the title of *Tcheshmenski*. That victory was due, however, to his British officers, Elphinstone, Gregg, and Dugdale. The Princess Tarakanoff, daughter of the dead Empress Elizabeth, was then residing in Italy, and caused anxiety to Catherine II. Professing himself the lover of the princess, he won her hand, enticed her on board his fleet, and carried her to Russia, where she was put to death. He was banished soon after the accession of the Emperor Paul.—(6) **ORLOFF, VLADIMIR:** scientist; son of (2); president of the Academy of Sciences of St. Petersburg.—(7) **ORLOFF, GREGORY VLADIMIR:** author; son of

(6); b. 1777; d. 1826; wrote numerous works on history and art.—(8) **ORLOFF, FEODOR:** general; son of (2); b. 1741; d. 1796; notable only through his four illegitimate sons, from whom the present members of the family descend.—(9) **ORLOFF, ALEXIS:** general; son of (8); b. 1786; d. 1861; saved the life of Emperor Nicholas in 1825; skillfully negotiated Treaty of Adrianople (1829), and Treaty of Hounkiar Iskelessi (1833), but was afterward generally unsuccessful in the many high offices he held; represented Russia at the Congress of Paris (1856), and was made a prince.—(10) **ORLOFF, NICOLAS:** diplomat; son of (9); b. 1827; d. 1885; Russian ambassador to Paris in 1872; wrote on campaign of 1806 in Prussia.—The **ORLOFF-DENISSOFF** family, unconnected with the persons above mentioned, are prominent on the Don, and have hereditary right to furnish the hetman of the Cossacks. E. A. GROSVENOR.

Ormazd, or Ormuzd [Pers. *O. Pers. auwama di*: Avest. *ahura mazdāh*; cf. Sanskr. *asura*, spirit, divinity, (later) demon, and *médhas-*, wisdom]: the supreme god in Zoroastrianism, or the religion of ancient Persia. The meaning of the name *Ahura Mazdāh* in AVESTAN (*q. v.*) is the Lord Wisdom, and he is the omniscient, omnipresent source of all that is good in the world; his opponent, *Ahriman* (Avest. *Anra Mainyu*, the Enemy Spirit), affords a parallel to Satan. Zoroastrian dualism recognizes the two principles of Ormazd and Ahriman as primeval and coeval, but not coeternal: Ormazd in the end shall triumph and destroy Ahriman. A later Persian sect, the Zervanists, regarded both these principles as sprung from *Zarvan Akarana* (Time Eternal); one Iranian sect, called Gayomarthians, conceived Ahriman to be an evil spirit sprung from Ormazd. The exalted and spiritual conception of Ahura Mazda with his ministering angels that is found in the Zoroastrian scriptures is the nearest approach to Jehovah that can be found in ancient religions. See **ZOROASTER**.

A. V. WILLIAMS JACKSON.

Ormiston, WILLIAM, D. D., LL. D.: clergyman; b. at Symington, Lanarkshire, Scotland, Apr. 21, 1821; removed to Canada in 1834; was educated at Victoria College, Cobourg, Ontario, afterward Victoria University, Toronto, where he completed his theological course, was classical tutor four years and Professor of Moral Philosophy one year; was pastor at Newtonville, Ontario, 1849-53; superintendent of the township schools 1849-63; mathematical master and lecturer in science in the Normal School, Toronto, 1853-57; examiner at Toronto University 1854-57; pastor of the Central Presbyterian church, Hamilton, Ontario, 1857-70; of the Collegiate Reformed church, New York, 1870-88; stated supply at Pasadena, Cal., 1889-90; since 1890 has been an evangelist in Southern California. Dr. Ormiston has written copiously for periodicals; prepared series of text-books; edited with notes *The Acts of the Apostles* (New York, 1883); was the author of *An Exposition on a Part of the Epistle of James in The Homiletical Monthly*; and long prepared the Sunday-school lessons for *The Sunday-school Times*. C. K. HOYT.

Ormolu, or Mosaic Gold [*ormolu* is from Fr. *or* or *moulu*, liter., ground or milled gold; *or*, gold (< Lat. *aurum*) + *moulu*, perf. partic. of *moudre*, mill, grind (< Lat. *molere*): an alloy of zinc and copper, containing from 25 to 75 parts of zinc in 100 of the alloy, a considerable proportion of the zinc being volatilized, unless the lowest possible temperature be employed in fusing the metals. The fused mass is kept until it takes on a white color, when it is cast at once, for if remelted it becomes a comparatively worthless kind of brass. It is largely employed in making household ornaments, which are colored by pickling in dilute oil of vitriol and then washed and varnished. In France the name is applied to gold-leaf prepared for gilding surfaces such as bronze or brass.

Ormond, JAMES BUTLER, First Duke of: soldier and statesman; b. in London, England, Oct. 19, 1610; educated by Archbishop Abbot as a ward of the king; succeeded to the earldom of Ormond on the death of his grandfather 1632; was commander of the royal troops in Ireland as lieutenant-general during the insurrection of 1641; was created marquis 1642; was forced to make a disadvantageous armistice with the rebels 1643; became lord-lieutenant 1644; resigned his office to the Parliamentary commissioners, and retired to France 1647; proclaimed Charles II. in Ireland, and made an unsuccessful attempt to capture Dublin 1649; was driven from Ireland by Cromwell Dec., 1650; was created duke by Charles II. 1660; was Viceroy of Ireland 1661-69;

chancellor of the University of Oxford 1669; narrowly escaped assassination by Col. Blood 1670; again Viceroy of Ireland 1677-85; was made a duke in the English peerage 1682. D. at Kingston Hall, Dorsetshire, July 21, 1688.

Ormus: an island, 12 miles in circumference, in the Strait of Ormus, at the entrance to the Persian Gulf; now important only for its salt-works. At its northeastern extremity a miserable village of a hundred huts occupies the site of the once splendid city. This was captured by Albuquerque (1507), who made it the entrepôt of European-Indian commerce, but was utterly destroyed (1622) by Shah Abbas and the British East India Company. It is held by the Imam of Muscat, who pays tribute for it to Persia. E. A. G.

Ormuzd: See ORMAZD.

Orne, *ôrn*: department of France; part of the old province of Normandy; area, 2,354 sq. miles. It is traversed by a range of wooded hills rising 1,370 feet above the sea, and rich in iron, copper, marble, and granite. To the N. and S. of these hills large pasture-grounds extend, where numerous cattle and horses are reared. Hemp is extensively cultivated, and there are large apple and pear orchards. About 22,000,000 gal. of cider are made annually. Manufactures, especially of metal-ware, are carried on. Pop. (1891) 354,387. Capital, Alençon.

Ornithology [from Gr. *ôrnîs*, *ôrnîdos*, bird + *lôgos*, discourse]: that branch of zoölogy which treats of birds and the literature respecting them. Although it includes all that relates to birds, their external appearance, pterylosis, anatomy, and habits, it is very largely concerned with their classification, or their division into groups, and the arrangement of these groups with respect to each other. In fact, a history of the attempts at the classification of birds is practically a history of the progress of ornithological science, and it is the purpose of this article to note some of the more important systems which have been brought forward and the characters on which they were based.

We look in vain in the ancient authors for any clear idea of the relations of the various groups of this class; birds are chiefly considered (e. g. by Aristotle) with relation to their food and the means by which they obtain it, or (e. g. by Belon and Aldrovandi) with respect to their adaptation for progression and their habitat. Willoughby,* and his commentator Ray,† first gave a reasonable arrangement of the constituents of the class dividing it, primarily, into land and water birds; the former were then differentiated into those organized as birds of prey and those adapted for a less carnivorous or for a frugivorous diet; the latter were divided into waders and swimmers.

Linnaeus‡ is celebrated as a systematist, and is looked up to as the father, to a great extent, of the modern methods; it is necessary, therefore, that his system should be alluded to. In the final edition of the *Systema Naturæ* (ed. 12, 1766) he divided the class into six orders—viz.: (1) *Accipitres*, in which the bill is hooked and decurved; the upper mandible projecting beyond the lower, and on each side dilated or armed with teeth; and the feet provided with acute arched claws. (2) *Picæ*, in which the bill is cultriform and with the dorsal outline convex, and the feet short and quite strong. (3) *Anseres*, in which the bill is smooth, covered with an epidermis, and enlarged at the tip; the feet webbed, and with the tibiæ compressed and short. (4) *Grallæ*, in which the bill is subcylindrical, the feet elongated and adapted for wading, and the femora partially naked. (5) *Gallinæ*, whose species have the bill convex, the upper mandible arched above the lower, and the nostrils overarched by a cartilaginous membrane, the feet adapted for walking, and the toes rough beneath; and (6) *Passeres*, in which the bill is conical and pointed, and the feet slender, with the toes separated and adapted for hopping. It will be thus seen that these groups were based entirely on the consideration of the structure of the bill and feet, the other characters enumerated by Linnaeus, but not here reproduced, relating to the body, food, and nesting habits, being quite subsidiary; but this classification was generally accepted, and the views involved therein prevailed with naturalists generally until very recent times. Cuvier§ in 1797 slightly modified the classification of Linnaeus in its details, but the orders were essentially the same

as those of his predecessor. Lacépède in 1799 divided the birds into two classes—differentiated because in the one case the leg is furnished with feathers, and in the other destitute of them. Fourteen orders were recognized. Meyer and Wolff* in 1810 primarily divided the birds into terrestrial and aquatic species: (a) the former into the orders (1) *Accipitres*; (2) *Coraces*; (3) *Picæ*; (4) *Oscines*, or singing birds; (5) *Chelidones*, including the swallows, swifts, and goatsuckers; (6) *Columbæ*, or the pigeons; and (7) *Gallinæ*; (b) the latter into the orders (8) *Grallæ*, or waders, and (9) *Natantes*, or swimming birds.

Illiger,† who attempted to reform the classification as well as nomenclature of the mammals and birds, presented an arrangement of the latter in which he grouped the various genera of birds into 41 families combined under 7 orders. The orders were distinguished, as by his predecessors, chiefly on account of the feet; the families by various characters, but more especially by the form of the bill and minor details of structure of the feet and wings. As the families were for the first time systematically introduced into this work, a synopsis of the system is worthy of reproduction:

ORDER I. *Scansores*, with families—1, *Psittacini* (parrots); 2, *Serrati* (toucans, plantain-eaters, etc.); 3, *Amphiboli* (cuckoos, etc.); 4, *Sagittilingues* (woodpeckers); 5, *Syndactyli* (jacamars).

ORDER II. *Ambulatores*, with families—6, *Angulirostres* (kingfishers, bee-eaters); 7, *Suspensi* (humming-birds); 8, *Tenuirostres* (sunbirds, hoopoes, etc.); 9, *Pygarrichi* (creepers, Dendrocolaptes); 10, *Gregarii* (orioles, starlings, etc.); 11, *Canori* (song-birds); 12, *Passerini* (sparrows); 13, *Dentirostres* (motmots, hornbills); 14, *Coraces* (Corvidæ, birds of paradise, grakles, etc.); 15, *Sericati* (Ampelis, Procnias); 16, *Hiantes* (swallows, swifts, goatsuckers).

ORDER III. *Raptatores*, with families—17, *Nocturni* (owls); 18, *Accipitrini* (Falconidæ); 19, *Vulturini* (vultures).

ORDER IV. *Rasores*, with families—20, *Gallinacei* (fowls, etc.); 21, *Epollicati* (Ortygis, Syrrhaptes); 22, *Columbini* (pigeons); 23, *Crypturi* (tinamous); 24, *Inepti* (dodos).

ORDER V. *Cursores*, with families—25, *Proceri* (ostriches); 26, *Campestris* (bustards); 27, *Littorales* (shore-birds).

ORDER VI. *Grallatores*, with families—28, *Vaginati* (Chionis); 29, *Alectorides* (mixture); 30, *Herodii* (cranes, etc.); 31, *Falcati* (Tantalidæ); 32, *Limicolæ* (Scolopacidæ, etc.); 33, *Macroactyli* (jacanas, rails); 34, *Lobipedes* (lobe-footed birds); 35, *Hygrobata* (incongruous mixture).

ORDER VII. *Natatores*, with families—36, *Longipennes* (Laridæ); 37, *Tubinaires* (Procellariidæ); 38, *Lamellosodontati* (Anatidæ); 39, *Steganopodes* (swimmers with four anterior toes); 40, *Pygopodes* (swimmers with legs far back); 41, *Impennes* (penguins).

In 1812 a German zoölogist, Blasius Merrem,‡ proposed a new arrangement, which was destined to be ignored by his contemporaries, but, in its primary features at least, after being almost dormant for half a century, to be revived and quite generally accepted. Instead of differentiating the class into orders distinguished by differences of bill, wings, and feet, he took the sternum as the essential feature, and divided the class primarily into two groups—(1) *Aves carinatæ*, in which the sternum was produced at the median line and provided with a keel; and (2) *Aves ratitæ*, in which the sternum was flat toward the middle and entirely destitute of a keel. The former (1) included all the ordinary birds, which were further differentiated into aerial birds (*Aves aëreæ*), including the *Raptores*, *Pici*, and *Passeres*; terrestrial birds (*Aves terrestriæ*), embracing the gallinaceous forms; water-birds (*Aves aquaticæ*), represented by the swimming types; and marsh-birds (*Aves palustres*), corresponding with the waders of other authors. The latter division (2) was limited to the ostriches, nandus, cassowaries, emus, and kiwis. The only really important modification introduced into the classification was the distinction of the two primary groups.

N. A. Vigors in 1823 read a memoir before the Linnean Society of London§ on the classification of the class,

* *Taschenbuch der deutschen Vogelkunde* (Frankfort-on-the-Main, 1810).

† *Carol. Illigeri Prodomus Systematis Mammalium et Avium* (Berlin, 1811).

‡ *Tenfaenen Systematis Naturalis Avium* (in *Abhandl. K. Pr. Akad. Wissensch.*, 1812).

§ *Observations on the Natural Affinities that connect the Orders and Families of Birds*, in *Trans. Linn. Soc. London* (vol. xiv., pp. 395-517, 1825).

* *Ornithologie libri tres* (London, 1676): a posthumous work edited by Ray.

† *Synopsis Methodica Avium et Piscium* (London, 1713).

‡ *Systema Naturæ*.

§ *Tableau élémentaire de l'Histoire naturelle des Animaux* (Paris, 1797).

* On the Classification of Birds; and on the Terms used in the Modifications of certain of the Cranial Bones of the Class (in *Proc. Zool. Soc. London* for 1867, pp. 415-472).

- b. The wing with a long humerus and with two unequal phalanges.

5, Rheidae (the nandus).

6, Struthionidae (the ostriches).

III. ORDER CARINATÆ. The metacarpals ankylosed together. The tail considerably shorter than the body. The sternum provided with a keel.

- a. The vomer broad behind, and interposing between the pterygoids, the palatines, and the basisphenoidal rostrum.

[I. SUB-ORDER] DROMÆOGNATHÆ.

7, Tinamomorphæ (the tinamous).

- b. The vomer narrow behind; the pterygoids and palatines articulating largely with the basisphenoidal rostrum.

a. The maxillo-palatines free.

i. The vomer pointed in front.

[II. SUB-ORDER] SCHIZOGNATHÆ.

8, Charadriomorphæ (plovers, etc.).

9, Cecomorphæ (gulls, petrels, divers, and auks).

10, Spheniscomorphæ (penguins).

11, Geranomorphæ (cranes).

12, Turnicimorphæ (hemipods).

13, Alectoromorphæ (fowls).

14, Pterocloromorphæ (sand-grouse).

15, Peristeromorphæ (pigeons).

16, Heteromorphæ (hoazin).

ii. The vomer truncated in front.

[III. SUB-ORDER] ÆGITHOGNATHÆ.

17, Coracomorphæ (passerines).

18, Cypselomorphæ (humming-birds, swifts, and goat-suckers).

19, Celeomorphæ (woodpeckers).

β. The maxillo-palatines united.

[IV. SUB-ORDER] DESMOGNATHÆ.

20, Ætomorphæ (birds of prey).

21, Psittacomorphæ (parrots).

22, Coccozygomorphæ (colies, plantain-eaters, cuckoos, barbets, toucans, capitonidae, galbulidae, kingfishers, hornbills, hoopoes, bee-eaters, motmots, coraciidae, and trogons).

23, Chenomorphæ (anatidae, palamedeidae).

24, Amphimorphæ (flamingoes).

25, Pelargomorphæ (storks, ardeidae, plataleidae, etc.).

26, Dysporomorphæ (cormorants, pelicans, tropic-birds, darters).

In 1873 and 1874 A. H. Garrod* based a classification of birds upon the consideration of the muscles of the thigh. He also made known those differences in the characters of the narial openings and nasal bones to which he applied the terms holorhinal and schizorhinal, and showed the importance of certain peculiarities in the arrangement of the deep plantar tendons. He also extended the researches on the trachea and tracheal muscles on the lines laid down by Müller. In his classification as based on the muscles of the thigh, the more important characters from a taxonomic point of view were considered to be the femoro-caudal muscle, the accessory femoro-caudal, the semitendinosus, and the accessory semitendinosus; but most important of all is the ambiens muscle; this arises from the tip of the short anteriorly directed spine, which is situated just above the anterior border of the acetabulum, and runs along the inner side of the thigh to the inner side of the knee, where it is covered by the sartorius, which is above it in the former part of its course. Its thin tendon then crosses the knee, running in the substance of the fascial extensor tendon, just in front of the patella, to the outer side, where it joins the fibers of the origin of the flexor perforatus digitorum. The presence or absence of this muscle determined Garrod to differentiate the class into two sub-classes. Those forms in which it is present were designated *Homologonata*, or typical kneed; while those in which it is absent were combined as *Anomalogonata*, or abnormally kneed. "There are," said Garrod, "peculiarities in the arrangement of the cæca of the intestine and of the tuft of feathers on the oil-gland which are correlatable with this presence or absence of the ambiens muscle." The secondary and tertiary groups of these sub-classes were distinguished by the combinations of the muscles already alluded to, and the presence or absence of cæca to the intestine, the development of a tufted or nude oil-gland, and the combinations in which those characters occur; and further, in the homologonatus birds, by the development of either a left or right carotid, or of both.

* On Certain Muscles of Birds and their Value in Classification, part ii. (in Proc. Zool. Soc. London, 1873, pp. 111-123).

The chief and apparently only merit of this arrangement is the generalized information respecting the muscles in question therein conveyed. The exceptions suggest the inadequacy of the combinations in question to serve as the expressions of the natural affinities of the various forms. Combined with other information, it will be of use in the construction of a more perfect system.

Other important characters used in classification are the number of the primaries, the arrangement of the wing coverts, the convolutions of the intestine and general character of the alimentary canal, the arrangement of the muscles of the upper arm, and resemblances or differences between the plumage of the young and adult. The importance of this last point seems to have been first recognized by Seebohm.

Numerous classifications of birds have been brought forward since 1880, but these have of necessity been based on the better use of known facts rather than founded on new discoveries. Among the most important are the systems of Dr. Leonhard Stejneger, Dr. Max Fürbringer, Dr. R. Bowdler Sharpe, Henry Seebohm, and Dr. H. Gadow. The first two are noteworthy for the fact that the primary divisions *Ratitæ* and *Carinatæ* are discarded, a step which seems a decided advance in classification, as the characters ascribed to the *Ratitæ* are very largely those due to a loss of the power of flight, and are not based on morphological facts. Dr. Stejneger employs Dr. Gill's convenient terms super-order and super-family to express degrees of group division. His system is based mainly on anatomical characters, although external characters are used as well. Omitting the families, Dr. Stejneger's scheme is as follows:

Sub-class I. SAURURÆ.

Order I. Ornithopappi. (*Archæopteryx*.)

Sub-class II. ODONTOTORMÆ.

Order I. Pteropappi. (*Ichthyornis*, etc.)

Sub-class III. ODONTOLCÆ.

Order I. Dromæopappi. (*Hesperornis*.)

Sub-class IV. EURHIPIDURÆ.

Super-order I. Dromæognathæ.

Order I. Struthionæ.

Super-family I. Struthioideæ.

" II. Rheoideæ.

" III. Casuarioideæ.

" IV. Dinornithoideæ.

Order II. Æpyornithes.

Order III. Apteryges.

Order IV. Crypturi.

Super-order II. Impennes.

Order V. Ptilopteri.

Super-order III. Euornithes.

Order VI. Cecomorphæ.

Super-family I. Colymboideæ.

" II. Heliornithoideæ.

" III. Alcoideæ.

" IV. Laroideæ.

" V. Procellarioideæ.

Order VII. Grallæ.

Super-family VI. Chionoideæ.

" VII. Scolopacoideæ.

" VIII. Eurpygoideæ.

" IX. Cariamioideæ.

" X. Gruioideæ.

Order VIII. Chenomorphæ.

Super-family XI. Anhimoideæ.*

" XII. Anatoideæ.

" XIII. Phœnicopteroideæ.

Order IX. Herodii.

Super-family XIV. Ibioideæ.

" XV. Ardeoideæ.

Order X. Steganopodes.

Super-family XVI. Pelecanoidæ.

" XVII. Fregatoideæ.

" XVIII. Phaetontoideæ.

Order XI. Opisthocomi.

Order XII. Gallinæ.

Sub-order I. Gallinæ Alecteropodes.

" II. Gallinæ Peristeropodes.

Order XIII. Pterocletes.

Order XIV. Columbæ.

Order XV. Accipitres.

Order XVI. Psittaci.

Order XVII. Picariæ.

Super-family, Cuculoideæ.

* Equivalent to Palamedeæ of other authors.

Super-family, Coracoideæ.
 " Colioidææ.
 " Alcedinoidææ.
 " Upipoidææ.
 " Picoideæ.
 " Trogonoidææ.
 " Micropodoidææ.
 Order XVIII. Passeres.
 Super-family, Menuroideæ.
 " Eurylaimoidææ.
 " Tyrannoidææ.
 " Formicarioidææ.
 " Passeroideææ.

Dr. Fürbringer's system is founded on anatomical characters, and he employs the term GENUS in much the sense that Dr. Stejneger uses super-family, while his sub-orders have about the same value as Dr. Stejneger's orders. The arrangement is as follows:

Sub-classis I. SAURURÆ.
 Order Archornithes.
 Sub-order Archaeopterygiformes.
 Gens Archaeopteryges.
 Sub-classis II. ORNITHURÆ.
 Order Struthionithes.
 Sub-order Struthioniformes.
 Gens Struthiones.
 Order Rheornithes.
 Sub-order Rheiformes.
 Gens Rheæ.
 Order Hippalectryornithes.
 Sub-order Casuariiformes.
 Gens Casuarii.
 Intermediate sub-order Æpyornithiformes.
 Gens Æpyornithes.
 Intermediate sub-order Palamedeiformes.
 Gens Palamedææ.
 Order Pelargonithes.
 Sub-order Anseriformes.
 Gens Gastornithes.
 " Anseres.
 Sub-order Podicipitiformes.
 Gens Enalornithes.
 " Hesperornithes.
 " Colymbo-Podicipites.
 Sub-order Ciconiiformes.
 Gens Phenicopteri.
 " Pelargo-Herodii.
 " Accipitres.
 " Steganopodes.
 Intermediate sub-order Procellariiformes.
 Gens Procellariæ.
 Intermediate sub-order Aptenodytiformes.
 Gens Aptenodytes.
 Intermediate sub-order Ichthyornithiformes.
 Gens Ichthyornithes.
 Order Charadriornithes.
 Sub-order Charadriiformes.
 Gens Laro-Limicolæ.
 " Laræ.
 " Oridides.
 Intermediate sub-order Gruiformes.
 Gens Euryptæ.
 " Grues.
 Intermediate sub-order Ralliformes.
 Gens Fulicariæ.
 " Hemipodii.
 Order Alectorornithes.
 Sub-order Apterygiformes.
 Gens Apteryges.
 Sub-order Crypturiformes.
 Gens Crypturi.
 Sub-order Galliformes.
 Gens Galli.
 " Opisthoes.
 Intermediate sub-order Columbiformes.
 Gens Pterocletes.
 " Columbææ.
 Intermediate sub-order Psittaciformes.
 Gens Psittaci.
 Order Coracornithes.
 Sub-order Coccygiformes.
 Gens Coccyges.
 Intermediate gens Galbulææ.

Sub-order Pico-Passeriformes.
 Gens Pico-Passeres.
 " Makrochires.
 " Colii.
 Intermediate gens Trogones.
 Sub-order Halcyoniformes.
 Gens Halcyones.
 " Buccerotes.
 " Meropes.
 Intermediate gens Todi.
 Sub-order Coraciiformes.
 Gens Coraciæ.
 " Caprimulgi.
 " Striges.

Realizing the fact that no correct idea of the relationships of animals can be given by arranging them in a continuous line, Dr. Fürbringer has carefully elaborated the idea of a genealogical tree. He gives views of this ideal tree from two sides, and also gives cross-sections which illustrate very clearly his ideas regarding the line of descent and affinities of various groups. While the *Passeres* do not stand first in Dr. Fürbringer's tables, they form the topmost twig of his genealogical tree.

In reviewing the various classifications of birds, the two facts which stand out most prominently are the gradual abandonment of external for anatomical characters, and the advancement of the perching birds from a subordinate to the leading position. The earlier systems are based wholly on external, the more recent almost as entirely on internal characters, and while the idea held by Linnaeus, that the *Accipitres*, or birds of prey, stood at the head of the class Aves, prevailed for a long time, it is now generally agreed that the *Oscines*, or singing birds, stand first, and among these the place of honor is variously assigned to the thrushes, crows, or sparrows. Incidentally it may be said that while the old plan in tabulating groups was to begin at the top and work downward, the modern method is to begin at the bottom and go upward, and that Lillejeborg, in the year 1866, was almost the first to publish a system arranged in this manner.

From what has been said in this article, it will be observed that the classification of birds is an extremely difficult problem, and, furthermore, that it is one whose satisfactory solution is still far from reached. It is, however, very evident that it is the resultant of many characters, rather than the use of any one or two, no matter how salient these may be, which must be relied upon for determining relationships and differences, and it will require the patient accumulation of detailed information on many points to set matters straight.

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* Titles preceded by an asterisk contain many references to other species.

rica.—*The Birds of South Africa*, by E. L. Layard (edited by R. B. Sharpe, London, 1875-84); *Die Vögel Ost Afrikas*, by Finsch and Hartlaub (Leipzig and Heidelberg, 1870); *Ornithologie d'Angola*, by du Bocage (Lisbon, 1877); Shelley's *Handbook to the Birds of Egypt* (London, 1872). 4. Australasia.—Gould's *Handbook to the Birds of Australia* (London, 1865); Buller's *History of the Birds of New Zealand* (London, 1887-88), and *Manual of the Birds of New Zealand* (Wellington, New Zealand, 1882); *Ornithologia della Papuasie e delle Molliche*, by Salvadori (Turin, 1880-81). 5. South America.—*Systematische Übersicht der Thiere Brasiliens*, by C. H. Burmeister (Berlin, 1855-56); *Ornithologie du Perou*, by Ladislaus Tacanowski (Rennes, 1884-86); *Argentine Ornithology*, by Hudson (London, 1888-89). 6. North America.—*The Birds of America*, by Audubon (New York, 1828-30); *The Birds of North America*, by Baird, Cassin, and Lawrence (Philadelphia, 1860; reprint with additions from Pacific R. R. Report, Salem, 1870); *A History of North American Birds*, by Baird, Brewer, and Ridgway (Boston, 1874-84); *Biología Centrali Americana*, by Salvin and Godman (London, 1879-87); Ridgway's *Manual of North American Birds* (Philadelphia, 1887); Coues's *Key to North American Birds* (4th ed. Boston, 1892).

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THEODORE GILL.

Revised by F. A. LUCAS.

Ornithorhynchidæ [Mod. Lat., named from *Ornithorhynchus*, the typical genus: ὄρνις, ὄρνιθος, bird + ῥύγχος, bill, beak]: one of the two families representing the order *Monotremata* and sub-class *Ornithodelphia*, and including the DUCKBILL (*q. v.*) or "water-mole" of Australia. The general form of the body is somewhat beaver-like; the covering is a dense and soft fur; the jaws are produced into a depressed bill-like snout resembling somewhat (but only superficially) the bill of a duck; the nostrils are above and near the end of the bill; no external ears are developed; there are eight horny teeth—i. e. each jaw is provided on each side behind with a broad and nearly oval tooth with a flattened crown adapted for grinding, and toward the front it has a long and narrow one; the tongue is short, and covered, to some extent, with horny papillæ; the legs are short; the feet well adapted for swimming, and each provided with five toes; the anterior ones have a web extending considerably beyond the toes, and the claws are depressed; the posterior feet have webs only between the toes, and the claws are curved; in the male a spur is developed on the hinder surface of each hind leg, which has no representative in the female; the tail is rather short, depressed, and quite broad. These are the characters which at once superficially distinguish the *Ornithorhynchidæ* from the *Tachyglossidæ*, but in addition to these are numerous anatomical characters. The family is peculiar to Australia, and is represented by but a single genus containing but one certainly known species, which, however, exhibits differences which have caused a distinction, by some authors, of two species. The species was first made known in 1799 by Shaw, under the name of *Platypus anatinus*, and in the following year by Blumenbach under that of *Ornithorhynchus paradoxus*; the name *Platypus* having been previously used in ornithology, that of *Ornithorhynchus* has been almost universally retained. The specimen which first served for description was supposed by some to be a made-up specimen composed of the bill of some unknown duck-like bird and the body of a mammal. The fact that the animal is oviparous was not established until 1884.

Ornithorhynchus: See ORNITHORHYNCHIDÆ and DUCKBILL.

Oro: a southwestern province of Ecuador; on the Gulf of Guayaquil, adjoining Peru; area, 2,340 sq. miles. It lies entirely in the lowlands adjoining the coast, and the climate is hot and in parts unhealthy. Cacao-raising is the principal industry. The capital and largest town is Machala, on the river Santa Rosa, near its mouth. Pop. of Oro (1885) estimated, 32,600. H. H. S.

Orodus [Mod. Lat.; Gr. ὄρος, mountain + ὀδούς, tooth]: a genus of cestraciont sharks of which the remains are

found in the Carboniferous rocks. The teeth have their crowns set with a series of blunt but frequently highly ornamented cones. The spines called *Ctenacanthus* probably belonged to the same fish. Some of the species of *Orodus* must have been of immense size, as the teeth, of which the number was large, are occasionally found 4 to 5 inches broad and very massive.

Orono: town (settled in 1774, incorporated in 1806); Penobscot co., Me. (for location, see map of Maine, ref. 6-E); on the Penobscot river, and the Maine Cent. Railroad; 8 miles N. of Bangor. It is the seat of the MAINE STATE COLLEGE (*q. v.*), and has paper, pulp, and lumber mills, iron-foundries, machine-shops, a savings-bank, and a monthly college paper. Pop. (1890) 2,790; (1894) 3,120.

EDITOR OF "CADET."

Orontes (in Gr. Ὀρόντης and Ὀρόντας): 1. A Persian general, put to death by Cyrus for treason (Xen., *Anabasis*, i., 6). 2. A Persian general, satrap of Armenia and son-in-law of Artaxerxes II. Mnemon. His immediate family reigned as satraps of Armenia and kings of Commagene from the times of Darius Hystaspis to those of Trajan, or for about seven centuries. See Humann and Puchstein, *Reisen in Klein-Asien und Nord-Syrien* (Berlin, 1890, pp. 283-286), and *American Journal of Archaeology* (1890, p. 534). J. R. S. S.

Orontes [= Lat. = Gr. Ὀρόντης], or *Nahr-el-Asi* (the rebellious river): the principal river of Syria, 240 miles long, but not navigable. It rises in the Anti-Lebanon, proceeds northerly 200 miles, then turning abruptly S. W. flows close to Antioch (Antakia) through a picturesque country, and enters the Mediterranean 29 miles S. of Iscanderoon. It was originally called Typhon from a mythical dragon who was said to have traced its course with his tail, but received its later name from Orontes, who built a bridge over it. The neighboring country was often called by the same name. Not far from its source is a peculiar square monument terminating in a pyramid about 65 feet high. Grotesque hunting scenes are carved in relief on the four sides. This monument is connected with the garden or hunting-park mentioned by Strabo as being near the source. E. A. GROSVENOR.

Oroomiah: See URMIA.

Orosius, PAULUS: historian; b. in Spain, probably at Tarragona, toward the end of the fourth century A. D.; took orders, and engaged with zeal in the controversies of his time. Having by direction of his bishop visited Africa to confer with St. Augustine, he was sent by the latter to Palestine, where Pelagius was spreading his heresies. In Bethlehem he made the friendship of Jerome. At a synod held at Jerusalem he opposed Pelagius, and in so doing provoked the hostility of John, the Bishop of Jerusalem. Orosius wrote in justification of himself in 415 a work entitled *Liber Apologeticus (contra Pelagium) de Arbitrii Libertate*. He returned to Africa, and probably to Spain, and after his return composed, at the request of his friend Augustine, or completed, his *Historie (adversus Paganos)*, a history of the world, in seven books, from the beginning of the world to A. D. 417, designed to meet the assertions of pagan writers that the calamities of Rome, especially the capture of the city (A. D. 410), were chargeable to Christianity for having abolished the worship of the old heathen gods. The date of Orosius's death is not known. The best edition is by C. Zangemeister (Vienna, 1882; ed. minor, Leipzig, 1889). King Alfred translated the history of Orosius into Anglo-Saxon, which has been edited with an English translation by Dr. Bosworth (London, 1856), and by H. Sweet (1883) with the Latin text. Another work of Orosius, entitled *Commen-torium ad Augustinum de Priscillianistis et de Origenis errore*, is printed in Schepss's edition of Priscillian (Vienna, 1889). See Teuffel's *Hist. Rom. Lit.*, § 455; Möriener, *De Orosii Vita eiusque Historiarum Libris Septem* (Berlin, 1844). Revised by M. WARREN.

Orozco y Ber'ra, MANUEL: author and publicist; b. at Mexico city, June 8, 1816. He studied topographical engineering and subsequently law, and was admitted to the bar in 1847. In 1852 he was appointed director of the national archives; he was twice secretary of public works under the liberal governments; and in 1863 he became associate judge of the Supreme Court. Having accepted office under Maximilian, he was imprisoned on the return of Juarez in 1867, but was soon pardoned. His works on Mexican history and ethnology are widely and favorably known; they include *Geografía de las lenguas y carta etnográfica de*

México (1864); *Historia de México* (1880-81), etc. He edited the Mexican supplement of the *Dictionnaire universel de historia y geografía*. D. at Mexico, Jan. 27, 1881.

HERBERT H. SMITH.

Or'pheus, *ōr fūs*, or *ōr fē-ūs* (in Gr. Ὀρφεύς): a mythical singer of Thrace, son of Oeagrus by the muse Calliope, and husband of the nymph Eurydice (*q. v.*). The charm of his song and lyre-playing was so great that even wild animals, trees, and rocks followed him. When Eurydice died of a snake's bite he descended to Hades to bring her back, and moved even Persephone to grant his request, conditionally. He was a member of the Argonautic expedition, and wrought various wonders in behalf of his comrades. He was torn to pieces by Thracian bacchantes, either because he was opposed to their orgies or because, after the death of Eurydice, he hated all women. His dismembered body was buried by the Muses of Pieria on Mt. Olympus, but his head and lyre floated across the sea to Methymna in Lesbos, the island of song. Aristotle (Cicero, *De natura deorum*, i. 38) denied the very existence of Orpheus, but ancient critics had early disputed the genuineness of the poems ascribed to Orpheus. The poems that have been preserved to us under his name are Ἀργοναυτικά (1,394 hexameters), being a glorification of the deeds of Orpheus on the Argo; Λιθικά (768 verses), in which the magical powers of certain precious stones are described; eighty-eight *Hymns* in honor of various gods. These poems were written by members of the ORPHIC BROTHERHOOD (*q. v.*), which was powerful even in the time of Pisistratus and continued to exist for some time after the Christian era. A number of other poems belonging to different periods, such as the *Θεογονία*, *Ἱεροὶ Λόγοι*, *Κατὰ Βάσις ἐς Ἄϊδου*, etc. (for a list of them, see Christ, *Griechische Litteraturgeschichte*, pp. 658-659), were ascribed to Orpheus, but some of them, for varying reasons, must be assigned even to the second century after Christ. See Hermann, *Orphica* (Leipzig, 1805); Tyrwhitt, *Lithica* (London, 1781); Abel, *Orphica* (1885); Abel, *Orphica Lithica* (Berlin, 1881); Buresch, *Klarios* (Leipzig, 1890); Lobbeck, *Aglaophamus* (1829); Schuster, *De veteris Orphicae theogoniae indole* (Leipzig, 1869); Kern, *De Orphici Epimenidis Pherecydis theogoniis* (Berlin, 1888). For a discussion of Orpheus in works of art, see the article *Orpheus* in Baumeister's *Denkmäler*, and for a discussion of the Orphic cult, see Gruppe, *Die Griechischen Culte und Mythen* (Leipzig, 1887, i., 612-674. J. R. S. STERRETT.

Orphic Brotherhood (in Gr. οἱ Ὀρφικοί): in ancient Greece, a society of ascetic persons who devoted themselves to a mystical worship of the Thracian Bacchus (Dionysus-Zagreus) and the elaboration of a system of theology, under the professed guidance of the spirit of ORPHEUS (*q. v.*). They dressed in white, ate no animal food, avoided all excesses, and professed to aim at purity of life, an exalted religious experience, and an immortal existence after death. See Gruppe, *Die Griechischen Culte und Mythen* (Leipzig, 1887, i., 612-674), where the literature on the subject will be found cited. J. R. S. STERRETT.

Orpiment, or **King's Yellow** [*orpiment* is viâ O. Fr. from Lat. *auripigmentum*, liter., pigment of gold; *auri*, genit. of *aurum*, gold + *pigmentum*, coloring, pigment, deriv. of *pin'gere*, draw, paint, color]: a sulphide of arsenic of the composition As_2S_3 . It may be prepared artificially by precipitating a solution of arsenic with sulphuretted hydrogen gas, and by fusing together equal parts of white arsenious acid and sulphur. It is stated on good authority that, when entirely free from arsenious acid, orpiment is not poisonous when swallowed, owing to its insolubility even in acids. As, however, it is easily soluble in alkalies, it is a dangerous material, and should be banished from common use as a pigment by those unfamiliar with its nature. It was formerly employed, in admixture with lime, as a depilatory, and in another dangerous way is used as an ingredient in fireworks.

Revised by IRA REMSEN.

Orr, JAMES, D. D.: clergyman and professor; b. at Glasgow, Scotland, Apr. 11, 1844; was educated at the University of Glasgow; minister at East Bank United Presbyterian church of Hawick 1873-91; first lecturer on the Kerr foundation, United Presbyterian Hall, Edinburgh, 1891; delegate to the Pan- Presbyterian Council at Toronto 1892; since 1891 has been Professor of Church History in the United Presbyterian College of Edinburgh. He has written numerous articles for periodicals, such as *Assyrian and Hebrew Chronology* in *The Presbyterian Review* (1888), and the homiletical sections in the volumes of the *Pulpit Commentary* on Exodus, Deuteronomy, 2 Kings, and Hosea.

He has published the Kerr Lectures for 1891; *The Christian View of God and the World as Centering in the Incarnation* (Edinburgh, 1893); and with Principal Rainy and Prof. Doak, *The Supernatural in Christianity* (Edinburgh, 1894). C. K. HOYT.

Orr, JAMES LAWRENCE: jurist and Congressman; b. at Craytonville, S. C., May, 12, 1822; graduated at the University of Virginia 1842; was admitted to the bar and practiced in Anderson, S. C.; member of the Legislature 1844-45; member of Congress 1848-59, and Speaker of the Thirty-fifth Congress; in 1860 was one of the convention that inaugurated secession, and was a State commissioner to Washington to treat with the U. S. Government for partition of property in South Carolina; Confederate State Senator 1862-65. He was provisional Governor of South Carolina 1865-69; was appointed judge of the circuit court of South Carolina 1870, and in 1873 U. S. minister to Russia. D. in St. Petersburg, May 5, 1873.

Or'ery [named in honor of the Earl of Orrery]: a machine constructed to exhibit the motions of the planets round the sun, or of satellites round their primary. Planetary machines (that is, machines exhibiting the motions of the planets) constructed in accordance with the idea that the earth was the center of motion were very early in use. Such were the Chinese spheres, said to have been made some 2,000 years before the Christian era, and later the spheres of Archimedes and Posidonius. It is thought that the earliest machine representing the Ptolemaic system was that of Chromatus. This system continued to be represented in all planetary machines until about fifty years after the death of Copernicus, when the last of the kind of any note was erected in the library of the Pantheon at Paris by Orone Finncé. Machines intended to represent the Copernican system were invented in the latter part of the seventeenth century by Huyghens and Römer, Huyghens introducing a method of calculating the wheelwork with precision. Then Römer invented a planetarium, and also a satellite-machine. The orrery made by Rowley in 1715 at the expense of Charles Boyle, Earl of Orrery, was a combination of the planetarium of the sixteenth century with other machines which showed the motions of the earth, moon, and planetary satellites.

Perhaps the most perfect of orreries were two invented and constructed by David Rittenhouse, LL. D., one of which is in possession of the College of New Jersey. The date on the face of the instrument is 1768. It is fitted for exhibiting continually the motions of the moon, as well as those of the earth and other principal planets to Saturn inclusive, then the outermost known. It is furnished with dial-plate arrangements for the current month and the day of the month, as well as the passing year, and the successive positions, at the dates thus recorded, of the bodies already specified, and the years of cycles; the whole kept in motion by a clockwork attachment. The orbits of the moon and of the planets are all elliptical, and the surrounding graduated circular ring, representing the arrangement of the twelve signs, has a rackwork and a screw of slow motion attached, by which even the precession of the equinoxes is allowed for.

Though it is impossible to construct a machine which will represent the motions of planets and satellites accurately, an orrery is useful in giving a general notion of the way in which they take place. Revised by R. A. ROBERTS.

Orris Root: See IRTS.

Orrville: village; Wayne co., O. (for location, see map of Ohio, rev. 3-G); on the Cleve., Akron and Col., the Penn., the Pitts. and W., and the Wheeling and Lake Erie railways; 14 miles W. N. W. of Massillon, 54 miles S. of Cleveland. It is in an agricultural and stock-raising region, is an important shipping-point, and has a private bank and a weekly newspaper. Pop. (1880) 1,441; (1890) 1,765.

Or'say, ALFRED GUILLAUME GABRIEL, Count d': society leader; b. in Paris, France, Sept. 4, 1801; served in the French army; married in 1827 a daughter of the Earl of Blessington by his first wife; was separated from her 1829; lived thenceforth chiefly in London, where he was regarded as a model of elegance and courtliness; was the most conspicuous member of the social circle at Gore House; was for many years a constant companion of Lady Blessington; was distinguished for his handsome person, fascinating powers of conversation, and artistic skill; became director of fine arts at Paris under Louis Napoleon. D. in Paris, Aug. 4, 1852.

Orsi'ni: a wealthy Roman family of princely rank; belonged to the party of the Guelphs, and became very conspicuous in the history of Rome during the Middle Ages by its perpetual feuds with the family of the Colonnas, which belonged to the Ghibelline party. It spread very widely, acquired immense possessions, and its power culminated in the latter part of the thirteenth century, when one of its members became pope under the name of Nicholas III. (1277-81). Another member of the family became pope under the name of Benedict XIII. (1724-30). The family-seat is still at Rome, where the Orsini palace stands on the spot where formerly stood the theater of Marcellus.

Orsini, FELICE: conspirator; b. in 1819 at Meldola, in the province of Forlì, Italy, at that time a part of the papal states; joined Mazzini's Young Italy Society in 1838; was imprisoned and condemned to the galleys for life, but restored to liberty in 1846 by the amnesty of Pius IX.; acted as a deputy for Bologna in the constituent assembly at Rome in 1849, and after the fall of the Roman republic was an agitator in Genoa and Modena; fled in 1853 to England, but reappeared in 1854 in Italy, agitating in Parma, Milan, Trieste; was captured at Vienna and put in the fortress of Mantua, but escaped to England in 1856. He repaired in 1857 to Paris, having formed a conspiracy with three others, Pieri, Rudio, and Gomez, for the assassination of Napoleon III., on whom vengeance was to be taken for his desertion of the principles of the Carbonari, into whose organization Napoleon had been admitted in 1831. On Jan. 14, 1858, Orsini, with his accomplices, threw three explosive bombs under the carriage of the emperor in the Rue Lepelletier, killing eight persons and wounding over a hundred. He was tried and sentenced to the guillotine. While in prison he wrote two letters to the emperor calling upon him to free Italy from her oppressors. These, which were published in the French papers, served to direct popular attention to Italian affairs, and Napoleon's policy in 1859 was along the lines advised by Orsini. The latter was guillotined Mar. 13, 1858. His autobiography was translated into English by G. Carbonel (Edinburgh, 1857).

Orsova, ōr'shō-vāa: Hungarian frontier town on the Danube; consisting of Alt (Old) Orsova and Neu (New) Orsova; the latter, a strongly fortified island which commands the Roumanian and Servian frontier, was ceded by Turkey in 1878 (see map of Austria-Hungary, ref. 9-J). Equidistant between the Iron Gates, it is the center of the grandest Danubian scenery. Pop. (1891) 3,381. E. A. G.

Orte'lius, ABRAHAM: geographer; b. at Antwerp, Apr. 4, 1527. He was wealthy, traveled in England, France, Germany, and Italy, and had a wide acquaintance with the geographers of his time. In 1570 he published his *Theatrum orbis terrarum*, a collection of maps with short descriptions of the various countries in Latin. This was long a standard geographical authority in Europe, and there are various editions in Latin, French, and German. Several of the maps are of great interest for the early cartography of America. Ortelius published other geographical works, and he amassed a museum of coins, antiquities, etc. He was appointed royal geographer by Philip II. in 1575. D. at Antwerp, Jan., 1598. HERBERT H. SMITH.

Orth, JOHANNES, M. D.: pathologist; b. at Wallmerod, Nassau, Germany, Jan. 14, 1847; studied medicine at the Universities of Bonn, under Rindfleisch, and Berlin, under Virchow, graduating M. D. from the former in 1870; in 1878 was elected Professor of Pathology and Pathological Anatomy in the University of Göttingen. His most important works are *Compendium der pathologisch-anatomischen Diagnostik* (Berlin, 1876; 5th ed. 1893); *Cursus der normalen Histologie* (1878; 5th ed. 1888); *Lehrbuch der speziellen pathologischen Anatomie* (1887). S. T. ARMSTRONG.

Orthacan'thus [Mod. Lat.; Gr. ὀρθός, straight, erect + ἄκανθα, spine]: a name given to certain defensive spines of sharks found in the coal-measures. They are slender and acute, but not always straight, though the name indicates this, and are ornamented with two rows of sharp, depressed hooks on the posterior face. They probably belong to the shark of which the teeth have been named *Diplodus*.

Orthagoris'eidae [Mod. Lat., named from *Orthagoris'eus*, the typical genus, from Gr. ὀρθάγορσιος, sucking pig]: a family of plectognath fishes, distinguished from all other fishes by the peculiar truncation of the posterior region of the body. The form varies, being either oblong or higher than long, but in all ends abruptly behind, and is entirely

destitute of anything like a tail or caudal peduncle; the abdomen is never distensible by air, as in the swell-fishes; the skin is rough or covered with hexagonal plates; the head externally inseparable from the body, and with all the bones covered by the integument; mouth terminal, small; the jaws, both upper and lower, developed into cutting ridges, and each destitute of a median suture; branchial apertures very small, slits in front of the pectoral fins; dorsal and anal fins far back, opposite each other, and developed alike, higher than long, and united with the caudal fin when present; pectorals well developed; ventrals entirely wanting. The skeleton is peculiar for the small number of caudal vertebrae, there being less than twenty, and in the adult of *Mola* there are ten abdominal and about eight caudal; no pelvic bones are developed; the air-bladder is absent; many other peculiarities are observable in the anatomy. The family is represented by two genera: *Mola* and *Orthagoriscus*. The species attain a large size, *Mola* sometimes weighing as much as 800 lb. Revised by D. S. JORDAN.

Or'thidae [Mod. Lat., named from *Or'this*, the typical genus, from Gr. ὀρθός, straight]: a family of extinct brachiopods abundantly represented in Palæozoic rocks. An elaborate analysis and description of the various genera of this group of fossils is contained in the eighth volume of the *Paleontology of New York State*.

Orthocera'tidae [Mod. Lat., named from *Ortho'ceras*, the typical genus; Gr. ὀρθός, straight + κέρας, κέρατος, horn]: a family name under which are combined a varying number of genera belonging to the class of Cephalopods, order of Tetrabranchiates, and sub-order *Nautiloidea*. All have a shell furnished with numerous chambers, which extend across the axis of the shell; the septal margins are simple and the funnel-like throat more or less sub-central and directed backward; they differ, however, in other respects. In the typical forms (*Orthoceras*, etc.) the shell is straight and the aperture simple: to this, by some authors, the family is restricted; others (*Cyrtoceras*) have the shell curved, but the aperture simple; others, again (*Gomphoceras*), have the shell straight, but a heterogeneous aperture; others still (*Phragmoceras*) have the shell curved, and the aperture is heterogeneous. The species are numerous, and lived from the Lower Silurian up to the Liassic epoch. They sometimes attained a large size. A species of *Endoceras*, 15 feet long, has been described from the Trenton limestone. Revised by H. S. WILLIAMS.

Orthoëpy: See PRONUNCIATION.

Orthognathous: See FACE.

Orthog'raphy [viâ O. Fr. from Lat. *orthogra'phia* = Gr. ὀρθογραφία, correct writing, deriv. of ὀρθόγραφος, writing correctly; ὀρθός, straight, correct + γράφειν, write]: the art of conventionally correct spelling, or of writing words according to a conventional standard of usage. The necessity for such an art commonly arises only in languages which have developed a standard literary type, compromising or repressing dialectal diversities of the same period, and to some extent also absorbing historical varieties of successive periods. When a language is first reduced to writing its spelling is approximately phonetic, at least so far as the available alphabet will permit. In the early Greek inscriptions, for example, each of a score or more of local communities speaking diverse dialects has recorded its language in a rude phonetic spelling. They simply used the alphabetic symbols in their received value, making with them as well as they might a record of words as they sounded when spoken. In the fourth century B. C. the Boeotians adopted from Athens the Ionic alphabet, but not an orthography, for they simply proceeded to apply the symbols in the value they had at Athens to the respelling of their spoken language. Only four or five of the Greek dialects became the receptacles of literary records. These began therewith to show some tendency toward the establishment of a standard form of spelling, but not until the Attic dialect in the form of the *koinè* began to assert its pre-eminence as a universal Greek literary medium did a sense for a standard Greek orthography manifest itself. This standard, which, following the manuscripts, we now use for all the monuments of Attic Greek literature, and which has even extended itself in large measure to the Modern Greek, represents essentially the pronunciation of the fourth century B. C.

The experience of Greece illustrates the general principle. The necessity for an orthography is dictated (1) by the existence of dialects within the domain covered by a litera-

ture, and (2) by the accumulation of books which give an historical continuity to a literature even over periods in which the spoken language has suffered change.

The English orthography presents the most extreme illustration of divorcement of the written from the spoken form of language. The spelling forms no certain guide to the sound of a word. The word and not the letter is the unit. The appeal is to the eye, not the ear. In acquiring the written language, one must practically learn each word by itself. How inconsistently the alphabetic symbols are used may be judged from a few illustrations. The voiceless lingual sibilant *s* is variously denoted by *sh* in *shine*, *si* in *pen-sion*, *s* in *sugar*, *sensual*, *ss* in *issue*, *sc* in *conscious*, *ti* in *nation*, *ci* in *social*, *ce* in *ocean*, *ch* in *charade*, *chivalry*, *ma-chine*. The combination *si* denotes the voiced sibilant *z* in *vision*, *occasion*, etc., as does also *s* in *usual*, *pleasure*, etc. The voiced dental sibilant *z* is denoted by *z* in *zeal*, *z* in *buzz*, *s* in *easy*, *lands*, *ss* in *scissors*, *sc* in *discern*, *c* in *sacri-fice* (verb), *x* in *Xerxes*. The voiceless guttural explosive *k* is variously denoted by *k* in *book*, *ck* in *duck*, *c* in *music*, *cc* in *accuse*, *ch* in *chord*, *q* in *queen*, *qu* in *liquor*. The high-front vowel *i* (*i*) is represented by *e* in *me*, *ee* in *see*, *ea* in *sea*, *ie* in *piece*, *ei* in *conceit*, *ey* in *key*, *eo* in *people*, *ay* in *quay*, *i* in *marine*, *a* in *Cæsar*. The combination *ough* denotes *of* in *cough*, *trough*, *ou* in *though*, *dough*, *uf* in *enough*, *ay* in *plough*. Words of like sound are often widely apart in spelling: as *cite*, *site*, *sight*; *draft*, *draught*; *bored*, *board*; *air*, *heir*; *base*, *bass*. Words of different sound are sometimes spelled alike; as *read* (pres.), *read* (pret.); *abuse* (noun), *abuse* (verb.); *close* (adjec.), *close* (verb); *record* (noun), *record* (verb), etc.

Prior to the sixteenth century the spelling of English, though not self-consistent, owing in general to the diversity in the sources of the language, and especially to the perverting influence of French methods of spelling, was still quasi-phonetic; i. e. though it did not always represent the same sound by the same symbol, it undertook to represent the spoken word. The appearance, however, in this (sixteenth) century of an abundant literature, coincident with the development of printing, tended to fix the spelling and remove it from subservience to sound. Since this time English spelling has remained in its essential features unchanged, though the pronunciation has meantime, especially in the vowel system, suffered radical change. Our present orthography may therefore be roughly said to represent nineteenth century words by means of symbols which, though by no means used with the simplicity or self-consistency of phonetic spelling, really stand for sixteenth century sounds. At that time the vowel-symbols were used essentially in their "continental" values. We now write the phonetic word *naym* (name) with *a*, because it was pronounced *naam* in the sixteenth century, and write *mîle* with *i*, because it was then pronounced *meel*. We write the word *see*, on the one hand, as *sea*, commemorating its former pronunciation with the open *ay*-sound (indicated phonetically as *æ*), and on the other as *see*, as a record of the older close *ay*-sound (indicated phonetically as *ē*). The two words were distinct in Shakespeare's time.

In the latter part of the sixteenth century appeared the first treatises on orthography: Sir Thomas Smith, *De recta et emendata lingue anglicæ scriptione dialogus* (Paris, 1568); John Hart, *An Orthographie, conteyning the due order and reason howe to write or printe the image of mannes voice, most like to the life or nature* (London, 1569); William Bullokar, *Booke at large for the Amendment of Orthographie* (1580); Richard Mulcaster, *The First Part of the Elementary which entreateth chiefe of the right writing of the English tung* (London, 1582).

The influence of printing tended to the gradual development of an orthographical uniformity which was practically established in its present existing form by the beginning of the eighteenth century. The appearance of dictionaries (Bailey's, 1721; Johnson's, 1755) and the use of spelling-books in the schools further developed this sense for uniformity into the present extraordinary orthographical prudery, which often treats false spelling as a mark of vulgarity, if not of mental inferiority. The following examples of diverse spellings current between 1600 and 1800 may serve to illustrate how late an achievement our present orthodoxy is: *arithmetick*, *arithmetike*, *arithmetique*, *arithmatick*, *arithmaticke*, *arithmetick*; *beauty*, *beawty*, *beuety*, *beuty*, *beautie*, *beuty*; *engineer*, *engenier*, *ingenier*, *engenir*, *ingeneer*, *inginiur*, *ingineer*; *bailiff*, *bailiff*, *bailife*, *bailiffe*, *balyfe*, *balyve*, *baylyff*, *bailiefe*, *baylife*, *bayliffe*, *bailive*, *baylive*,

bayliff; *curb*, *courbe*, *kurbe*, *kerbe*, *kirb*, *kerb*. There still remains a slight residue of words for which an authoritative spelling has not been established; thus notably in the case of loan words from languages not using the Roman alphabet, as *Brahmin*, *Brahman*; *attar*, *ottar*; *baksheesh*, *bakhshish*; also in the case of dialectal words which have but recently appeared in literature, as *bletherskate*, *blatherskite*; and in certain derivatives, as *abridg(ement)*, *judg(ement)*, *blam(e)able*, *civilize(-ise)*, *inflection(-xion)*, *worship(-per)*, *travel(ler)*, *mileage (milage)*, *mov(e)able*, *sal(e)able*, *wool(lyen)*, etc.; also individual cases like *ambassador (em-)*, *briar (brier)*, *brazier (brasier)*, *offence (offense)*, *dispatch (des-)*, *inquire (en-)*, *centre (-er)*, *theatre (-er)*, etc. See list in Webster's *International Dictionary*, pp. xciii. ff., and the rules for spelling, pp. xc. ff.

English spelling is neither phonetic nor etymological, but merely conventional. Attempts to reform it in the interest of etymology, and especially in conformity to Greek and Latin etyma, have been frequent since the revival of learning, but they have helped little and hindered much. Thus the addition of a *b* in *debt* and *doubt* (M. Eng. *dette*, *doute*) serves to suggest Lat. *debita* and *dubitare*, but is perfectly gratuitous and unhistorical, for both words came into English without either the sound or the letter. In a case like *fault* for *faute* or *arctic* for *artic* (O. Fr. *artique*), the introduction of the letter in spelling has resulted in perverting the pronunciation. Often the etymology suggested by the revised spelling is entirely false. Thus the *g* in *sovereign* (older *soverayne*, M. Eng. *soverain*, representing a Latin *superānus*) falsely suggests *reign*; as the *sc* of *scissors* (M. Eng. *sisoures*) does Lat. *scissus*, cut. The *s* of *island* (M. Eng. *iland*) is a deception, as *island* and *isle* are not related etymologically; so the *u* of *quest*, which is a Teutonic, not a French word, the *w* of *whole* (earlier *hole*), *whoop* (M. Eng. *houpen*), which is not etymological, and the *gh* of *delight* (M. Eng. *delit*), which imitates cases like *night*, *right*, where *gh* has etymological value. The *ue* of *tongue* (older *tung*; cf. Germ. *zung*) sadly disfigures a genuine English word in a possible deference to *langue*, and the plain Eng. *rime* (O. Eng. *rim*) is even ludicrous masquerading in Greek togger as *rhyme*. Much of this pseudo-etymological spelling is merely a decorative rococo.

Various attempts have also been made to reform the spelling upon a purely phonetic basis. See F. A. March, *The Spelling Reform*, Circular of Information of U. S. Bureau of Education (1880), No. 7; Skeat, *Principles of English Etymology*, i., ch. xvii. While radical changes in our present system are scarcely to be expected, especially such changes as involve a restoration of the "continental" values of the vowel-signs, or in other ways involve a violent break with the older recorded form of the language, it is not unlikely that a consideration for the spoken form of words will gradually tend to the simplification of our spelling and the elimination of some of its grosser inconsistencies.

BENJ. IDE WHEELER.

Orthometric Systems: See CRYSTALLOGRAPHY.

Orthopædic Surgery [orthopædic is from Gr. ὀρθός, straight + πᾱῖς, παῖδος, child]: that branch of general surgery which relates to the prevention and treatment, both by surgical and mechanical measures, of the various deformities and malformations of the human body, particularly such deformities as pertain to the osseous and muscular structures. In some countries deformities and malformations of the soft parts, as harelip, cleft palate, hypospadias, etc., are classified under this heading; but in the U. S. these are ordinarily grouped under plastic surgery.

There is no sharply drawn line between general and orthopædic surgery; nor is the division between orthopædic and nervous diseases with paralysis a distinct one, since there is an overlapping in both directions. The term orthopraxy (from Gr. ὀρθός, straight + πράσσειν, to do, act), is also occasionally employed. By the term deformity is meant any marked deviation from the normal symmetrical proportions of the human frame. The following classifications are generally recognized:

DEFORMITIES		Congenital.	Malformations.
			Distortions.
	Acquired		From traumatism.
			" paralysis.
			" inflammatory e. g. erysipelas.
			" rheoids.
			" joint diseases.
			" other diseases.

Hippocrates in his book on *Articulations* discusses both the nature and the character of the treatment of clubfoot,

spinal curvature, and other diseases now included under orthopædic surgery. His practical ideas were not equaled by other surgeons for centuries afterward. He describes accurately a very effective apparatus for straightening club-foot, which was not improved upon from that time (B. C. 500) until the sixteenth century, when Ambrose Paré published a work in which he recapitulated Hippocrates's teachings and ideas, and added many suggestions of his own. Paré's method of treating hunchback, or disease of the spine, was to have the patient lie on a bed while two strong persons pulled in opposite directions, the surgeon meanwhile moulding and forcing the bones into position by a wooden bar. About the middle of the eighteenth century Andry published a book with the specific title *Orthopædic Surgery*, in which he described a large number of mechanical appliances which, though rude, were efficient and ingenious. Scarpa, at the close of the eighteenth century, devised a shoe for clubfoot which has since been designated by his name. About this time the treatment of lateral curvature by suspension and splints received further impetus. To Delpech, of Montpellier, was largely due the great advance in this branch, yet none of Delpech's countrymen was wise enough to see the advantages to be gained from his work. It remained for Stromeyer, of Hanover, in 1834, to introduce the practice of subcutaneous tenotomy, although this operation had been foreshadowed by Mincius in the fifteenth century. Tenotomy proved to be almost revolutionary, and the subcutaneous division of tendons soon became a recognized procedure. Orthopædic surgery has since then steadily advanced. The tenth international congress at Berlin in 1890 was the first to give a special section to this subject, and the U. S. of America contains the only distinct national association of orthopædic surgeons.

Rickets, a disease essentially due to filth, close confinement, and poor air, and hence commonly found in crowded cities, is one of the most common causes of deformities. Knock-knee, bow-legs, curve of the arms, and sometimes lateral curvature of the spine, etc., are notable instances. The treatment consists in supplying good air, good food, and proper hygienic surroundings, with the internal administration of tonics, lime-salts, cod-liver oil, etc. The weight of the body should not be put upon the bones during their soft stage unless the limbs are properly supported by apparatus. After hardening occurs straightening is more difficult, but it may be accomplished, first, by the use of mechanical appliances; secondly, by division of the bone, or osteotomy; and, thirdly, by fracture of the bone, or osteoclasis.

Lateral curvature of the spine is a very common cause of deformity. It occurs with the greatest frequency in young girls about the age of puberty, especially if in poor health. Among the numerous causes are faulty positions in sitting or standing, difference in the length of the limbs, unequal weight bearing upon the shoulders, feeble muscular development, etc. As the deformity advances not only are the spinous processes twisted laterally, but rotation of the vertebral bodies also takes place, with consequent projection of the ribs and shoulder-blade on one side, and flattening of the chest on the opposite side. The condition is due to feeble muscular development, and indicates disproportionate power of the two sides of the body; hence gymnastics and general attention to the health are of primary importance, and if these are properly employed the use of apparatus is seldom necessary. When used it should be of the lightest kind. Strong supports are only necessary when the deformity is rapidly increasing. Spinal curvature should be distinctly separated from caries of the spine; the latter is an entirely different process—an osteitis—that involves the vertebral bodies; while lateral curvature of the spine is dependent not upon disease of the vertebrae, but upon unequal muscular development.

Clubfoot, or talipes, is a deformity of the foot usually occurring congenitally; but it may be found as an acquired condition, following the various paralyses of infancy. When one set of muscles becomes stronger than its opposing group, deviation occurs. When the anterior part of the foot turns inward, the variety known as talipes *varus* is produced. When the anterior part of the foot drops, with elevation of the heel, the condition known as *equinus* results, so called from its resemblance to the position of the bones of the foot in the horse. When the toes turn outwardly, the deformity is known as *valgus*; when upward, with elongation of the heel, it is *calcaneus*; other varieties are known as *cavus*, *plantaris*, etc., when the instep is highly elevated. In congenital cases the bones are sometimes

distorted at birth, and the distortion rapidly increases as soon as the weight of the body is placed upon them. In congenital cases the treatment should begin at birth with systematic measures designed to straighten the foot and mould it into proper position by manipulation and forcible stretching of the contracted tissues.

Some form of mechanical appliance should also be employed at once in order to bring the bones of the foot into the proper shape, particularly during the rapid growth of the first weeks of life. Various forms of apparatus are useful, and operative measures are required whenever the child begins to walk, provided the foot has not been already straightened by the previous use of apparatus. In older cases removal of the bones, or tarsectomy, is sometimes necessary, when other operative measures, such as tenotomy, fasciotomy, etc., have failed.

Hammer-toe is a condition of flexion in which the ligaments of one or more toes are contracted. It can be relieved by apparatus or by division of the fascial bands and tendons.

Dupuytren's contraction of the fingers is due to shortening of the fascia, and is usually found in rheumatic patients. It can be relieved by multiple and subcutaneous divisions of the shortened tissues. The tendons are rarely involved.

Joint diseases are among the most common causes of deformity. They are usually inflammatory in character, and in the majority of cases are tuberculous in their origin. The inflammation is usually awakened by some slight injury, but is largely dependent upon a tubercular predisposition in the individual. The course of the osteitis is ordinarily slow and tends to destruction first of the bones in the neighborhood of the joint, the process then extending to the articulation. Absolute rest in the recumbent posture is the first indication, to be followed by thorough mechanical fixation of the joint involved. Ambulatory apparatus, with axillary or perineal crutches, is permissible after the acute or painful stage has passed. Extension, both in bed and after the upright position has been assumed, is beneficial. Operative measures are usually necessary after suppuration has occurred. Hip, knee, and ankle joint disease are the most common varieties, the articulations of the upper extremities being but seldom affected.

DE FOREST WILLARD.

Orthopnea: See DYSPNEA.

Orthoptera [from Gr. *ὀρθός*, straight + *πτερόν*, wing]: an order of insects (see ENTOMOLOGY), characterized by having the jaws fitted for biting, an incomplete metamorphosis, and four wings, the anterior or outer pair narrow and coriaceous and serving as wing covers, the posterior pair membranous, broad, and folded like a fan when at rest. Examples are familiar to all in the grasshoppers, locusts, walking-sticks, cockroaches, and the like. A few (the mantis insects) are beneficial to man, but with these exceptions all are injurious from the fact that they feed on vegetation, and some forms, coming in vast swarms, are the most terrible scourges of the agriculturist. In all the jaws are strong. The head bears, besides the large compound eyes, three pairs of ocelli. The three joints of the thorax are distinct, and the abdomen in the female is frequently provided with an enormous ovipositor. The eggs are laid either in plants or in the ground, and the young when hatched resemble the parent, except in the absence of wings. With successive casting of the skin the adult condition is gradually attained. There are many forms in which wings are lacking even in the adult. Among the interesting features are the presence of sound-producing structures. These occur only in the males of certain forms, and consist of rasping organs upon the wings, or wings and legs. Corresponding to these, organs usually interpreted as ears occur, in the grasshoppers on the basal joint of the abdomen, in the crickets upon the tibial joint of the first pair of legs.

Six families are recognized. The *Blattidæ*, or cockroaches, are among the oldest of insects, numerous fossils occurring in the Carboniferous. In these the legs are all fitted for walking, the body is flattened, and no sound-producing apparatus occurs. The eggs are laid in a pod-like case, which the female carries about with her. The best-known example is the imported "Croton bug" (*Blatta germanica*), which forms a pest in most parts of the U. S. Persian insect-powder is the best means of ridding a house of them. The mantis insects (*Mantidæ*) are tropical and subtropical. From the strange attitudes they take they are known as rear-horses, praying-mantes, camel-crickets, and the like. They feed upon other insects, for which they lie in wait. In

the walking-sticks and leaf insects (*Phasmida*) are some of the strangest examples of mimicry. In the U. S. the forms are long and wingless, and resemble closely a dried twig, but in the tropics occur winged forms in which the whole body is strikingly leaf-like, sometimes bright green, sometimes of the color of a dried leaf. The



Locust just hatched, enlarged

two families *Acrididae* and *Locustariae* exhibit a strange confusion of scientific and popular names, for the Acridians are locusts and the Locustarians are grasshoppers. In both the hind legs are large and stout, serving as organs for leaping; sound-producing organs are present. The *Acrididae* have

short antennae and short ovipositors. Among the most prominent forms is the Rocky Mountain locust (*Melanoplus spretus*) which in 1872-75 created much destruction in the region W. of the Missouri river. In the *Locustariae* the antennae are long and thread-like, while the ovipositor is enormous. The katydids, named from their note, are the best-known forms. The last family is that of the crickets (*Gryllidae*). The males make a chirping sound by rubbing together the anterior wings. With these are to be grouped the large mole-crickets which live subterranean lives, feeding upon the roots of the grass, etc. In these the anterior legs are fashioned into digging organs.

See Reports of U. S. Entomological Commission (1878-83); Thomas, *Synopsis of Acrididae*, U. S. Geological Survey (vol. v., 1872); Ayers, *Embryology of Ecanthus*; *Memoris Boston Society Natural History* (iii., 1884); and numerous papers by Scudder, Bruner, and Walker. J. S. KINGSLEY.

Or'tolan [= Fr. from Ital. *ortolano*, ortolan, liter., gardener < Lat. *hortulanus*, gardener, deriv. of *hortulus*, dimin. of *hortus*, garden]: any one of several species of song-birds. In Europe the name was primarily employed for the garden-bunting, *Emberiza hortulana*, common on the continent of Europe and in the Levant. It is a handsome little bird without song, and is chiefly noteworthy for its extensive use as food. Immense numbers are captured in nets and are placed in dark rooms, where they are gorged with millet and other grain mixed with spices, until they undergo a kind of fatty degeneration. In fact when killed the ortolan is a mere lump of fat, of a flavor highly prized by gourmards. It is some 6 inches in total length, and attains a weight of nearly 3 oz. In some parts of the U. S. the name is applied to the BOBOLINK (*q. v.*) and to the Sora rail (*Porzana carolina*).

Revised by F. A. LUCAS.

Or'ton, EDWARD, Ph. D., LL. D.: geologist; b. at Deposit, N. Y., Mar. 9, 1829; graduated at Hamilton College in 1848; studied science at Lawrence School; was Professor of Natural Sciences, New York State Normal School, 1856-59, and at Antioch College 1866-73; was president of Antioch College 1872-73; president State University of Ohio 1873-81; Professor of Geology, State University of Ohio, from 1873; Assistant Geologist, Geological Survey of Ohio, 1869-83; State geologist of Ohio from 1883; vice-president (geological section) American Association for the Advancement of Science 1885. In geology Prof. Orton has given chief attention to economic problems, especially problems connected with the distribution of petroleum, natural gas, and coal. His principal writings are contained in the official reports of the Ohio Geological Survey from 1869 to 1890. He has also contributed papers on the geology of petroleum, gas, and asphalt to the Kentucky Geological Reports, 1891, to the *Annual Report of the U. S. Geological Survey* for 1887, to the *Bulletin of the Geological Society of America*, and to various journals. G. K. GILBERT.

Orton, JAMES: naturalist and traveler; b. at Seneca Falls, N. Y., Apr. 21, 1830. He graduated at Williams College 1855, and at Andover Theological Seminary 1858; traveled in Europe and Asia Minor; became a Congregational minister 1860; was appointed instructor in Natural Science in Rochester University 1866; was at the head of the Williams College expedition which crossed the Andes of Ecuador and descended the Napo and Amazon 1867-68; became Professor of Natural History in Vassar College 1869; and in 1873 made another journey to South America, ascending the Amazon and visiting Peru. He published *The Andes and the Amazon* (1870; enlarged edition 1876); *Underground Treasures: how and where to find them*

(1872); *The Liberal Education of Women* (1873); *Comparative Zoology* (1875). In 1877 he attempted to explore the river Beni, from Bolivia, but was forced to return after being deserted by his Indian canoe-men, and died on Lake Titicaca, Sept. 25, 1877. Revised by HERBERT H. SMITH.

Ortygia: See DITLOS.

Oru'ro: a western department of Bolivia, S. of La Paz and bordering on Chili; area, 21,333 sq. miles; population (1888) 111,372. It lies in the southern part of the great inclosed plateau called the Titicaca basin, and includes Lake Aullagas and part of the Desaguadero river; hardly any portion of the surface is below 12,000 feet, and the Andes on the W. and the Cordillera Real on the E. rise far above the limits of perpetual snow. Much of the land is arid, with extensive marshes and salty plains, and it is so cold that few crops will grow. The department is rich in silver, copper, and tin, and mining is the only important industry. A large proportion of the rural population is of Indian blood. Oruro, the capital, is near the left bank of the Desaguadero river, 118 miles S. S. E. of La Paz (see map of South America, ref. 6-C). It was founded in 1590, was an important mining town, and during the latter part of the seventeenth century is said to have had over 75,000 inhabitants; but later the mines were abandoned, and the place was nearly depopulated. It has lately become important again, owing to the railway which connects it with the port of Antofagasta in Chili. Valuable tin mines are worked in the vicinity, and tin, copper, and silver are largely exported. In 1891 Oruro was temporarily the capital of Bolivia. Pop. (1894) about 9,000. HERBERT H. SMITH.

Orvieto (anc. *Orbitum*, *Urbs Vetus*): city; in the province of Perugia, Italy; 78 miles N. N. W. of Rome (see map of Italy, ref. 5-D). It crowns an abrupt volcanic hill near the confluence of the Chiana and the Paglia, about 8 miles from Lake Bolsena. The Pozzo di San Patrizio (a circular well with 250 steps, excavated by Clement VII. in 1527 after the famous sack of Rome) is worthy of notice; but the great boast of Orvieto is its beautiful cathedral, founded in 1290 in honor of the famous miracle of Bolsena. (See Charles E. Norton's *Notes of Travel and Study in Italy*.) Orvieto is of Etruscan origin, was not conspicuous under the Romans, but on the breaking up of the empire declared itself independent, and being Guelph in its policy was long a safe refuge for fugitive popes. It manufactures white wine, and has considerable trade in silk, grain, and cattle. Pop. 7,304.

Orzeszkowa, or zesh-kov'a, ELIZA: novelist; b. at Milokowszczyzna, Poland, the hereditary estate of an uncle, in 1842; was educated at Warsaw; married when hardly sixteen. Her first published work, a prose idyl, *Obrazek z lat glodowych* (A Sketch of the Lean Years), appeared in 1866 in the *Tygodnik Ilustrowany*. Her novels, the first of which, *W Klatce* (In Prison), was published in 1867, include *Nadzie sumienia* (At the Bottom of Conscience, 1871); *Rodzina Brochwiczów* (1876); and *Bene Nati* (1890). She has also written a number of essays on literary and social matters. In her stories woman is generally represented as a victim of social injustice and a slave to her lord, the man, and the author appears as a champion of woman's rights. Her collected works appeared in 1885. J. J. KRAL.

Osage: city; capital of Mitchell co., Ia. (for location, see map of Iowa, ref. 2-II); on the Red Cedar river, and the Ill. Cent. and the Winona and S. W. Railways; 17 miles N. N. W. of Charles City. It is the seat of Cedar Valley Seminary (Baptist, opened in 1863), is the trade center of a large agricultural region, has a number of manufactories, and contains 2 national banks with combined capital of \$100,000, a private bank, and 2 weekly newspapers. Pop. (1880) 2,012; (1890) 1,913; (1895) 2,509.

Osage City: city (founded in 1869); Osage co., Kan. (for location, see map of Kansas, ref. 6-I); on the Atch., Top. and S. F. and the Mo. Pac. railways; 35 miles S. W. of Topeka. It is in the great Kansas coal basin and is principally engaged in coal-mining and flag-stone quarrying. The city and vicinity have extensive beds of pure yellow ocher, from which an excellent quality of brick is manufactured. There are 12 churches, a national bank, a State bank, and 2 weekly newspapers. Pop. (1880) 2,098; (1890) 3,469; (1895) 4,273. Editor of "Free Press."

Osage Indians: See SIOUX INDIANS.

Osage Orange, or **Bois d'Arc**: a North American tree, *Maclura aurantiaca*, of the family *Urticaceae*, native to the Arkansas region. It has a handsome, terminal, globose

yellow wood, which has been proposed as a substitute for fustic. The fruit is large, yellow, and somewhat like an orange, whence the name. It is not edible. The principal use of the tree is as a hedge-plant.

Osage River: a stream which rises in Kansas, where it is often called MARAIS DES CYGNES (*q. v.*). It traverses Missouri, and falls into the Missouri river 10 miles below Jefferson City. Its lower course is navigable.

Osaka (liter., hill of the large estuary): an important seaport, the second city of Japan in population and general importance, and in early times its capital; situated on the bay of the same name at the mouth of the river Yodogawa, which carries off the overflow of Lake Biwa (see map of Japan, ref. 6-C). For purposes of foreign trade Osaka is united with Hiogo, one hour distant by rail. Until the fifteenth century it bore the name of Naniwa; it dates its modern greatness from the time of HIDEYOSHI (*q. v.*), who resolved to make it the seat of his government, and founded the magnificent castle, still used as barracks. The interior palace, possibly in its time the handsomest building in the empire, was destroyed by fire in 1865; the gateways of the castle, with the huge stones of which they are constructed, attest the grand scale on which the whole structure was planned. The city, the streets of which are narrow, is the commercial center of the empire, and the great rice emporium. The most important Government building is the mint, opened in 1871 for the coining of bullion. Originally officered by Englishmen from the Hongkong mint, it has turned out a coinage of the finest quality. Close to Osaka is Sakai, where are made the cotton rugs which are largely exported. The trade in straw-matting has also its center in this neighborhood. On an island in the Yodogawa is situated the small foreign settlement, now deserted by traders and left entirely to missionaries. Osaka and its environs form one of the three city prefectures or *fu*, the other two being Tokio and Kioto. Population of the city, 483,600; of the *fu*, 1,216,670. J. M. DIXON.

Osar: See DRIFT.

Osawatomie: city; Miami co., Kan. (for location, see map of Kansas, ref. 6-K); on the Mo. Pacific Railway; 8 miles S. W. of Paola, the county seat. It is in an agricultural region, and contains the Kansas State Insane Asylum, 2 State banks with combined capital of \$37,740, and 2 weekly newspapers. Pop. (1880) 681; (1890) 2,662; (1895) 2,612.

Osborn, SHERARD: admiral; b. in Madras, India, Apr. 25, 1822; entered the British navy 1837; served in one of the expeditions in search of Sir John Franklin, in the Crimean war, and in the seas of China and Japan; accepted from the Chinese Government the command of a squadron for the suppression of piracy 1862; returned to England 1864 to take command of the turreted monitor Royal Sovereign; was for several years manager at Bombay of the Great Indian Peninsular Railway; became rear admiral 1873, and was a member of the commission for fitting out the Arctic expedition of 1875. Author of *Stray Leaves from an Arctic Journal* (1852); *A Cruise in Japanese Waters* (1859); *The Past and Future of British Relations in China* (1860); and other works. D. in England, May 6, 1875.

Oscan: See ITALIC LANGUAGES.

Oscar I.: King of Norway and Sweden; b. in Paris, France, July 4, 1799; the only child of Bernadotte, who, on Aug. 21, 1810, was elected heir to the throne of Sweden. On June 19, 1823, Oscar married Josephine, a daughter of Eugène Beauharnais, formerly Viceroy of Italy. He ascended the throne Mar. 8, 1844, and died July 8, 1859. He was a successful composer of music; in 1840 he published a work on prisons and the punishment of crime. His eldest son, Charles XV., succeeded him on the throne. R. B. A.

Oscar II., FREDRIK, of the house of Bernadotte: King of Norway and Sweden; poet and writer; b. Jan. 21, 1829, succeeded to the throne at the death of his brother, Charles XV., Sept. 18, 1872. His literary and artistic talents are of a very high order. In 1858 he gained the second prize of the Swedish Academy for a collection of poems, *Ur Svenska Flottans Minnen* (2d ed. 1862); since that time he has published miscellaneous writings under the title *Nytt och Gammalt af O***** (5 small volumes, 1859-72); *Några bidrag till Sveriges krigshistoria åren 1711, 1712, och 1713* (1859-65); translations of Herder's *Cid*, Goethe's *Torquato Tasso*, and others. His complete writings (*Samlade Skrifter*) have appeared in four volumes (1875-91). King Oscar is a very felicitous speaker, and most of his addresses and

speeches on different occasions in the Swedish, Norwegian, and other languages have been published in the periodical press. His speeches in the Musical Academy (*Tal i Musikaliska Akademien*) were published in 1885, with notes by Fr. Cronhamn. A fifth volume of his complete writings, containing all his speeches made since his accession to the throne, appeared in 1894. P. GROTH.

Osceola: city (founded in 1850); capital of Clarke co., Ia. (for location, see map of Iowa, ref. 7-G); on the Chi., Burl. and Quincy and the Des M. and Kan. City railways; 50 miles S. by W. of Des Moines. It is in an agricultural and stock-raising region; contains 7 churches, 3 public-school buildings, new court-house, a sanitarium, 2 State banks, a private bank, electric-light plant, and 2 weekly newspapers; and has marble-works, agricultural-implement works, and railway machine-shops. Pop. (1880) 1,769; (1890) 2,120; (1895) 2,176. EDITOR OF "SENTINEL."

Osceola: a Seminole chief, son of William Powell, an Englishman, by an Indian mother, born about 1804, near the river Chattahoochee. Osceola was early distinguished for ability, courage, and hatred of the whites; attained great influence among the Seminoles, and strongly opposed the cession of the tribal lands in Florida. In 1835 his wife, the daughter of a fugitive slave, was stolen as a slave, and Osceola, demanding her release of Col. Thompson, U. S. agent at Fort King, used language which the latter resented, and the chief was put in irons. Six months later Thompson was murdered; the battle on the Withlacoochie, the massacre of Dade, the assaults on Forts Micanopy and Drane, and other spirited actions followed, in which the Indians more than held their own against very great odds; but during a conference with Gen. Jessup, under a flag of truce, Osceola was treacherously seized (Oct. 22, 1837), and imprisoned at Fort Moultrie, S. C., where he died Jan. 20, 1838.

Os'cines: a term applied by Johannes Müller to a group of *Passeres* containing those with a highly developed singing apparatus, having five or six pairs of tracheal muscles attached to the ends of the upper bronchial half-rings—an arrangement termed acromyodian. The name was used by Merrem, but not in the same manner as it was by Müller, and not with his exactness of definition. The group, or sub-order, contains over nine-tenths of the passerine birds, and is contrasted with the CLAMATORES (*q. v.*) or Mesomyodian birds. F. A. LUCAS.

Osco'da: village; Iosco co., Mich. (for location, see map of Michigan, ref. 5-J); on Lake Huron, at the mouth of Au Sable river, and the Au Sable and N. W. and the Detroit, Bay City and Alpena railways; 100 miles N. E. of Bay City, 200 miles N. of Detroit. It is in an agricultural, lumber, and salt-manufacturing region; has a large trade in lumber; and contains three churches, public and Roman Catholic schools, a savings-bank, and a weekly newspaper. Pop. (1880) 1,951; (1890) 3,593; (1894) 2,078.

EDITOR OF "SATURDAY NIGHT."

Oscula'trix and **Osculatory Circle** [*osculatrix* is Mod. Lat., liter., femin. of *osculator*, a kisser, deriv. of *osculum*, a kiss, liter., dimin. of *os*, mouth]: an osculatrix is a curve of a given kind which, at an assigned point of another curve, has the closest possible contact with the latter. If two plane curves have two consecutive points in common, the straight line passing through these points is tangent to both curves at the first point, and the two curves are said to have a contact of the first order. In general, if two plane curves have $n + 1$ consecutive points in common, they will have n consecutive rectilinear tangents in common, and the two curves are then said to have a contact of the n th order. If two curves have a contact of the n th order, they must have $n + 1$ consecutive ordinates in common, counting from the first point, and consequently they must have n successive differential coefficients of their ordinates at that point equal to each other. Conversely, if two curves have a common point, and if n successive differential coefficients of their ordinates at that point are equal, they will have a contact of the n th order.

It is a property of osculatrices that no osculatrix whose contact is of an odd order can cut the curve to which it is osculatory at the point of osculation, and that every osculatrix whose contact is of an even order must cut the curve to which it is osculatory at the point of osculation.

The *osculatory circle* is a circle that, at a given point of a curve, has the closest possible contact with the curve. Thus it passes through three consecutive points of the curve, as a

circle is determined by the three conditions; consequently the first and second differential coefficients of the ordinates of the curve and circle are equal at the point of contact. The radius of the circle is called the radius of curvature, and its reciprocal may be considered as a measure of the curvature of the curve. The center of the circle is called the center of curvature; and the locus of this point is the evolute of the curve. (See EVOLUTE.) It is to be remarked that we can not assign to a circle a higher order of contact than the second, but it may happen that it has a higher order of contact at particular points. This is the case at those points where three consecutive normals (see NORMAL) pass through a point, as, for instance, at the vertices of the conic sections.

Revised by R. A. ROBERTS.

Osgood, SAMUEL: soldier and official; b. at Andover, Mass., Feb. 14, 1748; graduated at Harvard 1770; studied divinity, but became a merchant; was much in public life; attained the rank of colonel and assistant commissary in the Revolutionary army; served in the Massachusetts Legislature; was in Congress 1780-84; was first commissioner of the U. S. Treasury 1785-89; Postmaster-General 1789-91; became Speaker of the New York House of Assembly; supervisor in New York 1801-03; naval officer of the port of New York 1803-13. He wrote various works, chiefly on religious questions. D. in New York, Aug. 12, 1813.

Osgood, SAMUEL, D. D., LL. D.: clergyman and man of letters; b. in Charlestown, Mass., Aug. 30, 1812; graduated at Harvard College 1832, and at Cambridge Theological School 1835; was pastor in Nashua, N. H., 1837, in Providence 1841, and in New York 1849; in 1870 left Unitarianism for the Episcopal Church, but assumed no pastoral charge. His numerous writings include *Studies in Christian Biography* (1851); *The Hearth-stone* (1854); *God with Men* (1854); *Mile-stones in our Life Journey* (1855); *Student Life* (1860); he translated from the German de Wette's *Human Life* (1842) and Olshausen's *History of the Passion* (1839). He edited *The Western Messenger* two years and *The Christian Inquirer* four; was for many years home corresponding secretary of the New York Historical Society. D. in New York, Apr. 14, 1880.

O'Shaughnessy, ō-shaw'ne-sēē, ARTHUR WILLIAM EDGAR: poet; b. 1846; d. 1881. In 1864 he entered the British Museum. In 1873 he married Eleanor, sister of Philip Bourke Marston. He belonged to the neo-romantic group of poets, followers of Morris and Swinburne and of the French romantic school; published *An Epic of Women* (1870); *Lays of France* (1871), a free paraphrase of the *lais* of Marie de France; *Music and Moonlight* (1874); and *Songs of a Worker* (1881). H. A. B.

Osh'awa: town and warehousing port of Whitby township, Ontario County, Ontario, Canada; on the Grand Trunk railway, 33 miles N. E. of Toronto and near Lake Ontario (see map of Ontario, ref. 4-E). It has extensive manufactures of superior flour, of furniture, farm implements, machinery, steam-engines, printing-presses, etc., and two weekly newspapers. Pop. (1891) 4,066.

Osheba: See FANS.

Osh'kosh: city; capital of Winnebago co., Wis. (for location, see map of Wisconsin, ref. 5-E); on Lake Winnebago at the mouth of Fox river, and on the Chi. and N. W., the Chi., Mil. and St. P., Mil., L. S. and W., and the Wis. Cent. railways; 35 miles N. W. of Milwaukee, 49 miles S. S. W. of Green Bay. It is in a lumber region; has an excellent location for communication with distant points by water; and is the third city in the State in population, wealth, and commercial importance. The census returns of 1890 showed that 423 manufacturing establishments (representing 71 industries) reported. These combined had a capital of \$6,531,213, employed 5,397 persons, paid \$2,017,267 for wages and \$4,663,510 for materials, and had products valued at \$8,619,219. The principal manufactures were connected with the lumber and sash and door industry, and comprised 15 establishments, which had a combined capital of \$3,354,598, used materials valued at \$2,709,816, and had products valued at \$4,208,400. Other important industries, in the order of capital investment, were the manufacture of furniture, \$556,464; carriages and wagons, \$378,702; foundry and machine-shop products, \$313,960; malt liquors, \$151,838; flour and grist mill products, \$116,655; tobacco, \$107,771; printing and publishing, \$97,951; and slaughtering and meat-packing, \$38,300. The city is the seat of a State normal school and of the Northern Wisconsin Insane

Asylum; contains a U. S. Government building, 2 libraries (State Normal School and Public) with over 7,000 volumes, large city-hall building, 10 public-school buildings, public-school property valued at over \$233,000, gas and electric-light works, and Holly water-works; and has 3 national banks with combined capital of \$500,000, 3 State banks with capital of \$350,000, and 2 daily, 7 weekly, and 2 monthly periodicals. The assessed valuation in 1894 was \$8,580,497, and the bonded debt on Feb. 15, 1894, was \$236,800. Pop. (1880) 15,748; (1890) 22,836; (1895) 26,947.

EDITOR OF "NORTHWESTERN."

Osian'der (or **Hosemann**, his true name), ANDREAS [*Osiander* is a Grecized form of *Hosemann*; cf. Gr. *ὄσιπρος*, *avōpōs*, man, and Germ. *mann*, man]; theologian; b. at Gunzenhausen, near Nuremberg, Dec. 19, 1498; studied theology at Ingoldstadt and Wittenberg; became preacher at Nuremberg in 1520, and being an ardent adherent of Luther he labored with great energy for the Reformation. In 1548, however, he was deprived of his office, as he would not subscribe to the Augsburg Interim, but he was shortly after (1549) made preacher and Professor in Theology at Königsberg. Here he entered into a hot controversy concerning justification. He held very peculiar views on that point. Fundamentally he agreed with Luther and was as antagonistic to Calvinism as to Romanism, but he was a mystic, and maintained the righteousness of Christ is not imputed to us but infused into us. His views may be best learned from his two pamphlets *An filius dei fuerit incarnandus*, etc. (1550), and *Von dem einigen Mittler, Jesu Christo*, etc. (1551). He died suddenly in Königsberg, Oct. 17, 1552. His principal works were *Harmonia Evangelica* (1537); *De Lege et Evangelio* (1549); and *De Justificatione* (1550). See his *Life*, by W. Möller (Elberfeld, 1870). See also the article GERMAN THEOLOGY. • Revised by S. M. JACKSON.

Osiris [= Lat. = Gr. *Ὀσίρις*, Egypt. *Äsür Äsiri*, Hesiri]: the Egyptian god of the dead and ruler of the nether regions. He is conceived as the son of Nut, brother and husband of Isis; brother also of Nephthys and Set-Typhon. The story of Osiris is told at length by Plutarch (*Isis and Osiris*), and is the only Egyptian myth of which we have the outlines in any degree of completeness. The native texts are full of allusions to this as to a multitude of other myths, but they are fragmentary in character and extent. *Osiris* appears first as a divine ruler of Egypt, elevating the mode of life, improving the condition of the land, dividing it and organizing its administration. After a happy and prosperous reign he was murdered by his brother Set. He afterward rose again in the region of the departed and became the ruler of the dead, in which character he henceforth appears. His death was avenged by Horus, son of Isis, who succeeded in overcoming Set. According to the myth, Set had divided the body of Osiris into fourteen parts. Thirteen of these were found by Isis, who erected a temple to Osiris over each. The place which was specially sacred to him was Abydos, where his heart was believed to be buried. Before him, as god of the dead, the judgment scene occurs, with its weighing of the soul of the individual over against the symbol of truth. (See RITUAL OF THE DEAD.) Like Osiris, every man must die, be judged, and rise again in order to partake in the future happiness that awaited the pious Egyptian. The dead themselves were called by his name. He was the special hero of the *Book of the Dead*, and the prayers of funeral steles were addressed to him. The belief in him and in the immortality which he symbolized was the deepest in Egyptian religious thought.

CHARLES R. GILLET.

Oskaloosa: city; capital of Mahaska co., Ia. (for location, see map of Iowa, ref. 6-1); on the divide between the Des Moines and the South Skunk rivers, and the Burlington Route, the Ia. Cent., and the Chi., Rock Is. and Pac. railways; 24 miles N. N. W. of Ottumwa, 62 miles E. S. E. of Des Moines. It is in a coal, agricultural, and stock-raising region, which also has valuable deposits of iron ore and fire-clay. It is the seat of Oskaloosa College (Christian, chartered in 1855), and of Penn College (Friends, chartered in 1873); has gas and electric light plants, water-works, street-railways, 4 libraries (public, high school, and Oskaloosa and Penn Colleges) containing over 11,000 volumes; a national bank, 2 State banks, a private bank, and a daily, 5 weekly, and 3 monthly periodicals; and manufactures flour, woolen goods, iron and brass goods, paving-brick, and furnaces, and packs pork. Pop. (1880) 4,598; (1890) 6,558; (1895) 8,551.

EDITOR OF "THE OREGONIAN."

Osler, WILLIAM, M. D., F. R. C. P.: clinician; b. at Tecumseth, Ontario, Canada, July 12, 1849; graduated at Trinity College, Toronto; studied medicine at McGill University, Montreal, and in London, Berlin, and Vienna; was Professor of the Institutes of Medicine, McGill University, 1874-84; Professor of Clinical Medicine, University of Pennsylvania, 1884-89; became professor in Johns Hopkins University, and physician-in-chief Johns Hopkins Hospital, Baltimore, in 1889; was Galstonian lecturer at the Royal College of Physicians, London, in 1885, and Cartwright lecturer at the College of Physicians and Surgeons, New York, in 1886. He is the author of *Clinical Notes on Smallpox* (Montreal, 1877); *Histology Notes for Students* (1881); *The Cerebral Palsies of Children* (London and Philadelphia, 1889); *The Principles and Practice of Medicine* (New York, 1892); and edited *Montreal General Hospital Reports* (1878).

S. T. ARMSTRONG.

Osman: See OTHMAN.

Osman Pasha: soldier; b. at Tokat, Asia Minor, 1832; was educated at the military schools of Constantinople; fought in the Crimean war, the Cretan campaign, and the Serbo-Turkish war; at the outbreak of the Russo-Turkish war was commander of the Fifth Army-corps. Defeated at Scalevitze, he intrenched himself at Plevna, which he held from Aug. 31 to Dec. 10, 1877, when he surrendered with 43,000 men. Since the conclusion of peace he has been several times Minister of War, and is now (1894) grand marshal of the palace. In personal appearance, character, and mode of warfare, he is a typical Ottoman soldier, fanatical, frugal, brave, and when behind earthworks almost invincible.

E. A. GROSVENOR.

Os'mazome [from Gr. *ὀσμή*, smell + *ζωμός*, broth]: a name given by Thénard to that portion of meat extract which is soluble in alcohol and contains those constituents of the flesh which determine its taste and smell.

Osmium [from Gr. *ὀσμή*, smell, odor, deriv. of *ὀσείν*, smell]: an element of matter, one of the "platinum metals"; that is, found in association in nature with platinum. Its only ore is a native compound with another metal of the same natural group, Iridium (*q. v.*), forming the mineral metallic alloy called iridosmine or osmiridium, which is exceedingly hard, and therefore used for tipping gold pens. This native alloy contains also Ruthenium (*q. v.*). The methods of procuring metallic osmium and its compounds from the ore are complex and difficult. At the most intense heats it volatilizes without fusion. In fine division it is very combustible, burning to osmic acid. Osmium is believed to be, in some of its combinations, the most poisonous also of known substances.

Revised by IRA REMSEN.

Osmundaceæ: See FERNWORTS.

Os'nabrück: town; in the province of Hanover, Prussia; on the Hase; 70 miles W. S. W. of Hanover (see map of German Empire, ref. 3-D). It contains a large cathedral, built in the thirteenth century, a town-hall, in which the Treaty of Westphalia was signed in 1648, and numerous manufactories of steel and iron, tobacco, chicory, soap, paper-hangings, leather, and linen and woolen fabrics. It dates from 772; suffered much during the Thirty Years' war, but recovered in the eighteenth century, owing to the development of its linen industry. Pop. (1890) 39,929.

Oso'rio, MANOEL LUIZ: soldier; b. near Pelotas, Rio Grande do Sul, Brazil, May 10, 1808. He early entered the army; first attained distinction in the civil war in Rio Grande do Sul 1839-45; was prominent in the campaign in Uruguay and against Rosas 1851-52; and on the breaking out of the Paraguayan war was made commander-in-chief of the Brazilian forces in operation Mar. 1, 1865. He was superseded by Caxias July 15, 1866, but continued to serve until Dec., 1869, when he was severely wounded. As a cavalry leader he was unsurpassed; the soldiers called him *O legendario*, or The Fabulous, on account of his bravery. He became lieutenant-general in June, 1867, and was created successively baron, viscount, and Marquis of Herval. After the war he took an active part in politics; was senator from Jan. 11, 1877, and Minister of War from Jan. 5, 1878. "D. at Rio de Janeiro, Oct. 4, 1879.

HERBERT H. SMITH.

Osorkon: the name of three Egyptian kings; the second and fourth of the twenty-second (Bubastite) dynasty, and the second of the twenty-third (Tanite) dynasty. Of Osorkon I. and II. little of importance is known, except that the former apparently founded a city at the entrance to the Fayum near the site of the modern Illahun. It has

also been conjectured, on the ground of chronology, that he was the Zarus of Josephus (*Antiq. Jud.*, viii., 12, 1-2) and the Zerah of 2 Chron. xiv. 9-13; but this is very doubtful. The third Osorkon is named among the twenty kings of Egypt at the time of Pianchi the Ethiopian conqueror, as King of Bubastis in the Delta. The divided condition of the land made it an easy prey to the power of the growing Ethiopian kingdom whose capital was at NAPATA (*q. v.*).

CHARLES R. GILLET.

Osorno, MARQUIS OF: See O'HIGGINS, AMBROSIO.

Ospi'na Rodriguez, MARIANO: politician; b. at Guasca, New Granada, 1803. He was a lawyer, early took part in politics, and joined the party which opposed Bolivar in 1830. Subsequently he was a leader of the conservative party; was a member of congress, Secretary of the Interior 1841, and governor of Bogotá. From 1857 to 1861 he was president of the Grenadine Confederation. A revolt which broke out in 1859 was partially suppressed, but was successful soon after Ospina's term came to an end, and resulted in a change of constitution. Ospina was imprisoned for a short time, and subsequently exiled until 1872. D. at Medellin, 1885.

HERBERT H. SMITH.

Osprey: See FISH-HAWK.

Os'sein [from Lat. *os*, *ossis*, bone]: the modification of GELATIN (*q. v.*) that occurs in bones, forming substantially the whole of the organic part of the bone, apart from the tricalcic phosphate, which makes up the mass of the earthy part. Ossein may be isolated in its natural state by dissolving out the earthy part of the bone with muriatic acid and long and repeated washing with cold water. It then forms, before drying, a soft elastic mass, which is insoluble in cold water, but quickly dissolves in boiling water to a solution of ordinary gelatin.

Revised by IRA REMSEN.

Osse'tish: an Iranian language; the speech of the Caucasus folk Ossetians. The Ossetians are the most northwestern people of the Iranians, and they are somewhat separated by other tribes from the main body of the race, but their speech is none the less Iranian. Three dialects of the language may be recognized: First, the northeastern or eastern, called Tagaurian; second, the northwestern or western, termed Digorian (but styled Iranian by the Ossetians themselves); third, the southern or Tualian. In its inflectional system the Ossetish shows ten cases, including a so-called sociative and elative, in the declension; the verb conjugation and the syntax show a comparative fullness in accordance. A striking phonetic feature of the speech is the absence of *h*, a letter otherwise common in Iranian tongues. Ossetish can make but slight literary claims.

The names of the principal authorities on this language are Sjögren, G. von Rosen, W. Miller, Fr. Müller, Lerch, Tsoarajew, Salemann, B. Joseph, Stackelberg, and Hübschmann.

A. V. WILLIAMS JACKSON.

Ossian (OISIN or OSSIN): bard and hero of Irish legend, son of Fingal (Finn or Find), father of Oscar. The legend puts these heroes in the latter half of the third century, and in the earliest poems and tales they have the air of historical characters. References to them in the oldest sources are scanty. Between the twelfth and fifteenth centuries they were the center of a vigorous growth of stories that developed in the east of Ireland, and are known as the cycle of Leinster, or the Ossianic cycle. This cycle long kept its vitality, developing new branches as late as the eighteenth century. It was carried across to the Scotch Highlands, and first came to general notice through the Gaelic forms of the tradition. James MacPherson, a young Highland schoolmaster, had collected from oral tradition a few fragments of Gaelic poetry, and brought them to the notice of the Rev. John Home, who showed them to Dr. Hugh Blair, then a power in the world of Scotch letters. Blair urged MacPherson to publish his English versions of them, and these accordingly appeared in 1760, in a small volume, entitled, *Fragments of Ancient Poetry, collected in the Highlands of Scotland, and translated from the Gaelic or Erse*, with a preface by Dr. Blair. The volume provoked considerable enthusiasm among Scotch literary men and antiquarians, who subscribed money in aid of further search for similar remains. MacPherson undertook the task, and traveled extensively through the remoter Highlands, and upon his return published in London two additional volumes: *Fingal, an Ancient Epic Poem, in six books, with other lesser poems* (1762); *Temora, an Epic Poem, in eight books, with other poems* (1763). All were then collected in

a single volume as *The Poems of Ossian* (1765). Immediately upon their appearance a fierce controversy arose. Dr. Johnson declared that no ancient poetry could be discovered among the Highlanders; that MacPherson had had no originals and was tricking the public; and that his poems were worthless bombast. W. Shaw's *Inquiry into the Authenticity of the Poems of Ossian* (London, 1781) and Malcolm Laing's *Notes and Illustrations to Ossian* (Edinburgh, 1805) were important works in support of that contention. On the other hand, Dr. Blair and others collected evidence of the existence of poetry in the Highlands and its collection by MacPherson, and pointed out beauties in the poems equal to those of Homer. In 1805 the Highland Society of Edinburgh published a report of its elaborate inquiry into the question of the existence of ancient Gaelic originals. The report found that a great legend of Finn and Ossian and popular poetry concerning them had existed; that fragments were collected having in the main the same substance as the poems published by MacPherson, but none which were exact originals; and that MacPherson had edited his materials freely, and added of his own invention. Those who attacked the authenticity of the poems had challenged MacPherson to publish the Gaelic manuscripts, and £1,000 had been subscribed among his Scotch supporters for that purpose. MacPherson died (1796) without publishing them, but left among his papers materials which were published in 1807. This Gaelic text seems to be a curious mosaic of old and new materials, made by one unproficient in the Gaelic language; it was contended that MacPherson had made his Gaelic text by translating his poems from the English, and the dispute continued. It has not yet been entirely abandoned, though the advances in Celtic scholarship and the publication of authentic remains of old Gaelic tradition (cf. notably J. F. Campbell, *Popular Tales of the West Highlands, orally collected, with a Translation*, 4 vols., Edinburgh, 1860-62; *The Dean of Lismore's Book*, edited by T. MacLachlan, London, 1862) have confirmed the general conclusions of the Highland Society's report of 1805, and made it clear that MacPherson had originals to work upon, found in the living oral tradition; that these originals were very old, or made up of very old materials, developed and elaborated in the popular imagination, and were not indeed poems of Ossian, but Ossianic poems; that MacPherson used his materials with great freedom, and mixed with the heroes of the Ossianic cycle those of the cycle of Ulster; and that the style, tone and manner of MacPherson's versions are very different from the older forms of the traditions, and are the work of the translator himself.

Wholly aside from the question of authenticity, MacPherson's publications produced an impression upon literary Europe that was phenomenal in its breadth and intensity for nearly two generations. Numerous translations of MacPherson's volumes, or parts of them, appeared in Germany, France, Italy, Spain, and other countries. In Italy Cesa-rotti wrote a considerable essay, ranking Ossian with Homer, Goethe, Schiller, Herder, Schubert, Chateaubriand, Byron, and Coleridge all passed under the spell. Napoleon carried Ossian about with him incased in a costly box. Lamartine owns him as among the most powerful formative influences of his youth. Traces of the general enthusiasm are universal in the works of the years about 1800. At that time a Parisian publisher, planning to issue the masterpieces of the world's literature, made Ossian the first and Homer the second of the series. Now the poems of Ossian have passed almost completely out of notice. The ecstatic, declamatory style, the indistinct actors and nebulous landscape, saturated with a vague and monotonous melancholy, have ceased to be pleasing. They have been reprinted in almost innumerable editions. For the Ossianic cycle in Celtic literature, cf. d'Arbois de Jubainville, *Cours de littérature celtique*, vols. i., ii., and v. (Paris, 1884-93).

A. E. CANFIELD.

OS'SOLI. SARAH MARGARET FULLER, MARRIEDNESS: author; b. in Cambridgeport, Mass., May 23, 1810; daughter of Hon. Timothy Fuller, a representative in Congress 1817-25; was in early childhood a proficient in the classical languages and modern literature, but noted for eccentricities and the violence of her passions; taught languages in Boston to private classes, and in Bronson Alcott's school after the death of her father in 1835; was a conspicuous figure in the literary set comprising also Emerson, Hawthorne, and Channing, and became widely known for brilliant powers of conversation; became principal of a school at Providence, R. I., in 1837; was in 1840 editor of *The Dial*, a quarterly magazine;

published in 1839 a translation of Eckermann's *Conversations with Goethe*, and in 1841 the *Letters of Goethe to and Bettina*; made in 1843 a journey to Lake Superior, and wrote *A Summer on the Lakes*; removed to New York in Dec., 1844; became a writer for the *Tribune*, to which she contributed most of the *Papers on Art and Literature* issued in a volume in 1846; expanded an early essay in *The Dial* into a volume entitled *Woman in the Nineteenth Century* (1845; new ed. 1855); went to Europe early in 1846; married in Rome in Dec., 1847, a nobleman, Giovanni Angelo Ossoli; was a witness of the Roman revolution of 1848, and of the siege of Rome by the French in 1849, at which time she was appointed by Mazzini directress of one of the hospitals; embarked at Leghorn for the U. S. in the ship Elizabeth May 17, 1850, accompanied by her husband and infant son, and with them perished by shipwreck at Fire island, near New York, July 19, 1850. An unpublished history of the Roman revolution was lost with her. A monument to her memory is in Mt. Auburn cemetery. Her collected newspaper correspondence, edited by her brother, Rev. Arthur B. Fuller, was published in 1856, under the title *At Home and Abroad*. See the memoirs by Emerson, Channing, and James Freeman Clarke (2 vols., 1852), by Julia Ward Howe (Boston, 1883), and by Thomas W. Higginson (Boston, 1884). A new edition of her complete works appeared at Boston in 1874.

Revised by H. A. BEERS.

Ostade, ōs'tā-de, ADRIAN, van: painter and etcher; b. at Lubeck in 1610. He studied under Franz Hals, and soon became famous as a genre-painter. His pictures were in great demand in his own time, and are to be seen in Flanders, Germany, France, and England. He worked in Haarlem, in Lubeck, and in Amsterdam, where he died in 1685. A series of fifty-four of his etched plates have been published. His brother Isaac, who was his pupil, acquired the manner of his brother so thoroughly that his pictures are often mistaken for those of Adrian.

W. J. STILLMAN.

Ostend': town; in the province of West Flanders, Belgium; on the German Ocean, 77 miles by rail W. N. W. of Brussels (see map of Holland and Belgium, ref. 9-A). It has a good harbor, is fortified and neatly built, and communicates daily by steamers with London and Dover. Besides manufactures of linen, sail-cloth, and ropes, it carries on important fisheries of oysters, cod, and herrings and an active traffic in the transport of butter, rabbits, etc. In the summer season it is the resort of 20,000 visitors from all parts of Europe. There is a handsome kursaal, and a seawall 3 miles long and 35 yards broad forms a favorite promenade. Pop. (1891) 24,688.

Osteoblasts and Osteoclasts: See HISTOLOGY (Bone).

Osteogloss'sidæ [Mod. Lat., named from *Osteoglossum*, the typical genus; Gr. ὀστέον, bone + γλῶσσα, tongue]; a family of fresh-water fishes of the sub-order *Isoospondyli*, characterized by the peculiar form and bony head. The body is more or less elongated, compressed, and covered with large hard scales composed of mosaic-like pieces; the lateral line high, little incurved from the back, and with widened mucous ducts; the head oblong, with the integument very thin, and cheeks protected, with large suborbital and post-orbital plates; mouth with a lateral cleft; its upper margin formed by the intermaxillaries at the middle and the supra-maxillaries at the sides; teeth acute, on the jaws as well as palate; gill apertures large; branchiostegal rays numerous (8-16); dorsal and anal posterior elongated, the anal originating farther forward than the dorsal; caudal separately developed; pectorals inserted low down on each side of the throat; ventrals perfect, not very far from the head. The skeleton has numerous vertebrae (60-80). The family is noted for the peculiar distribution of its species. It is divisible into two sub-families (1) *Osteoglossinae*, in which the abdomen is trenchant, having two genera, *Osteoglossum*, represented in South America, and *Scleropages*, with one species in several of the Philippine islands, and another in Queensland, Australia; and (2) *Heterotilinae*, also with two genera: *Heterotis*, peculiar to West Africa and the Nile, and *Arapaima*, confined to South America. One species (*Arapaima gigas*) reaches a gigantic size, sometimes exceeding 15 feet in length and weighing upward of 400 lb. It is taken sometimes with a hook baited with small fishes, and sometimes with a harpoon. In Brazil it sells for a high price.

Revised by F. A. LUCAS.

Osteol'ogy [Gr. ὀστέον, bone + λόγος, discourse, reason]; the science of the skeleton of vertebrate animals. This

skeleton is composed of bone, or its cartilaginous or membranous basis, the intimate structures of which are pointed out in the article HISTOLOGY (*q. v.*). The skeleton consists either of a cartilaginous or membranous continuum, or of cartilaginous or osseous segments arranged in continuous succession, so as to form two tubes, one superior and one inferior, attached by a solid axis between them, the whole furnished with various appendages. Each axial segment is in turn composed of sub-segments, each of which arises from a separate (sometimes more than one) center of ossification in the primal cartilage or membrane. Each primary segment of the skeleton is called a vertebra, and each vertebra is composed of the same elementary segments, some of which may be omitted, subdivided, etc., and also greatly modified in their form for the accommodation of the viscera they inclose. The superior arches or tubes protect the nervous axis of the animal, while the inferior surround the nutritive organs, or the digestive, circulatory, respiratory, and reproductive systems. The elementary segments and their modifications are exhibited in the accompanying sections from the cranial, thoracic, and caudal regions respectively, in order to display the excessive developments of the *neural* or upper arch (Fig. 1), the *hamal* or lower arch (Fig. 2), and of the centrum (Fig. 3), by reduction of the arches. The

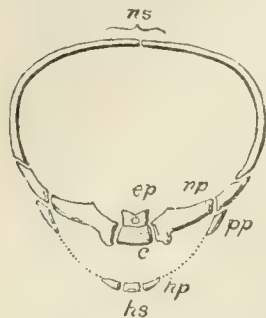


FIG. 1.—Cranial segment: *c*, centrum; *ns*, neural spine; *ep*, epapophysis; *pp*, pleurapophysis; *hp*, hamapophysis; *hs*, hamal spine.

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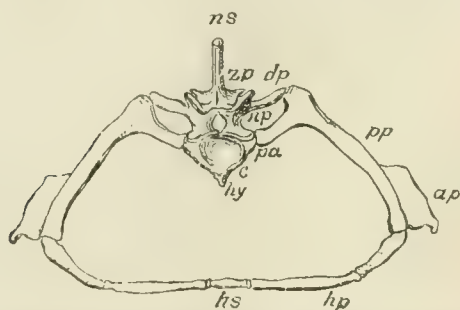


FIG. 2.—Thoracic segment from a crocodile. Letters as in Fig. 1: *zp*, zygapophysis; *dp*, diapophysis; *pa*, parapophysis; *hy*, hypapophysis; *ap*, appendage.

elements are named as follows: *ns*, neural spine; *zp*, zygapophysis; *dp*, diapophysis; *pp*, pleurapophysis; *hp*, hamapophysis; *hs*, hamal spine. In addition to these, there are other processes less universally present—namely, on the middle line of the centrum above, *ep*, epapophysis (Fig. 1), on the middle line below, *hy*, hypapophysis (Fig. 2), and on the side of the centrum below the diapophysis, *pa*, parapophysis (Fig. 2, represented by capitular articulation for rib). In the thoracic vertebra the segments correspond to the following special names of the bones: neural spine, *spinous process*; zygapophysis, *articular process*; diapophysis, *transverse process*; neurapophysis, *superior arch*; pleurapophysis, *rib*; hamapophysis, *thoracic rib or cartilage*; hamal spine, *sternal segment*; centrum, *body*.

FIG. 3.—Caudal segment from dugong. Letters as before.

There are many peculiarities in the segments which compose the skull of the Vertebrata, on which account the name of vertebrae has been denied them. Since they also present some likenesses to the vertebrae of the body in their growth-history as well as composition, they may be regarded as representing a special class of vertebrae. The limbs of Vertebrata also have received a variety of interpretations. These, when fully represented by a front pair and a hinder

pair, are attached to corresponding arches, which depend from the vertebral axis, and are therefore hamal. The pelvic arch, which bears the hinder limbs, is attached to the sacral vertebra, and includes one superior (*ilium*) and two inferior elements (viz., *ischium* and *pubis*). That which supports the fore limbs, or the scapular arch, is not attached to an axial body in any class excepting that of the fishes, and then it is to the occipital or posterior segment of the skull and by dermal bones only. It also includes one superior element (*scapula*) and two inferior (*epicoracoid* and *coracoid*). The limbs are lateral appendages of these arches, like the uncinate processes of the ribs (Fig. 2, *ap*), opercula of the suspensor of the lower jaw in fishes, etc.

Development of the Skeleton.—The spinal column will first claim attention. The germinal layer of the yolk of the egg, or blastoderm, is early marked by a linear impression, the "primitive groove." The blastoderm is divided into three layers, of which the lower ultimately forms the interior lining of the alimentary canal, and the upper forms the cerebro-spinal nervous axis and the epidermis of the body. It is the upward longitudinal folding of the upper and middle layers (ectoderm and mesoderm) on each side

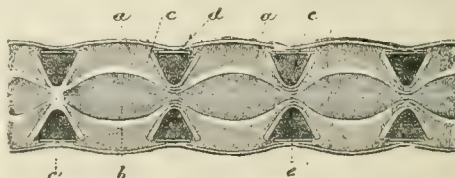


FIG. 4.—Longitudinal section of the posterior part of the vertebral column of *Heptanchus* (from Kölliker): *a*, fibro-cartilaginous part of sheath of chorda dorsalis; *b*, gelatinous chorda; *c*, osseous double cone perforated for the contracted chorda; *d*, section of a vertebra to one side of the perforation; *e*, the cartilage filling the interspace of a double cone.

into the "dorsal laminae" that forms the "primitive groove." The laminae grow toward each other and unite along the median line, forming the neural canal. The two layers are at the same time folded downward as parallel folds, or ventral laminae. The middle layer divides, the inner lamina, with the entoderm, forming the alimentary canal, while the outer, with the mesoderm, form the outer walls of the abdominal cavity, or the somatopleure. In the meantime there appears in the layers below the primitive groove a cylindrical body of large cells filled with transparent protoplasm or sarcode, around which are differentiated from two to four layers, forming a sheath. This cylinder is the *chorda dorsalis*, which extends forward to within a short distance of the end of the primitive groove. The portion of the

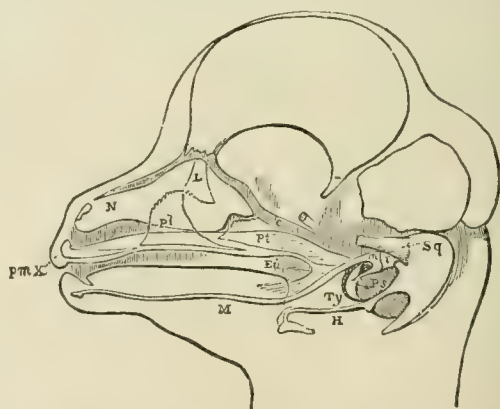


FIG. 5.—Head of a foetal lamb, dissected so as to show Meckel's cartilage, *M* (from Huxley): *m*, the malleus; *i*, the incus; *Ty*, the tympanic; *H*, the hyoid; *Sq*, the squamosal; *Pt*, the pterygoid; *pl*, the palatine; *L*, the lacrimal; *pmx*, premaxillary; *N*, nasal sac; *Eu*, Eustachian tube.

groove above it is enlarged, and then bent downward in front of the chorda. There is a constriction in the last-named portion of the now inclosed groove, or neural canal, so that three vesicles are formed, which are the concavities of the three axial segments of the future brain. The walls of this neural canal are continuous from the one end of the animal to the other. In the bodily portion of the axis, that part of the blastoderm which surrounds the chorda dorsalis

early presents the appearance of sub-quadrate segments or bodies, which, extending, gradually inclose the chorda as rings. At the same time corresponding segments appear in the dorsal laminae. These are the bases of the future vertebrae, representing centrum and neurapophysis. The diapophysis and ribs appear in the form of cartilage in the somatopleure. The elements are completed by the deposit of phosphate of lime round the nutritive vessels, or the process of ossification; and they may remain distinct from each other or become co-ossified, according to the type of vertebrate. The manner of ossification of the body of the vertebra varies as follows:

I. Spinal column represented by the membranous sheath of the chorda dorsalis: class *Lepidocardi* (duncelet).

II. Spinal column represented by the membranous sheath of the chorda, and cartilaginous neurapophyses and pleura-pophyses: class *Marsipobranchii* (lamprey) and the *Chondrostei* (sturgeon, etc.).

III. Column represented by imperfect ossifications of the sheath of the chorda alone, with similar neurapophyses and pleura-pophyses: certain sharks; e. g. *Hexanchus* and the merospondylous *Teleostomi*.

IV. Bodies of column ossifications of the chorda, together with the investing sheath: class *Selachii*, most sharks and rays.

V. Centra of vertebrae composed of ossifications of the external or blastodermic investment of the chorda: classes *Teleostomi*, bony fishes, *Batrachia*, *Reptilia*, *Aves*, and *Mammalia*.

The ossification of the bodies, beginning in the circumference of the sheath, first completes a ring, which then grows inward, constricting the chorda. The latter may be nearly or quite divided by the osseous body, and portions of it and the sheath remain between the biconcave centra as doubly conical or globular bodies, as in the osseous fishes and many salamanders.

When cartilage appears round the chorda dorsalis, in what becomes the base of the skull, it is unsegmented. It is

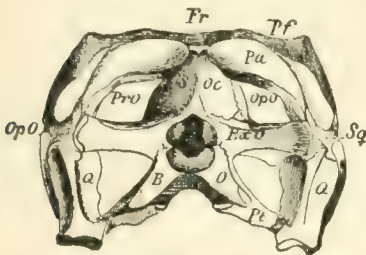


FIG. 6.—Cranium of *Iguana tuberculata*, from behind.

plate-like, and sends a bar on each side round that part of the brain cavity (hypophysis) which is decurved in front of the end of the chorda. The bars (trabeculae) reunite in front of it, forming another smaller plate. The borders of the plates then curve upward, forming the sides of the primordial cartilaginous skull, and, meeting above, close it in, frequently, however, leaving a vacuity in the middle line, or a fontanelle. In the cranial as in the spinal parts of the axis, cartilaginous rods appear in the inferior folds of the blastoderm or somatopleure, forming the visceral arches, the upper pieces of which become the ribs. Two of these appear beneath the posterior part of the skull, which become the *hyoid arch*, and the mandibular arch or lower jaw; a third (the palatopterygoid arch) appears as nearly horizontal, extending from the base of the second to near the end of the cartilaginous skull in front. When ossification sets in, the segmentation of the skull appears. This, however, takes place under two forms: the ossific deposit may be made in the cartilage or in the membrane investing that cartilage, forming the membrane bones of anatomists. It appears that the membrane bone represents a primary condition, and one that prevailed among the early Vertebrata, while the penetration of ossification to the cartilage was the mode of origin of the first cartilage bones. Hence, though corresponding ones of the cranial bones may have different origins to-day, their correspondence is not thereby destroyed. The base of the brain-case ossifies into three bones, the posterior the *basioccipital*, the next the *basisphenoid*, the anterior the *presphenoid*. The sides of the case ossify three plate-like bones, which correspond to and rest on these; namely, the *exoccipital*, the *alisphenoid*, and the *orbitosphenoid*. Closing the cranial cavity above are the three corresponding bones, the *supraoccipital*, *parietal*, and *frontal*. Thus three distinct cranial segments are presented, the occipital, the parietal, and the frontal. A section of the parietal arch is seen at Fig. 1 *cos*,

parietal; *np*, alisphenoid; *c*, basisphenoid). Of these elements the parietal and frontal bones are membrane bones, the remainder cartilage bones. An extended membrane

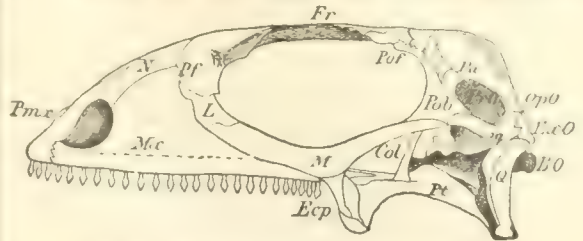


FIG. 7.—Cranium of *Iguana tuberculata*, profile.

bone, the *parasphenoid*, takes the place more or less completely of the cartilage bones, forming the axis or base of the brain-case in the fishes and batrachians. In front of it is another membrane bone, which is always present, the *vomer*, which forms the axis of that part of the skull which lies in front of the brain-case. This consists, first, of the ethmoid bone, which is a flattened cylinder formed by the union of the upturned borders of the primitive cartilaginous basal plate of that part of the skull. After uniting at the top, they turn downward in the middle line, forming a vertical septum. Laminae project into the cavities so formed, from the outer wall, on which the branches of the olfactory nerve are spread; these are the *turbinal bones*. Above or on the ethmoid two membrane bones are developed, the *nasals*; at their sides behind and in front of the orbit, two other membrane bones may be present—viz., the *prefrontal* (the upper) and the *lachrymal* (the lower). We have then a fourth or *ethmoid* segment. It remains to consider another series of bones situated between the parietal and occipital segments. These do not extend to the middle line of the superior or neural arch, but are developed in the cartilage in which the semicircular canals of the labyrinth of the auditory organs are imbedded. The upper lateral bone, which is usually only present in fishes, is the *pteroic*. Below this is the *petrous* bone, which is separated posteriorly from the exoccipital in some fishes by the *intercalary*. This bone is wanting in higher Vertebrata. In the Rhipidopterygian and Crossopterygian fishes, in Stegocephalous Batrachia, and in Cotylosaurian Reptilia the temporal fossa in which the temporal muscle is inclosed is covered by a roof which consists of some or all of the following bones: Immediately posterior to the orbit, above, the postfrontal; below, the postorbital. Posterior to these, above, the supramastoid; below, the supratemporal. Below these, in front, the jugal; behind, and joining the quadrate, the zygomatic. Between the supramastoid, supraoccipital, and exoccipital, the tabulars. In higher Vertebrata this roof is perforated by large foramina, so that bars or arches only remain. These may be either of three, or any two of them together. These are, according to their posterior attachments, the supramastoid, the supratemporal, or the zygomatic arches.

If we turn to the inferior or haemal arches, we find three almost constantly and several others occasionally present. The former are, beginning at the front of the skull, the maxillary, the pterygopalatine, the mandibular, and the hyoid arches; the latter are the branchial arches, most of which are present only in fishes and some batrachians. The maxillary rods of opposite sides do not meet on the middle line, but the apex of the ethmoid arch is produced and its membrane ossifies on each side, forming the premaxillary bones, which in all vertebrates occupy the space between the maxillaries. The latter result from the ossification of the membrane covering the cartilage of the first visceral rods. Their inner margins sometimes grow together, forming the roof of the mouth and removing the posterior opening or the nostrils to the back part of it. The mandibular arch in its cartilaginous state is known as *Meckel's cartilage*. The part next the skull becomes separated from the rest, and is the support of the palatopterygoid cartilage. The remaining portion may be wanting, as in the lampreys (*Marsipobranchii*), or may remain as a movable articulated lower jaw. If these portions remain mostly cartilaginous, we have the permanent condition seen in the sharks and rays. In bony fishes three ossifications appear in it, namely (beginning next the skull), the *metapterygoid*, the *inferior quadrate*, and the *articular*. In the membrane

surrounding the cartilage the *angular* and *coronoid* bones appear in some; round the remainder of it the *dentary* is developed in all Vertebrata above Marsipobranchii. In reptiles and birds the metapterygoid and the inferior quadrate are represented by a single bone, the *quadrate*, which is the true support of the under jaw. In mammals the articular disappears, while the quadrate is drawn into the ear-chamber

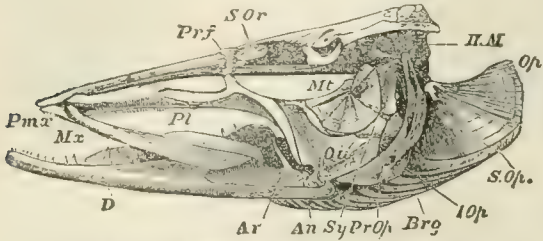


FIG. 8. Skull of pike. From Huxley. Pmr, premaxillary; Mx, maxillary; Pl, palatine; Prf, prefrontal; SOr, supraorbital; H.M., hyomandibular; Mt, metapterygoid; Op., operculum; SOp., suboperculum; IOp., interoperculum; PrOp., preoperculum; Brg., branchiostegal rays; Sy, symplectic; Qu., quadrate; An., angular; Ar., articular; D., dentary.

as the *malleus* or hammer, leaving the dentary to articulate directly with the skull. The hyoid arch also develops several osseous segments. In fishes these are called (beginning at the cranium) the *hyomandibular*, the *stylohyal*, *ceratohyal*, and as the middle piece below, the *basihyal*. The first named is a large bone, and supports in part the articulation of the lower jaw through the intervention of the inferior quadrate. The *stylohyal* segment is united by suture with the *ceratohyal* in fishes; in reptiles and mammals it is cartilaginous or ligamentous, and the portion next the skull in the latter when ossified is called the *styloid process*.

It remains to notice some membrane bones which protect the sides of the cranium, and the muscles attached to them. The maxillary carries on its posterior end a more or less flat rod, the *malar* bone, which protects the orbit below in mammals and many reptiles. On its posterior end it is joined to another piece, the *zygomatic*. In mammals this piece is fused to a plate on the side of the temple (the *squamosal*), and unites with the petrosal bone to form the *temporal*. In reptiles, where the quadrate carries the articulation of the lower jaw away from the skull, the zygomatic accompanies them and stands above the end of the quadrate, supported on the projecting rod formed of the paroccipital, exoccipital, etc., which is now known as the *suspensorium*. In *Batrachia salientia* the supratemporal lies over the length of the quadrate, and in fishes occupies a similar position on the outer face of the inferior quadrate and hyomandibular, and is known as the *preoperculum*. In fishes other membrane bones are added; namely, the operculum and suboperculum behind it, and the interoperculum below it. Another bone is formed in some reptiles which develops in the cartilage between the position of the intercalary in fishes and the exoccipital, viz., the paroccipital. In tortoises and pythonomorphs it forms part of the suspensorium, and is very much elongated in serpents. In lizards it sends a process upward with the supramastoid, which forms, with a descending projection of the posterior angle of the parietal, the parieto-quadrate arch. The zygomatic arch is the only one found among the mammals. The ethmoid segment surrounds the olfactory lobes of the brain; the frontal is in front of the optic foramen; the parietal passes before the foramen of exit of the trigeminus (fifth) nerve. The otic bones extend posteriorly to the vagal (tenth) foramen, and the occipital to the foramen magnum.

In the fishes no bones are expressly related to the function of hearing. In the *Batrachia* and forms above them a portion of the otic capsule is separated as a lid, and is known as the *stapes*. In the tailless *Batrachia* (*Salientia*) a short bone originates at its anterior border (the interstapedial) and extends forward. To its distal end is appended a cartilaginous rod (the mesostapedial), and this is followed by a cartilaginous disk, the epistapedial, over which is stretched the integument forming the tympanum or ear-drum. In reptiles the interstapedial and mesostapedial are represented by a single bony rod, which is confluent with the stapes, the whole being termed the *columella auris*. In *Mammalia* the stapes is distinct, the interstapedial is represented by a small bone, the orbicular, and the mesostapedial by the incus or anvil. The epistapedial has disappeared, and in its place the proximal end of the Meckel's

cartilage is ossified as the malleus, which impinges on the tympanic membrane.

Special Osteology.—There are very numerous peculiarities characteristic of natural divisions of the Vertebrata to which only brief allusion can be made here. The vertebral bodies consist originally of three elements, two superior, each supporting a neuropophysis, and one below, or an intercentrum. All unite to form the body in fishes generally, but both form complete bodies in the tail of the *Amia*, etc. In *Batrachia* the body consists chiefly of intercentrum, while in the remaining Vertebrata the intercentrum is gradually extinguished, remaining principally in the caudal region as the basis of the chevron-bones. The centrum may be concave at both ends (*amphicæalous*), as in selachians, fishes, and Ichthyosauri, and many tailed batrachians; with ball-and-socket joint, the concavity being in the front of the body (*procæalous*), as in most tailless *Batrachia* and a majority of reptiles; with the cup behind (*opisthocæalous*), in the bony garfishes, some salamanders and frogs, a few Reptilia, and in the neck of many ungulate mammals. Finally, the centra are plane at both ends in *Mammalia* in general, and numerous reptiles, especially the extinct types *Rhynchocephalia*, *Sauropterygia*, *Dinosauria*, and some *Crocodylia*, where the ends are sometimes somewhat excavated. In *Mammalia*, and to a lesser degree in other Vertebrata, the vertebræ are distinguished into cervical, dorsal, lumbar, sacral, and caudal. The first are generally seven in number, and are readily distinguished by the perforation of their transverse processes (= diapophysis + parapophysis) for the conduct of the vertebral artery. The dorsals are distinguished as furnishing the points of attachment for the ribs. These vary in structure as follows: I. A single rib-basis; *a*, exclusively on the vertebral centrum: fishes, batrachians, and some reptiles, viz., tortoises, lizards, *Pythonomorphs*, and serpents; *aa*, partially standing on the neural arch: *Sauropterygia*. II. Two separate points of rib attachment; *a*, on the centrum only: Reptilia, Ichthyopterygia; *aa*, the lower (capitular) articulation on the centrum, the upper (tubercular) on the diapophysis, which springs from the neural arch: reptiles (*Crocodylia*, *Dinosauria*, most *Theromora*, *Pterosauria*), birds and mammals. The lumbar vertebræ succeed the dorsals, and are distinguished by the absence of rib articulations; but the ribs extend to the sacrum in some *Crocodylia* (*Belodon*), *Dinosauria*, *Theromora*, and birds. The sacral vertebræ are usually co-ossified into a single mass, the sacrum, with very massive diapophyses for sutural attachment to the iliac bones or pelvis. They are numerous in the birds, less so in the *Dinosauria* (*Agathaumas* has eight), four to six among mammals with well-developed hind limbs. There are three or two in reptiles with hind limbs, while in any of the orders where these members are small or rudimentary a single vertebra serves the same purpose. The caudal vertebræ are distinguished among Vertebrata below the mammals by the presence of the chevron-bones (see Fig. 3, *pp*, *hp*) on the inferior surface. They are present in *Cetacea* (whales), *Edentata*, some *Insectivora*, etc., among *Mammalia*.

The ribs present a general similarity except in their proximal attachments, as already pointed out. They articulate in the thorax with the median bones of the breast or sternum in all above the fishes, and usually remain separate for the remainder of their length. An exception, however, occurs in the tortoises, where they are so widened as to unite by their borders into a more or less complete shield, which protects the entire visceral cavity, and into which, in many species, the head, tail, and limbs may be withdrawn. In birds and some crocodiles and *Rhynchocephalia* there are recurved processes on the ribs pointing backward, the "uncinate processes." The thoracic ribs are united by segments on the middle line below, which, taken together, constitute the sternum. The hæmal element of the ribs is wanting in fishes, serpents, Ichthyopterygia, *Sauropterygia*, and tortoises; the sternum is absent in the same groups, so far as known. The first appearance of the sternum is in the *Batrachia*, where a cartilaginous plate behind the shoulder-girdle represents it in the tailed and many of the tailless forms. In many of the latter it becomes an osseous segment, and in some extinct *Stegocephali* is a bony, shield-like body. In *Lacertilia* and *Pterosauria* it is a broad plate behind the coracoid bones. In *Dinosauria* it is small and often divided. In birds it is of similar form in the most reptile-like forms, as the apteryx, ostriches, etc., but is peculiar in the possession of a produced process on each side in front (costal process). This is frequently ossified from a separate cen-

ter (protosteon), while the main shield originates from a center on each side, the pleurostemon, and sometimes from two others behind these, the metostea. In most existing birds besides the ostriches there is a middle center of ossification, the lophosteon, which when ossified is a prominent keel extending along the length of the sternum. The metostea are frequently produced as separate lateral rods, and in nearly all birds the hinder margin of the sternum is variously incised. In *Crocodylia* the sternum exists as a small shield in front, and a prolongation from it backward on the median line. This brings us to the form seen in the *Mammalia*, where it defends the middle line of the thorax as a series of segments which may number from two (*Echidna*) to thirteen (two-toed sloth). In the whales it is represented by an oval or cruciform bone, and its posterior segment in other mammals is a spatulate cartilage or bone known as the xiphisternum.

There are various dermal ossifications found posterior to the sternum and hemapophyses in different Vertebrata. These consist, in many Stegocephali, of osseous rods arranged *en chevron*, with the angle anteriorly directed. Similar pieces, with the addition of lateral ones, exist in ichthyopterygian, sauropterygian, crocodilian, and rhynchocephalian reptiles. In tortoises these extend below the shoulder-girdle in front and the pelvic arch behind, and unite together into the solid inferior plate or plastron. This is connected with the ribs by a series of membrane bones, the marginals, which also extend all round the free margin of the upper shell or carapace. The dermal pieces of the plastron are the two clavicles, the interclavicle between them, the two hyosternals, the two hyposternals, and the two postabdominals.

The scapular arch in vertebrates is composed of both cartilage and membrane bones. Like the pelvic arch, it appears as a cartilaginous rod in the somatopleure of the fetus, often extending in its fold to near the point of con-

2. Interclavicle only ossified membrane bone: *Crocodylia*.
3. Clavicle and single interclavicle of membrane, and scapula, procoracoid and coracoid of cartilage, all osseous.

a. Clavicle and interclavicle united with plastron: *Testudinata*.

aa. Clavicle and interclavicle free; epicoracoid cartilaginous: *Ichthyopterygia*, *Lacertilia*.

aaa. Clavicle and interclavicle united with a short procoracoid, forming furcula; epicoracoid not osseous; suprascapula co-ossified with scapula: *Aves*.

aaaa. Clavicle and interclavicle distinct; epicoracoid large, osseous; procoracoid wanting: *Mammalia prototheria*.

AAAA. Arch not suspended; both membrane and cartilage bones; coracoid rudimental or wanting.

a. Clavicle united with mesoscapula and procoracoid into one bar; epicoracoid and suprascapula rudimental or wanting: *Mammalia eutheria*.

The Limbs.—The cartilage forming the limb-bones appears early in a fold of the outer skin, and in the Vertebrata above the fishes is soon divided by transverse interruptions into three segments. In the *Lepidosirenidae* this cartilage may be broken up into many successive joints. In *Ceratodus* a branch segment is given off at the end of each of these primary joints, but in sharks and fishes most of the segments diverge from one side only. The basal and the first and second of the one side are especially enlarged in the sharks, forming the *metapterygium*, *mesopterygium*, and *propterygium*, from which numerous cartilaginous radii arise, forming a triangular fin. The extremities of the fins are dermal, and embrace the ends of the cartilaginous rods. In true fishes the propterygium and mesopterygium are wanting, and the radii of the first cross-row, either cartilaginous or osseous, reach the scapular arch. The upper radial unites with the metapterygium to form the first ray of the fin, often

a strong spine; the remainder usually number four, but may be more numerous in the lower groups. They are subquadrate in the higher fishes, but much elongate in the *Pediculati*, where the number is reduced to three and two.

In Vertebrata, from the *Batrachia* up, the limbs, both fore and hind, are early divided into three principal segments. In the anterior, the first presents a single bone, the humerus; the second, two parallel bones, the ulna

and radius; and third the foot. This consists of two transverse rows of small bones, the carpals, and from three to five rows of longer bones, the phalanges, arranged in typically five ray-like lines or digits, the basal segments of which are called the metacarpals. Typically, there are three bones in the first transverse row of carpals and five in the second, with a median bone inclosed between the rows, a condition seen in various batrachians and reptiles. In higher classes these bones are variously combined or omitted. The bone next the radius is the scaphoid, the next the lunar, the next the cuneiform; in the second row the first is the trapezium, the second trapezoides, third magnum, while in many forms the fourth and fifth are combined and called the unciform, and the centrale is united with the scaphoid. In *Ichthyopterygia* the bones of the fore and hind limb beyond the humerus and femur are of similar shape, but, though undistinguishable as to form, are proximally of the usual position and number. In birds there are never more than three digits of the fore foot, in the *Apteryx* and *Casuaris* only one. These answer to the second, third, and fourth of the ordinary foot. The metacarpals are co-ossified in all birds excepting the extinct *Archæopteryx*. In *Mammalia* of the order *Cetacea* the ulna and radius are immovably fixed in a single plane with the carpus and manus, and not flexibly articulated with the humerus, thus resembling the aquatic reptiles (*Sauropterygia*). In higher orders the radius possesses greater or less power of rotation on the ulna, which is especially developed in apes and man. In proboscideans the proximal end of the radius is moved outward above the ulna, so as to cross it obliquely. In *Perissodactyla* (odd-toed) and *Artiodactyla* the ulnar attachment to the carpus is more and more reduced, until the radius, appropriating the larger part, extends almost entirely in front of the ulna. The latter becomes in the horse and



FIG. 9.—*Amia calva*, L.: 1, frontal bone; 2, postfrontal; 3, posttemporal; 4, maxillary; 5, hyoid; 6, dentary; 7, angular; 8, interoperculum; 9, branchiostegal rays

tact above the vertebrae on the median line. If development proceeds, the upper part of this cartilage becomes segmented off, forming the scapula, while the lower portion becomes bifurcated into the coracoid and epicoracoid bones. In mammals, fishes, and some others, a membrane bone is developed in front of the epicoracoid, the clavicle. From the junction of the three, the cartilaginous basis of the fore limb appears. Above the scapula another segment is usually present, the suprascapula.

The fishes differ from other vertebrates in having another membrane bone, the posttemporal, connecting the epiclavicle with the cranium at the tabular bone. This is wanting in sharks, where the arch is cartilaginous and without laminiform membrane bones. In many fishes there are membrane bones which extend in a bar backward and downward from the clavicle; namely, the first, second, and third postclavicles. There may also be a cartilage bone behind the coracoid, the postcoracoid. The following scheme will express the leading characters of the classes and orders in the structure of the scapular arch:

A. Arch suspended to cranium by posttemporal.

1. Scapula, coracoid; epiclavicle and clavicle, and sometimes interclavicle, present: *Pisces*.

AA. Arch not suspended to the cranium; no laminiform dermal bones.

1. Arch cartilaginous: *Selachii*.

2. Coracoid and scapula osseous; suprascapula and epicoracoid cartilaginous: *Batrachia uradela*.

3. Coracoid and scapula, suprascapula and clavicle osseous; epicoracoid cartilaginous: *Batrachia anura*.

AAA. Arch not suspended; laminiform dermal bones present (except *Chamaeleo*).

1. Scapula and coracoid only ossified; no clavicle or interclavicle: *Lacertilia chiptoglossa*.

ruminants very slender and co-ossified with the radius. In the carpus a bone develops below the tendon of one of the flexors of the foot, which articulates with the cuneiform, called the *pisiform*. In five-toed orders the carpals are usually distinct, excepting in the Carnivora, where the scaphoid and lunar are generally co-ossified. In the Artiodactyla the number of toes is regularly reduced from four to

use; the horny covering partly incloses it behind, and forms a hoof. In apes and men the last phalange is flat, and supports a flat horny nail.

The *pelvic arch* is composed of the single superior element, the *ilium*, and the two inferior ones arranged as limbs of a fork, the anterior, the *pubis*, the posterior, the *ischium*. The ilium corresponds with the scapula, the pubis with the epicoracoid, and the ischium with the coracoid. The ilium generally presents a crest forward, from which a strong ligament descends to the end of the pubis, which represents the clavicle. It is the Poupart's ligament of human anatomy. Fishes, however, do not possess a pelvis, with two exceptions, those of the *Lepidosirenidae* and of the *Holocephali*. In the

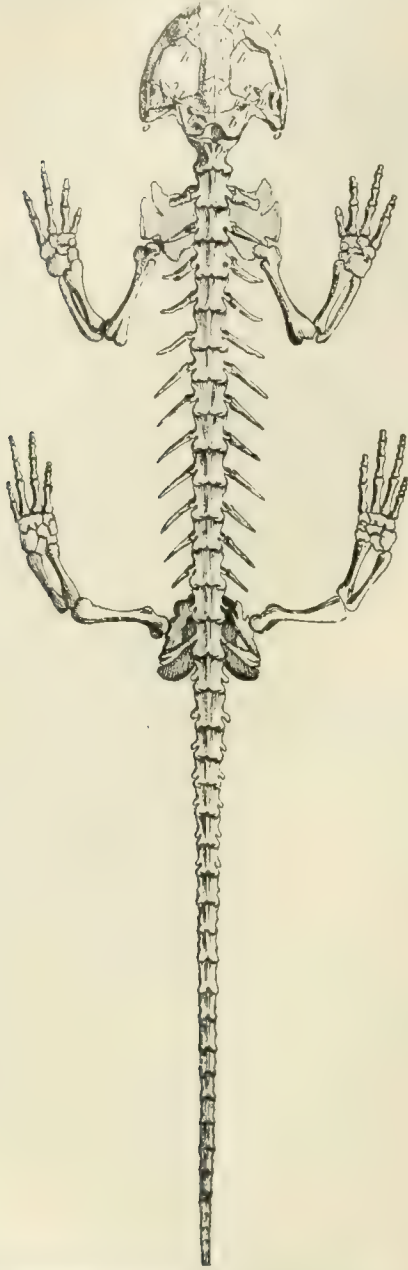


FIG. 10.—*Salamandra maculosa*, L.: *b*, exoccipital; *c'*, parietal; *c*, frontal; *e*, pterygoid; *f*, premaxillary; *g*, nasal; *h*, prefrontal; *k*, maxillary; *l*, prootic; *m*, squamosal; *o*, quadrate.

two, and the number of carpals is reduced correspondingly in the second row, those of the first being narrowed. In the most specialized Ruminantia the trapezium is wanting, and the trapezoides and magnum are confluent. The outer digits become smaller and disappear, while the two middle metacarpals, representing the third and fourth, co-ossify into the single "cannon-bone." In the living types the third metacarpal supports the whole width of the trapezoides and magnum, while in the extinct family of the *Anoplotheriidae* it articulated with the magnum only. The last phalange in Carnivora, Insectivora, bats, rodents, etc., is compressed, and with its complete horny sheath forms a claw; in ungulates it is broad, the posterior faces becoming inferior when in

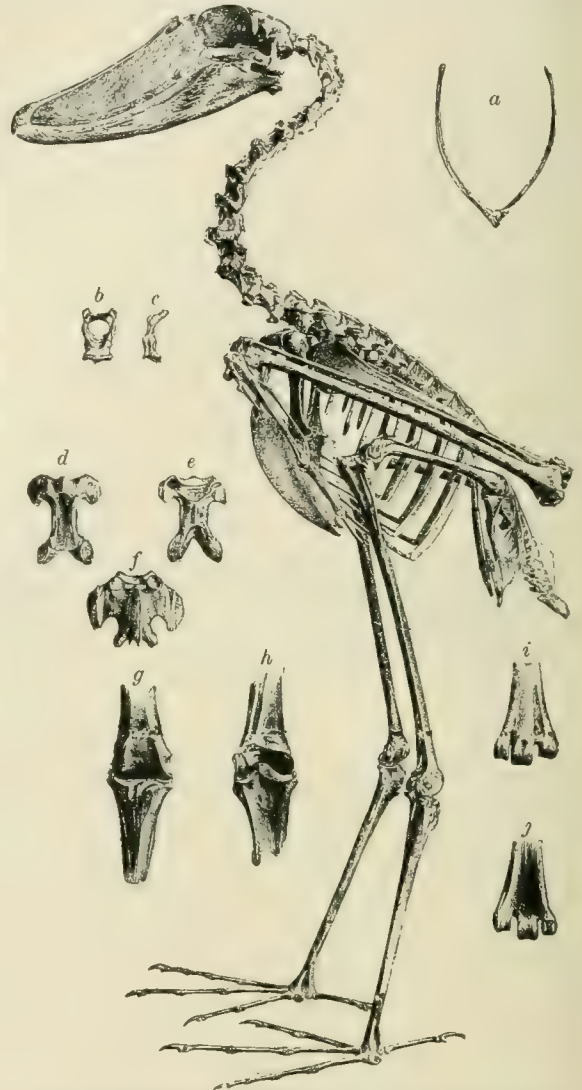
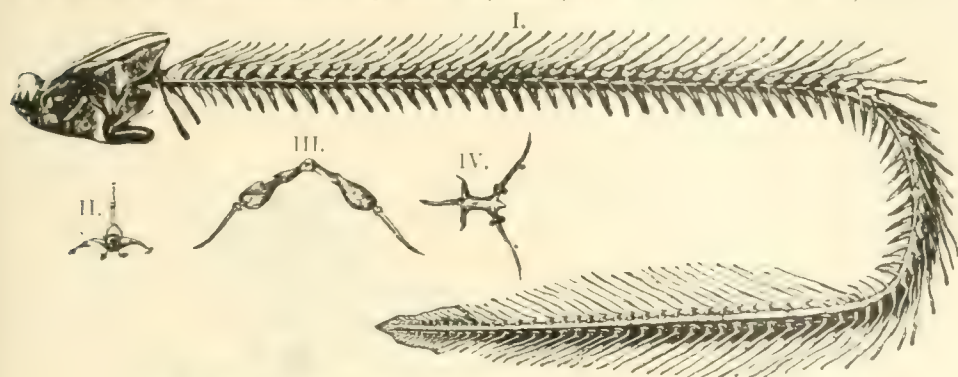


FIG. 11.—*Balæniceps rex*, Gould: *a*, hyoid arch; *b*, atlas from behind; *c*, atlas, profile; *d*, ninth cervical vertebra from below; *e*, same from above; *f*, middle dorsal vertebra from above; *g*, posterior view of tibio-tarsal joint; *h*, anterior view of the same; *i*, distal end of tarso-metatarsus, front view; *j*, same from behind.

former there is a single median diamond-shaped cartilage, to which the limbs are attached, whose homology is unknown. In the latter there is a flat curved cartilage extending forward from the basis of each fin on each side, which occupies the position of the pubis. Another and serrate cartilage is attached to its anterior margin in the male, which projects into an open pouch, from which it can be protruded. A cartilaginous rod succeeds the pubic bone as the basal element of the posterior limb. In the Dipnoi this is followed by others, forming the segmented ray representing the ventral fin. In *Ceratodus* each segment is furnished with a short divergent sub-segment on each side; but in the sharks and rays the sub-segments or radii are all on one side. In

hind. These relations are maintained so long as the limbs extend horizontally without twist, either in paddles, as in Ichthyopterygia, or terrestrial animals, as salamanders. In most vertebrates the first bones are twisted in opposite directions, that is, toward each other, the knee pointing forward, the elbow backward, which causes an apparent rever-



an apparent reversal of the homologies of the two bones of the second segment. In the hind foot of the higher Vertebrata, especially the mammals, the tibiale and intermedium form the single astragalus, while the fibulare is produced backward, forming the heel-bone or calcaneum. The centrale becomes the navicular, while the fourth and fifth of the second row unite to form the cuboid. In the reptiles these

bones are less distinctly constituted, and various modes of combination present themselves. In the Dinosauria the astragalus and calcaneum are often co-ossified, and may be united, by suture or co-ossification, with the tibia. In the birds the latter case always prevails, and the fibula, being much reduced, does not generally extend to the articulation. In reptiles and birds, then, the ankle-joint is between the two rows of tarsals, while in Mammalia it is between the tibia and astragalus. The number of toes is usually four and five in the Batrachia and reptiles; among birds it is usually four, the inner being turned backward and reduced in size, and sometimes wanting. The metatarsals of the three remaining toes are co-ossified with each other and with the second row of tarsal bones. In Mammalia the normal number of digits is five, but is often reduced to four. Among ungulates the hippopotamus displays four; the lateral ones are reduced in the hog and the *Tragulus*, till in the *Poebrotherium* they are reduced to rudiments, two only remaining. These are united into a solid "cannon-bone" in the *Bovidea*, which supports two distinct toes. In the rhinoceros there are but three toes, of which the central is the largest; the laterals are successively reduced in the horse series, composed of such genera as *Anchitherium* and *Prohippus*. In ruminants the navicular and cuboid bones are united, and often the second and third of the second row or euneiforms with each other and the naviculo-cuboid.



Plethognathi they form a simple rod, which is generally deprived of fins. In Batrachia the hind limbs are constituted like the fore limbs, and therefore embrace one bone in the first segment, *femur*; two in the second, *tibia* and *fibula*; three in the third, *tibia*, *medial*, and *fibular*; five in the fourth, from which are continued the five metatarsals and series of phalanges. These correspond with the elements of the fore leg as follows: femur to humerus; tibia to radius in front, and fibula to ulna behind.

cercal tail. In the dorsal and anal fins of the Teleostomi the basilar bones are usually wanting, but in some cases rudimentary; they are long in the anal fin of *Amia*. In *Polypterus* certain median fin rays are very elongate, and each supports a number of cartilaginous rays, the posterior from the end, but the more anterior from the posterior side, forming the horizontal dorsal pinnules of that genus. In higher fishes the interneurons, which support the dorsal, and the interhamals, that support the anal fin, are more numerous than the vertebrae they are opposite to. In many fishes there are interneurons between the cranium and dorsal fin which support no fin.

Horn cores are developed on the crania of various species of Mammalia, especially the *Eobasilidae* among Amblypoda, *Menodus* among Perissodactyla, and the *Boöidea* among Artiodactyla. They are permanent except in the *Cervidae* among ruminants, where they grow and are shed annually, leaving a basal portion, the burr, attached to the frontal bones. They are often of large size, and grow with incredible rapidity.

See Cope, *On Osteology of Fishes, Batrachia, and Reptilia, especially Lacertilia*; Cuvier, *Ossements Fossiles*; Flower, *Osteology of Mammalia*; Gegenbaur, *On Limbs and the Shoulder and Pelvic Girdles*; Huxley, *Elements of Comparative Anatomy*, and *Anatomy of Vertebrated Animals*; Kölliker, *The Development of the Vertebral Column*; Owen, *Anatomy of Vertebrate Animals*; Homologies of the Vertebrate Skeleton; Parker, *Anatomy of the Shoulder Girdle*; *Development of the Skull in the Ostrich Tribe, the Pig, Frog, Eel, and Salmon*; Vrolik, *On the Ossification and Bones of the Skull of the Teleostei*. E. D. COPE.

Osthoff, HERMANN: comparative philologist; b. at Billmerich, near Unna, in Westphalia, Apr. 18, 1847; educated at the gymnasium in Unna and at the Universities of Bonn, Tübingen, and Berlin; teacher at the gymnasium in Cassel 1871-74, privat docent in Leipzig 1875-77; Professor of Comparative Philology in the University of Heidelberg since 1877. His chief works are *Forschungen im Gebiete der indogerm. nominalen Stammbildung* (2 vols., 1875-76); *Das Verbum in der Nominalcomposition* (1878); *Morphologische Untersuchungen* (in collaboration with Karl Brugmann, 5 vols., 1878-90); *Zur Geschichte des Perfects im Indogermanischen* (1884); also many important articles in various scientific journals. He was one of the leading spirits of the neo-grammarians movement, and has contributed as much as any one to the establishment of the new theories of the Indo-European vocalism. His writings are aggressive and independent, often controversial, and they are always rich in suggestion and strictly scientific in method.

BENJ. IDE WHEELER.

Ostia: an old Roman town; on the left side of the mouth of the Tiber; about 14 miles S. W. of Rome. Ancient writers agree in stating that it was founded by Ancus Martius as a maritime station for his capital, but it was not until the wars with Carthage that it became important as a port for the introduction of foreign grain. From that time it grew rapidly, and was soon the principal commercial and naval station of the Romans. The harbor, however, was never a really good one, and in the reign of Claudius it was already shoaled up by deposits from the Tiber as to necessitate the construction of an artificial basin about 2 miles to the N. This was called *Portus Augusti*, afterward *Portus Trajani*; but the new town which grew up around it (*Portus* or *Portus Urbis*) never equaled the old one in size and opulence. Ostia began to decline with the declining empire, and early in the ninth century was a heap of ruins. Gregory IV. then tried to rebuild it, but without success; and later popes have made similar fruitless attempts. Fine statues and other works of art are often disinterred here, and excavations, which have been systematically carried on since 1855, have disclosed extensive warehouses and other commercial and public structures, whose foundations and lower stories remain to witness to the former greatness of this ancient city. Ostia was an episcopal see at the beginning of the fifth century, and the title bishop of Ostia and Velletri is now given only to the dean of the Sacred College, resident in Rome.

Ostracism [from Gr. *οστρακισμός*, ostracism, deriv. of *οστρακίζω*, banish by vote, ostracize, deriv. of *οστρακον*, shell, (used in voting)]; a form of temporary banishment which once prevailed in ancient Athens and some other Greek cities (Argos, Megara, Miletus). The Athenian senate and ecclesia having decided that ostracism was necessary in

the case of any citizen, the ten tribes voted upon the question in the agora. Each voter in favor of the ostracism presented a tablet or shard of burnt clay, on which was written the name of the person to be banished. If there were 6,000 votes for it, the person ostracized was obliged to leave the state within ten days and not return for ten years unless recalled. Ostracism was not a penalty for crime, but was employed against persons supposed to possess dangerous power. The exile retained his property and social position. In Syracuse the olive-leaf was used instead of the clay tablet, and the act of exile was called *petalism*.

Revised by J. R. S. STERRETT.

Ostrac'oda [from Gr. *οστρακον*, shell + *ειδος*, form]: an order of Crustacea, sub-class ENTOMOSTRACA (*q. v.*), embracing a few small aquatic forms, some living in the sea, others in fresh water. The most striking features in their structure are the presence of seven pairs of appendages, a short unjointed abdomen, the whole inclosed in a horny or even calcareous bivalve shell. These forms feed upon decaying animal matter and are abundant in stagnant water. Fossil forms occur in all formations since the Paleozoic. For an illustration, see article CYPRIS. The two principal genera are *Cypris* and *Cypridina*, the former of which has the power of reproducing parthenogenetically. See Brady, *Transactions of Linnæan Society of London* (xxvi.), and papers by Claus and Sars. Little has been done with the American species.

J. S. KINGSLEY.

Ostre'idæ [Mod. Lat., from *Ostre'a*, the typical genus, from Lat. *ostrea*, from Gr. *ὄστρεον*, oyster]: the family of Lamellibranch molluscs which includes the OYSTERS (*q. v.*). Among the characters separating it from the LAMELLIBRANCHIATA (*q. v.*) are the following: The mantle lobes are not united to each other, no siphon is formed, there is but a single adductor muscle for closing the shell, while the foot has disappeared. The shell is irregular in shape, the two valves being more or less unequal, and the hinge is without projections or teeth. Only one living genus, *Ostrea*, is recognized, while this and two others (*Gryphæa* and *Exogyra*) exist as fossils. The pearl oysters belong to a different family.

J. S. KINGSLEY.

Ostrich [from O. Fr. *ostruche* > Fr. *antruche*: Span. *aves-truz*: < Lat. *a'vis struthio*; *a'vis*, bird + *struthio* = Gr. *στρουθίων*, ostrich, deriv. of *στρουθός*, sparrow, bird]: the largest of living birds, belonging to the family *Struthionidæ* and order *Struthiones*, distinguished by its great size and by having only two toes on each foot. Its scientific name is *Struthio camelus*. The adult male ostrich stands nearly 8 feet high and weighs upward of 200 lb. The head is flattened, eyes large, neck and thighs practically bare, the wings small and useless. The plumage, including the wing and tail feathers, which furnish the large plumes of commerce, is loose and wavy. The males are glossy black with white wings and tail, the females and young are dirty gray: the



African ostrich (*Struthio camelus*).

chicks are striped. The ostrich inhabits the sandy plains of Africa from the Barbary States to Cape Colony, but in many places has been exterminated, or nearly so, for its feathers. In former days it was found over a considerable portion of Southwestern Asia, but is now practically restricted to Central Arabia. The ostrich is sometimes found in small troops, but more often, especially during the breed-

ing season, a male and from three to five females will be found together. The females lay their eggs to the number of about thirty in one nest, a shallow pit scooped in the sand, and during the day they are mostly left to the heat of the sun. At night the male sits on the eggs and they are rarely left unguarded in the daytime. A number of loose eggs are always found in the vicinity of the nest, it is said for the nourishment of the newly hatched young. The food of the



American ostrich (*Rhea americana*)

ostrich consists of grass, roots, and seeds, but lizards, insects, and other animal food are also eaten. The ostrich trusts to flight for protection, but can inflict a dangerous blow with its foot. Two or three species of ostriches have been described, but it is not yet clear whether these are good species or only geographical races. The egg of the northern bird is rough; that of the southern smooth.

Ostrich-farming is extensively carried on in South Africa, and to a far less extent in Northern Africa, South America, and Southern California. London is the chief market for ostrich feathers, and the annual sales amount to from 120,000 to 175,000 lb. The prices vary greatly; from \$200 per lb. for the best white plumes to \$7 for the young feathers. The name ostrich is frequently applied to the South American rhea. See RHEIDÆ.

F. A. LUCAS.

Ostrog': town; in the government of Volhynia, European Russia; 176 miles W. of Kieff (see map of Russia, ref. 8-C). Here the first Slavonic Bible was printed. Ostrog has a military school, a school for teachers, five churches, and a trade in wool, wood, leather, wheat, and flour. Pop. about 16,900, mostly Jews.

Ostrogoths: See GOTHs.

Ostrolen'ka (in Polish, *Ostroleka*): town; in the government of Lomza, Russian Poland; on the Narew. An encounter took place here Feb. 16, 1807, between the French under Savary and the Russians under Essen, in which the former were victorious. The place became still more famous by the battle which was fought here May 26, 1831, between the Poles under Skrzynecki and the Russians under Diebitsch. After a long and bloody contest the Poles were forced to retreat, but the Russians were unable to follow them on account of their own losses. Pop. 5,120.

Ostrov'skii, ALEKSANDR NIKOLAEVICH: dramatist; b. in Moscow, Russia, Mar. 30, 1824; d. June 2, 1886. Having begun to write while still a schoolboy, he first became known to the public by a couple of scenes which appeared in Moscow newspapers in 1847. Two years later he established his reputation with *Svoi Liudi sochtemsia* (We Get on with Our Own Kind), one of his best comedies. His pieces followed each other in rapid succession. After 1862, while still continuing with his comedies, he also composed dramatic chronicles in verse, which, however, do not rise to the height of real historical tragedy, and achieved only moderate success. Perhaps the best known of them are *Dmitrii Samonovets* (*Vasiliu Shaiskoi*) (1867) and *Vasileia Melentievna* (1868). Ostrovskii is very popular in Russia. He chose as the field of his descriptions the life and ways of the middle classes in Moscow, a part of society hardly above the peasants in intelligence, with customs and ideas still those of the Middle Ages, almost unaffected by Western European thought and culture. Among the best of his plays are *Bednaria Nevesta* (The Poor Bride, 1852); *Bednost in*

Porok (Poverty is not a Fault, 1853); *Dobrodutno Mesto* (A Profitable Place, 1857); *Groza* (The Storm, 1859); and *Goriachee Serdtsio* (A Warm Heart, 1869). He also was the author of many excellent single scenes and of several translations, especially a remarkable one of *The Taming of the Shrew*. His complete works were published at St. Petersburg (1887, 10 vols.). Three of his plays have been translated into French by Durand Greville. A. C. COCHRAN.

Ostrow'ski: the name of a celebrated family of Polish nobility, originally descending from the palatinate of Lublin. Among its most remarkable members was TOMASZ ADAM RAWICZ, Count Ostrowski, b. at Ostrow, Dec. 21, 1739. He took a very active part in the establishment of the constitution of May 3, 1791, and was appointed Minister of Finance, but resigned when the king shortly after joined the confederacy of Targowicza, and lived after the third division of Poland (1795) in retirement on his estates in the Ukraine. On the establishment of the duchy of Warsaw he was made grand marshal of the diet in 1809, and president of the senate Dec. 6, 1811. The Emperor Alexander I. also showed great confidence in him, and the Poles received their new constitution of 1815 from his hands. D. Feb. 5, 1817.—His son, ANTONI JOANNES, Count Ostrowski, b. at Warsaw, May 27, 1782, studied at the University of Leipzig; entered in 1806 the French body-guard; was made a member of the provisional government of the duchy of Warsaw; followed Napoleon to Dresden in 1813, and fought in the battle of Leipzig; entered the Polish senate after the death of his father, and opposed the arbitrary measures of the Grand Duke Constantine; was one of the leaders in the Polish revolution of 1830, fighting at last in the ranks on the walls of Warsaw, and wrote the manifesto which the last remnant of the Polish army issued (Oct. 4, 1831) to the kings and nations of Europe after crossing the Prussian frontier and laying down their arms. He afterward lived in France, and published *Le Panславisme moscovite* (1842). D. in Paris in 1847.

Osuna: an old, substantially but irregularly built town, in the province of Seville, Spain; 48 miles E. S. E. of the city of Seville; on a hill in a very fertile plain rich in wine, almonds, figs, and olives (see map of Spain, ref. 19-D). The castle of the Duke of Osuna is a large and magnificent building. There are manufactures of silk, linen, and leather. Pop. (1887) 19,376.

Osuna, PEDRO TELLEZ GIRON, Duke of: statesman; b. at Valladolid, Spain, in 1579; spent his childhood at Naples, where his grandfather was viceroy; was educated at Salamanca, and assumed the title of Duke of Osuna on his marriage with a daughter of the Duke of Alcalá. He was at first unpopular at the courts both of Philip II. and Philip III., and was twice exiled, but having gained military distinction in Flanders, where the twelve years' truce of 1609 was advised by him, he was restored to favor at the Spanish court. He became Viceroy of Sicily 1611, but was transferred to Naples 1616. In the latter office he won great popularity by his defense of the people against the oppressions of the nobility and clergy. He was subsequently suspected of conspiring with foreign princes to make himself independent in Southern Italy; was recalled 1620, and subjected to a long and secret trial for high treason. Though not convicted, he was retained a prisoner in the Castle of Almeida, where he died in 1624, either by suicide or poisoned by his wife.

Oswald, SAINT: King of Northumbria; b. about 604; son of Ethelfrid, who was killed in 617 by Redwald, King of East Anglia; resided some years thereafter an exile in Scotland (or Ireland), where he was converted to Christianity; came to the throne 634; made war upon Cadwalla, King of Wales, whom he killed in battle; introduced Christianity into Wales; married Cyneburg, daughter of the West Saxon king Cynegil, on condition of her embracing Christianity, and was killed at Maserfield Aug. 5, 642, by the heathen king Penda of Mercia. The events of his life as given by Bede and Aleuin are overgrown with miraculous legends, which were long popular, especially in Germany. He was canonized by the Roman Church.

Oswego: city; capital of Labette co., Kan. (for location, see map of Kansas, ref. 8-J); on the Neosho river, and the Mo., Kan. and Tex. and the St. L. and S. Fé railways; 13 miles S. by E. of Parsons. It derives good power from the river for manufacturing, and has several mills, a national bank with capital of \$60,000, a State bank with capital of

\$50,000, a private bank, and three weekly newspapers. Pop. (1880) 2,351; (1890) 2,574; (1895) 2,145.

Oswego: city; capital of Oswego co., N. Y.; on Lake Ontario, at the mouth of the Oswego river; at the northern terminus of the Oswego Canal; on the Del., Lack. and West., the N. Y., Ont. and West., and the Rome, Watertown and Ogdensburg railways; 35 miles N. N. W. of Syracuse, and 328 miles N. W. of New York city (for location, see map of New York, ref. 3-G). It is beautifully laid out on three large, low hills, thus having unsurpassed natural drainage. The streets have a uniform width of 100 feet and cross at right angles; the building blocks are 400 feet long by 200 feet wide; the paving is stone. The city has five large public parks, delightfully shaded, with an average area of 5 acres. It has fine national, State, municipal, and other buildings, including the U. S. custom-house, which contains the post-office and the U. S. court-room, a spacious city-hall, State armory, handsome new county-jail, one of the most commodious court-houses in the State, a U. S. life-saving station supplied with modern apparatus, and a new opera-house which cost \$100,000. Fort Ontario, on the east side of the river, commanding the entrance to the harbor, is a casemated structure, with moat and bastions, and is garrisoned by a company of U. S. infantry. It is one of the three fortifications that originally defended the city while a British possession. There are 20 churches, classified as follows: Methodist Episcopal, 3; Protestant Episcopal, Presbyterian, Baptist, and Lutheran, 2 each; Roman Catholic, 5; Congregational, Evangelical, Universalist, and African Methodist Episcopal, 1 each. Oswego is noted for her educational facilities, having a State Normal and Training School, five large brick public schools, and many smaller ones, all graded, besides several parochial and private schools and business colleges. The number of pupils enrolled in the public schools in 1893-94 was 3,425; in the parochial schools, 1,274. The city contains a public library (founded by Gerrit Smith in 1855) with over 20,000 volumes, and a city-school and a normal-school library. It has a hospital and asylums for homeless old ladies and orphans. In 1893 the total receipts of the city were \$318,404.77, and expenditures \$281,721.24, and the assessed valuations were, real estate, \$8,708,305; personal, \$793,860—total, \$9,502,165. There are 2 national banks, with a total capital of \$300,000, and 2 savings-banks with total deposits of about \$1,750,000, besides several aid and loan associations. The city has abundant water-power, supplied by the Oswego river, which divides it E. and W. and forms the outlet of a beautiful group of eleven lakes in Central New York. It has many manufacturing concerns, several of which are the largest of their kind in the U. S., such as starch-works, underclothing-factory, boiler-works, the Standard Oil Company's box-shops, malt-house, shade-cloth works, and a match-factory. Other large local industries are a book-binding, silver-plating works, car-building and repair shops, sash and blind factory, and extensive lumber-yards. Here are located the famous Deep Rock Mineral Springs. The paid fire department is one of the best equipped and most efficient in the State. Oswego is one of the chief ports of entry in the U. S. A vast outer harbor is formed by a breakwater, with parapet, over a mile long, and contains the D., L. and W. Railroad Company's immense coal-trestles. The old or inner harbor is formed by two piers at the river's mouth, and contains another large coal-trestle. These harbors protect several miles of wharfage and accommodate the largest vessels. Coal is the main article of export, and 538,751 net tons were shipped during the year ending June 30, 1893. There were received during the same period 45,034 net tons of grain and 170,000,000 feet of lumber. The total revenue collected for the year was \$284,058.60. A steamer runs three times a week from the city to the Thousand Islands during the pleasure season. Oswego has various outing clubs and a yachting club with a fine fleet, and is a noted fishing resort. There are 2 daily and 2 weekly newspapers. The city is one of the oldest settlements in the State, and was incorporated as a city in 1848. It was the last point to be surrendered by Great Britain to the U. S. Government. Pop. (1880) 21,116; (1890) 21,842; (1894) estimated, 25,000.

A. M. HALL, EDITOR OF "PALLADIUM."

Otaheite. ō-tā-hē-ī-tē: See TAHITI.

Ota'go [from Maori *Otakou*, red earth]: the most southern provincial district of the Middle island of New Zealand. Area, 25,487 sq. miles. The first settlement was made here

in 1847, and in 1851 the number of settlers had increased to 1,740; but in 1861 gold was discovered in several districts, and in two years the population swelled to 48,907, of whom only 500 were natives. The gold-fields now comprise an area of 2,500,000 acres, and in other directions the province has made great progress; it is being extensively cultivated, and its natural riches are rapidly developing. Pop. (1891) 153,097. Capital, Dunedin.

Otari'idæ [Mod. Lat., named from *Ota'ria*, the typical genus, from Gr. *ὠτάρης*, large-eared, deriv. of *ὠς*, *ὠτός*, ear]: a family of mammals of the order *Pinnipedia*, containing the sea-lions and fur-seals. The form is more like that of ordinary quadrupeds than in any other members of the order; the fore limbs are flippers, the hind limbs flexible forward; the head is bear-like; small linear ears are developed; the 34 or 36 teeth are present ($M. \frac{5-6}{5-5}$, $C. \frac{1}{1}$, $I. \frac{3}{2} \times 2$),

and the incisors of the upper jaw are notched; the anterior limbs are about as large as the posterior; their digits decrease in a curved line and are destitute of claws; the posterior feet have all their digits nearly coterminous, and are furnished with long flaps extending beyond the tips; the three middle toes are alone provided with claws. The family has been variously subdivided, but by naturalists in the U. S. is regarded as being represented by five genera, viz.: (1) *Zalophus*, (2) *Eumetopias*, (3) *Otaria*, (4) *Arctocephalus*, and (5) *Callotaria*. The first is represented on the coast of California as well as Japan and Australia; the second is restricted to the North Pacific. *E. stelleri* descending, however, as far as California; the third and fourth belong to the southern seas; and the fifth to the North Pacific. The first three are "hair-seals" and the last two "fur-seals." *Arctocephalus* is hunted for its fur at widely distant places; *Callotaria*, however, is only sought for to any extent on the Pribyloff islands, Alaska, and Commander islands, Kamchatka. Revised by F. A. LUCAS.

Otfried: poet; a Frank by birth; studied at Fulda under Hrabanus Maurus (822-847), and also under Salomon I., Bishop of Constance (839-871); went to St.-Gall, and was afterward monk in the Benedictine monastery at Weissenburg, Alsace. Here he wrote, with the avowed purpose of displacing the worldly songs of the people, his famous *Evangelienbuch*, a paraphrase in verse of the Gospels. The first part of his poem he sent to Hartmuat and Werinbracht, monks of St.-Gall, another part to Bishop Salomon, and the complete work he finally dedicated about 865 to King Louis, the German, and to Archbishop Liutbert of Mentz. In an extremely interesting letter, written in Latin to Liutbert, he speaks of the aim of his poem and of the difficulties he encountered with the German language while composing it. The poetical merit of Otfried's work is very small. As one of the most extensive documents of the Old High German period, which, moreover, was composed in rhymes, Otfried's *Evangelienbuch* is, however, of the greatest value for the study of the German language and of German metrics. For the didactic parts of his poem, which are very frequent, Otfried used the works of Hrabanus, Bede, and Alcuin. See the editions of Otfried by J. Kelle, P. Piper, and O. Erdmann; K. Lachmann, *Kl. Schriften*, i., 449. J. GOEBEL.

Othman or Osman I. GHAZI, the Victorious: founder of the empire and people, called from his name Ottoman or Osmanli; b. in 1259. After a romantic and adventurous youth, he succeeded his father, Ertogrul Shah, a Turkish chieftain, as principal commander of Alaeddin III., Seldjuk Sultan of Roum (1288). The Seldjuk empire falling to pieces (1299), Othman at Kara Hissar was proclaimed *Padi-shahi ali Osman*, Emperor of the Ottomans (1300). His kingdom comprised parts of Bithynia and Phrygia. Though his name was mentioned in the Friday prayer (one of the two distinctive attributes of sovereignty among the Mussulmans), he did not coin money or assume the title of sultan. His life was passed in petty but advantageous wars with the Byzantine empire, and in the organization of his conquests. Broussa was captured (1326) just before his death. He was brave, patient, sagacious, generous and frugal, and possessed the peculiar virtues and talents essential to the founders of empires.—**OTHMAN II.**: Ottoman sultan (1617-22); b. in 1604; succeeded Mustapha I. Though he was a warlike and intelligent prince, his reign was unfortunate, being convulsed by frequent rebellions of the janissaries and by a disastrous war with Poland. At the unsuccessful siege of Choczim 50,000 Ottomans perished. Imprudently threatening to suppress the janissaries, he was dethroned by them, and

strangled in the Seven Towers by the hands of the grand vizier, the first Ottoman sultan put to death by his subjects. —**OTHMAN III.**; Ottoman sultan (1754-57); b. in 1700; succeeded Mahmoud I. He was effeminate and soured by his long seclusion in the seraglio, but his reign was uneventful. E. A. GROSVENOR.

Othman or Osman-Ibn-Affan: third caliph of the Muslims; b. about 574; an early convert to Islam, a relative and secretary of the prophet Mohammed, whose daughters Rubiya and Um-Sul-sum he married. On the assassination of Omar (644) he was chosen caliph, mainly through the influence of the Korëish. During his caliphate the first authentic copy of the Koran was compiled (652), Armenia and Asia Minor were partially subdued (646), and Cyprus, Crete, Rhodes, and Cos conquered by the first naval expedition ever sent out by the Arabs (649); but his reign was distracted by numerous insurrections, which he could not put down. He was a feeble and incapable ruler, indulgent and despotic by turns, and often unjust. When he ordered Mohammed, the son of Abubekir, to be put to death, the latter marched upon Medina without opposition, and stabbed the caliph on the pulpit steps (655). E. A. GROSVENOR.

Otho: King of Greece; second son of Louis I., King of Bavaria; b. at Munich, July 1, 1815. Nominally chosen king by the Greeks (May 7, 1832) he was really appointed by France, Great Britain, and Russia, with scant regard to Greek aspirations. He married the beautiful Princess Amelia of Oldenburg, Sept. 22, 1836. Surrounding himself with Bavarians, insisting on German as the official language, despotic and reactionary in policy, he was soon detested by his subjects. The peaceful revolution of Sept. 14, 1843, forced the king to dismiss the foreigners and to grant a constitution, promulgated Mar., 1844. Its provisions he soon sought to evade or nullify. He gained a temporary popularity during the Crimean war by wishing to attack the Ottoman empire, but the Anglo-French fleet occupied the Piræus and prevented action. The popular hatred of his government soon returned, and showed itself in several attempts at insurrection, which were, however, easily crushed. The national outburst of Oct. 21, 1862, was successful. Boulgaris, Canaris and Kouffos formed a provisional government, and pronounced the deposition of the king, who returned to Bavaria, and died in obscurity at Bamberg, July 26, 1867. In Otho's behalf it may be said that British, French, and Russian intrigues at Athens complicated and increased his difficulties, and that the newly enfranchised Greeks were impatient of control. E. A. GROSVENOR.

Otho, MARCUS SALVIUS: Roman emperor from Jan. to Apr., 69 A. D. As a young man he was conspicuous as a companion of Nero, and a sharer in his revels; but the emperor's passion for the wife of Otho, Poppæa Sabina, was the cause of alienation, and finally of practical exile, Otho being sent to take charge of the remote province of Lusitania (Portugal). Here, on the revolt of the provinces against Nero, Otho joined the forces of Galba, hoping to be adopted by him, and thus designated as his successor. When, however, Galba adopted L. Calpurnius Piso, Otho by a daring stroke won over the prætorian guard, already somewhat disaffected, and was saluted by them as emperor. Galba and Piso were thereupon murdered by the guard, and on the same day the senate clothed Otho with the imperial dignities. Soon after his succession news was brought that Vitellius, commander of the legions on the lower Rhine, had been proclaimed emperor by his army, and that his forces were advancing on Rome to make good his claim. Otho with great promptness collected his forces, and met the advance of the enemy in the region of the Po. Here for a time his operations were successful, but, a portion of his army suffering defeat near Cremona, he lost heart, and put an end to his life. His brief reign gave promise of a liberal and vigorous administration.

GEORGE L. HENDERICKSON.

O'thoes (Egypt. *Tetù*): the name given by Manetho to the first king of the sixth Egyptian dynasty. According to Manetho (Africanus) Othoes-Teta ruled thirty years. He was the first king to assume the royal title, which was ever afterward customary. "Son of Ra." Particularly noteworthy is the fact that his pyramid at Saqqarah, opened in 1881, was one of those containing funeral texts, which have been published by Maspero (*Revue de l'égyptologie relatée à la philologie et à l'archéologie égyptiennes et assyriennes*, vol. v.). The name *Tetù* also belonged to the second king of the first dynasty, reported to have been a writer on medi-

cine and anatomy, and later to the sixth king of the third dynasty, who is called Tosertasis by Manetho.

CHARLES R. CHITTENDEN.

Otho of Freising: historian; b. about 1114; a grandson of Henry IV., and the uncle of Friedrich I.; was educated for the Church, studied in Paris, entered the Cistercian monastery of Morimund in 1130, and was in 1137 appointed Bishop of Freising. D. Sept. 21, 1158. He took an active part in the various theological and political movements of his age, but he is principally known as a historian. Between 1143 and 1146 he wrote a work (*De duabus civitatibus*), an imitation of the work of Orosius, and, like that, based on Augustine. Especially the last book of the work is of great interest. His *Gesta Frederici*, a work of still greater interest, he left unfinished. His works have been edited by Wilman (Hanover, 1884) and in *Mon. Hist. Germ.*

Otid'idæ [Mod. Lat., from *Otis*, name of a genus, from Lat. *otis* = Gr. *ὠτίς*, a kind of bustard with long ear-feathers, deriv. of *ὠτῆ*, *ᾠτός*, ear]; a family of birds containing the bustards, a group confined to the Old World. There are about twenty-five species, two of which occur in Europe, one in Australia, and the others in India and Africa. See BUSTARD. F. A. L.

Otis, FESSENDEN NOTT, A. M., M. D.: surgeon; born Ballston Spa, N. Y., May 6, 1825; graduated at the New York Medical College 1852; was resident assistant physician at Blackwell's Island Hospital 1852-53; surgeon to the U. S. M. Steamship Company 1853-60; surgeon of the New York police department 1861; lecturer on genito-urinary diseases at the New York College of Physicians and Surgeons 1862-71; superintending surgeon to Pacific Mail Steamship Company 1869-73; president of New York board of police surgeons 1870-72; surgeon to the Strangers' Hospital and president of its medical board 1871-73; Clinical Professor at the College of Physicians and Surgeons 1871; advisory physician to the Artists' Fund Society, and member of the medical board of the New York Charity Hospital 1873. He wrote *Land-scape Perspective and Animal Drawing* (1849), *History of the Panama Railroad and the Pacific Mail S. S. Co.* (1861), and numerous monographs on urethral and syphilitic diseases, and invented a number of surgical instruments.

Revised by S. T. ARMSTRONG.

Otis, GEORGE ALEXANDER, M. D.: surgeon; b. in Boston, Mass., Nov. 12, 1830; graduated at Princeton 1849, and at the medical department of the University of Pennsylvania 1851; studied surgery two years in London and Paris; established *The Virginia Medical Journal* 1853; entered the U. S. army in 1861 as surgeon; was assigned to duty July, 1864, in the office of the surgeon-general at Washington; published monographs on *Amputation of the Hip Joint* (1867) and *Excisions of the Head of the Femur for Injury* (1869); prepared in 1871 a *Report of Surgical Cases treated in the Army of the United States from 1867 to 1871*, forming a quarto volume; and in 1872 edited the surgical volume of the first part of the *Medical and Surgical History of the War*. He was curator of the Army Medical Museum at Washington. D. in Washington, D. C., Feb. 23, 1881.

Otis, JAMES: political leader; b. in West Barnstable, Mass., Feb. 5, 1725; graduated at Harvard College 1743; studied law with Jeremiah Gridley, and began practice at Plymouth 1746; removed to Boston 1750; published in 1760 *Rudiments of Latin Prosody*; in 1761, when advocate-general of the admiralty, refused to argue in favor of the writs of assistance, and resigned his office to plead the people's cause; in 1762 was elected to the State legislature, and in 1765, on his motion, the Stamp Act congress met in New York, to which he was a delegate. His speeches and pamphlets placed him at the head of the patriotic party in Massachusetts; in 1769 he denounced in print the commissioners of customs, and on Sept. 9, meeting one of the commissioners in a coffee-house, he was attacked, and received a cut on his head which led to derangement; took part, however, in the battle of Bunker Hill; retired to Andover, where he was killed by lightning May 23, 1783. His published works include *Vindication of the Conduct of the House of Representatives* (1762); *Rights of the British Colonies asserted* (1765); and *Consideration on Behalf of the Colonists* (1765).

Otomis, or **Othomis**: a tribe of Indians inhabiting the mountain regions of the states of Querétaro, Hidalgo, and Guanajuato, with scattered bands in several other states of Mexico. They have been established in their present seats

from time immemorial, and occupied the valley of Mexico before the Toltecs and Aztecs. At present they maintain no tribal organization, are Mexican citizens, and usually speak Spanish in addition to their own language, which is one of the harshest and most guttural of all Indian dialects. It consists in a great measure of words of one or two syllables only, whence it has erroneously been supposed to belong to a different linguistic family from the neighboring tribes, and unsuccessful efforts have been made to connect it with the Chinese. Several catechisms and devotional works have been printed in Otomi, the best-known grammar being that of Neve y Molina (Mexico, 1767).

Otranto. DUKE OF: See FOUCHÉ.

Otranto, Terra di: See LECCE.

Otsego Lake: a body of water in Otsego co., N. Y.; $7\frac{1}{2}$ miles long, $1\frac{1}{4}$ broad, 1,193 feet above tide; the source of the main fork of the Susquehanna river. Its waters are clear and abound in fish. Cooperstown stands at its outlet.

Otsu: a town and garrison-station of Japan; at the southern end of Lake Biwa; about 7 miles from Kioto; the seat of government of the Shiga prefecture (see map of Japan, ref. 7-C). In a monastery on the hill is a famous bell, said to have been stolen by Benkei, the Japanese Hercules, in the twelfth century. On the western border of the lake, about 3 miles off, is the famous pine-tree of Karasaki, of extraordinary age and size. J. M. D.

Ottawa: city; capital of the Dominion of Canada, and of Carleton County, Province of Ontario; at the junction of the Ottawa, the Rideau, and the Gatineau rivers: on the Rideau Canal, and the Canadian Pacific, the Canada Atlantic, the St. Lawrence and Ottawa, the Ottawa and Gatineau Valley, the Pontiac and Pacific Junction, and several branch railways; 95 miles N. E. of Kingston, 120 miles W. of Montreal, 450 miles N. by W. of New York city (for location, see map of Ontario, ref. 2-H). It is on the south bank of the Ottawa river, from which it rises by a succession of bluffs to Parliament Hill, 160 feet above tide-water, on which the principal Government buildings have been erected, and is bisected by the Rideau Canal. The scenery at every turn is very beautiful, comprising a grand display of architectural skill, river, mountain, and forest attractions, and two picturesque waterfalls, Chaudière, on the W. of the city, and Rideau, about a mile E. of the center of the city. The city is laid out in wide and regular streets, which are ornamented with shade trees and drinking fountains, and is lighted with gas and electricity. It has an improved drainage system, and a water-works plant completed in 1874 at a cost of over \$1,000,000, which brings water from an intake, some 3,000 feet above Chaudière Falls, to the city by direct pumping, rendering a reservoir unnecessary. There are a number of public parks and squares, including Parliament Hill and Major's Hill, both under control of the Federal Government; Lansdowne Park, on the Rideau Canal; Cartier Square, containing a brick drill-hall, used as a parade-ground by the local militia and as an athletic field by various societies; and Rockcliffe Park, a short distance N. E. of the city, which has become a popular place of recreation and a hot-weather resort. The city is connected with the various suburban towns and resorts by electric street-railway.

The most notable of the public buildings are those built on three sides of a quadrangle on Parliament Hill. They comprise the Parliament building, the Eastern Departmental building, the Western Departmental building, and the Langevin block, the latter on Wellington Street, nearly facing the Parliament building. They are separate buildings, almost pure Gothic in architecture, and with walks and drives occupy an area of 30 acres. The main building, used by the Senate and House of Commons, has a tower over 220 feet high, and the library building, in the rear of the main structure, is octagonal in shape, with a circular interior 290 feet in diameter. The Langevin block was erected in 1883 at a cost of \$787,000, and the total cost of the Government buildings up to 1892 was about \$5,000,000. Other Federal buildings are those occupied by the Supreme and Exchequer Courts, the geological and natural history survey, and the national art gallery and fishery exhibit, and the Cartier Square drill-hall. About a mile and a half from the Parliament building is Rideau Hall, in a domain of 78 acres, the official place of residence of the governors-general of the Dominion. The public buildings of the municipality include the city-hall, which cost \$90,000; the court-

house and jail, the normal and model schools, the University of Ottawa, the Collegiate Institute, the post-office and custom-house, Orphans' Home, Home for the Aged, Carleton Protestant Hospital, General Hospital, Lady Stanley Institute for training nurses, Home for Convalescents, and the Rideau and Athletic clubs.

Ottawa is the seat of an Anglican bishopric and of a Roman Catholic archbishopric, and has thirty-five churches, representing almost every Christian denomination. At the head of the educational institutions is the University of Ottawa, which was founded as a college in 1848, made a university in 1866, and raised by the pope to the rank of a Roman Catholic university in 1889. There are also a model and normal school, a collegiate institute, the Coligny Young Ladies' College, a number of nunneries and convents, the Harmon School, and a number of public and private institutions. There are ten chartered banks, or branches of banks, with an aggregate paid-up capital of \$38,745,960, and a reserve of \$14,362,033.

Abundant water-power for manufacturing purposes is furnished by the Ottawa river, which is augmented in the vicinity of the city by the Rideau, the Gatineau, the Du Lievres, the Black, the Bonnechère, the Rouge, and the Mattawa rivers. The industrial establishments comprise paper-mills, railway car and repair shops, indurated ware, woodenware, match, carriage, stove, and furniture factories, foundries, planing and flour mills, and granite-works. The Ottawa valley contains a large and seemingly inexhaustible supply of timber, and its development has made the city one of the largest lumber-markets in the world. The first sawmill at Chaudière Falls was erected in 1853, and in that year was cut the first lumber exported from this district to the U. S. The sawed lumber trade has since increased to such an extent that the capacity of the mills within the city limits alone is about 200,000,000 feet per season. In 1892 the customs receipts aggregated \$367,629, the imports \$3,741,201, and the exports \$1,942,051; and in 1893 the civic assessments were \$18,616,985. The papers and periodicals in 1894 comprised 4 daily, 3 semi-weekly, 3 weekly, 1 semi-monthly, and 4 monthly publications.

Ottawa was founded in 1826, when the construction of the Rideau Canal was begun under Lieut.-Col. By, of the Royal Engineers, and was known as Bytown till 1854, when it received a city charter under its present name. In 1858 it was selected to be the permanent seat of government of united Canada, and in 1867 it was made the capital of the Dominion. Pop. (1881) 31,307; (1891) 44,154; (1893) estimated with Hull, on the opposite or Quebec side of the river, 61,265, of which a large proportion is French and Roman Catholic. McLEOD STEWART.

Ottawa: city (settled in 1830, incorporated as a village in 1838 and as a city in 1853); capital of La Salle co., Ill. (for location, see map of Illinois, ref. 3-E); at the confluence of the Illinois and Fox rivers; on the Illinois and Michigan Canal, and the Burlington Route, and the Chi., Rock Is. and Pac. railways; 83 miles W. S. W. of Chicago, 98 miles E. of Rock Island. It is in a region abounding in coal, brick and pottery clay, and cement and glass-sand, has exceptional transportation facilities, and ships large quantities of grain, produce, and general merchandise. The city occupies a beautiful site, and is tastefully laid out, having several public parks, one of which, South Park, contains a noted medicinal spring. There are gas and electric lights, electric street-railway, sewerage system completed in 1892, water-works supplied by over 150 artesian wells and by suburban springs, 12 churches, 7 public-school buildings, including a high school, public-school property valued at \$100,000, St. Francis Xavier's Academy, a driving-park association, 2 national banks with combined capital of \$200,000, a private bank, 5 libraries (High School, Illinois Law, Odd Fellows', Reddicks Public, and Young Ladies' Temperance Union) containing about 20,000 volumes, and 3 daily and 8 weekly newspapers. The manufactures include window-glass, glass bottles, lamp-chimneys, pottery, drain-tile, sewer-pipe, fire-brick, tile-roofing, organs, cigars, carriages and wagons, agricultural implements, flour, saddlery and harness, pumps, and lumber. Pop. (1880) 7,834; (1890) 9,985.

Ottawa: city; capital of Franklin co., Kan. (for location, see map of Kansas, ref. 6-J); on the Marais des Cygnes river, and the Atch., Top. and Santa Fé and the Mo. Pac. railways; 27 miles S. of Lawrence, 53 miles S. W. of Kansas City, Mo. It is the seat of Ottawa University (Baptist, chartered in 1860), and has 2 national banks, a private bank,

2 libraries (public and university) containing over 5,500 volumes, a new court-house that cost \$50,000, and a daily, 4 weekly, and 2 monthly periodicals. Ottawa has railway repair and machine shops, flour-mills, castor-oil and linseed-oil mills, sorghum, sugar, and sirup factories, grain elevators, foundry, and soap and furniture factories. Pop. (1880) 4,032; (1890) 6,248; (1895) 7,059. EDITOR OF "REPUBLICAN."

Ottawa: village; capital of Putnam co., O. (for location, see map of Ohio, ref. 3-D); on the Cin., Ham. and Day, and the Findlay, Ft. Wayne and West. railways; 50 miles S. W. of Toledo. It is in an agricultural, lumbering, and stock-raising region, and has several flour and saw mills, a private bank, and three weekly newspapers. Pop. (1880) 1,293; (1890) 1,717.

Ottawa Indians: See ALGONQUIAN INDIANS.

Ottawa River: in Canada; is the boundary between the provinces of Ontario and Quebec (except in the very lowest parts of its course). It rises on the divide between the basin of the St. Lawrence and Hudson Bay, and flows S. E. and E., communicating with the St. Lawrence at the west end of Montreal island. It sends off the Rivière des Prairies, between Montreal island and the Isle Jésus, N. of which the Ottawa flows, finally joining the St. Lawrence below the island of Montreal. It has numerous rapids, some of which are flooded out by dams and others surmounted by canals. It is a noble stream and has a heavy trade in lumber. Its cataracts afford very great and well-utilized water-power. It is navigated by steamboats and canal-boats. It is connected with Lake Ontario by the Rideau Canal. Its valley contains much fertile land and is rapidly filling with settlers. Length, 791 miles.

Ottendorfer, OSWALD: journalist; b. at Zwittau, Moravia, Feb. 26, 1826; studied law at Prague and Vienna; settled in New York 1850; became an editor of the *New Yorker Staats-Zeitung*, and subsequently its manager and proprietor. Under his auspices it became one of the leading German-American papers and a prominent advocate of the interests of the Democratic party. As president of the German Reform Association Mr. Ottendorfer took a leading part in the exposure of dishonesty in the city government in 1871, at which time his paper assumed an independent attitude in politics; was alderman 1872-74, and was an independent candidate for mayor 1874. He built and endowed an educational institution in his native town, founded a home for aged and indigent men on Long Island, and established the Ottendorfer free library in New York city.

Otter: a long-bodied, short-legged animal, with a small, flattish head, long, stout, rounded or slightly flattened tail. Otters are carnivorous mammals, belonging to the family *Mustelide* and sub-family *Lutrine*. Most species have sharp nails and webbed feet, but those of the genus *Aonyx*, found in Africa, Java, and Sumatra, have the webs small and the nails short or even lacking on some toes. The general color of the long outer coat of hair is a rich brown; the under fur, which in northern species is thick and valuable, is much lighter. Otters are aquatic in their habits, dwell in burrows by the water, and feed on fish. They are fond of sliding down-hill on the snow or mud banks. The common European otter (*Lutra vulgaris*), which is found throughout a great part of Europe and Asia, attains a length of 3 ft. 6 in. and a weight of 18 to 24 lb. The North Amer-



American otter (*Lutra canadensis*)

ican species (*Lutra canadensis*), which occurs in favorable localities from Florida to Canada and from Maine to Alaska, is sometimes 4 ft. 6 in. long. Various species of otters

inhabit South America, Africa, Asia, and Japan, but the coat of the tropical species is short and commercially of little or no value. In India and China otters are trained for fishing. The sea-otter (*Enhydra lutris*), the sole member of the sub-family *Enhydrina*, is a marine species, found from California northward through the Aleutian island to Kamchatka and the Kurile islands. It is a bulky animal, distinguished by its short head, large flattened hind feet, and short tail. It attains a length of 4 feet, feeds on crabs, shellfish and sea-urchins, and is strictly aquatic, being often found in the open sea, sleeping and rearing its young in the water. The fur of this animal, which is very thick, soft, and dark-colored, is extremely valuable, good skins bringing \$400 to \$600. Owing to this value the animal is much hunted, has become very scarce and is, at least on the American coast, threatened with extermination. F. A. LUCAS.

Otterbein, PHILIP WILLIAM: founder and bishop of the United Brethren in Christ; b. at Dillenburg, Germany, June 4, 1726; entered the Reformed ministry in 1749; went in 1752 to North America as a missionary; labored especially in Pennsylvania and Maryland; founded his new church near Frederick, Md., 1800; was chosen bishop; toiled with great earnestness and success. D. at Baltimore, Nov. 17, 1813. He was a man of learning and piety. See UNITED BRETHREN IN CHRIST, and his *Life*, by A. W. Drury (Dayton, O., 1884).

Otterbein University: the oldest institution of learning under the charge of the United Brethren in Christ; at Westerville, O.; 12 miles N. of Columbus. It was founded in 1847, and chartered with university privileges. There are three buildings at present: the main college building, 170 feet by 109, two and four stories high; Saum Hall, a ladies' dormitory; and the Conservatory of Music. Its new Christian Association building is the first of its kind in the State. The endowment is \$90,000. There are four strong literary societies with elegantly furnished halls. The library contains about 6,000 volumes. There are two courses, the classical and philosophical, with three years of preparatory instruction. The faculty consists of eleven regular professors and four instructors. The institution has 300 students and some 400 alumni. In addition to the preparatory and the regular college class, there are post-graduate, normal, art, and music departments. The president, Thomas J. Sanders, A. M., Ph. D., was inaugurated June, 1892. T. J. SANDERS.

Otter Creek: a stream which rises near the south border of Rutland co., Vt.; flows through Rutland and Addison Counties, and reaches Lake Champlain at the town of Ferrisburg. It is 90 miles long, affords good water-power, and is navigable 8 miles to Vergennes.

Otto, WILHELM LUITPOLD: King of Bavaria; b. Apr. 27, 1848; succeeded to the throne June 13, 1886, on the death of his brother, Ludwig II.; but as he was mentally incapacitated for governing, the rule continued in the hands of Prince Luitpold, who had been appointed regent three days previously.

Ottocar II.: King of Bohemia from 1253 to 1278; b. about 1230, a son of Wenceslas I.; revolted against his father, but was defeated, and imprisoned for some time. He acquired Austria and Styria by marriage; made a crusade, after succeeding to the throne of Bohemia on the death of his father, against the heathen Prussians; conquered their country and founded Königsberg; defeated the Hungarians on the Marchfeld in 1260, and took possession of parts of Hungary; inherited Carniola and Carinthia in 1269, and ruled with vigor and intelligence his vast empire, which stretched from the Baltic to the Adriatic, and from the Inn, Bavaria, to the Raab, Hungary. In 1273 he opposed the election of Rudolph of Hapsburg as Emperor of Germany, and refused to acknowledge him; the consequence was a war, in which Ottocar was defeated and compelled to cede Austria, Styria, Carniola, and Carinthia. Once more he tried his fortune against Rudolph, but was again defeated, and fell in the battle of Jedenspeng, Aug. 26, 1278. In his internal government he strove to break the power of the feudal lords and encouraged industry and commerce.

Ottoman Empire: See TURKEY.

Otto of Roses: See ATTAR OF ROSES.

Ottumwa: city; capital of Wapello co., Ia. (for location, see map of Iowa, ref. 7-I); on the Des Moines river, and the Burlington Route, the Chi., Ft. Mad. and Des M., the Chi., Mil. and St. P., the Chi., Rock Is. and Pac., the Ia. Cent. and the Wabash railways; 75 miles N. W. of Burlington. It is in the center of the Iowa coal-fields, derives abundant

water-power from the river, and from the extent and variety of its manufactures has become known as "the Lowell of Iowa." The surface rises in terraces from the river to the summit of the bluff, and all the railways enter the city along the river-front. The city contains a U. S. Government post-office building, court-house that cost \$150,000, 8 public-school buildings, public-school property valued at over \$175,000, high school library, city library, 3 national banks with combined capital of \$420,000, 2 savings and 1 State bank with capital of \$250,000, and 5 daily and 8 weekly periodicals, an opera-house—one of the finest in the State—a union railway station, several large wholesale houses, a Y. M. C. A. building that cost \$40,000, and a \$50,000 Episcopal church in course of erection. There are gas and electric light plants, water-works, electric street-railway, a steam-heating plant for residences and business buildings, and foundries, pork-packing establishments, starch-mill, oil-mill, iron-works, ruffler-works, bridge-works, fine office-furniture, and other factories. The city has a large trade, especially in coal. Pop. (1880) 9,004; (1890) 14,001; (1895) 16,761.

R. H. MOORE, EDITOR OF "DEMOCRAT."

Otun'ba: a town of the republic and state of Mexico; 35 miles N. E. of Mexico city; on the railway to Vera Cruz (see map of Mexico, ref. 6-H). It was the ancient Indian *pueblo* of Otompan; Cortés, after his retreat from Mexico, defeated the Aztec forces here July 8, 1520. Pop. about 500. H. H. S.

Otway, THOMAS: dramatist; b. at Trotton, Sussex, England, Mar. 3, 1651; was educated at Winchester and Christ Church, Oxford; became an unsuccessful actor; served for a time as cornet in the Low Countries; and then returned to London and wrote for the stage. His most successful plays were *Don Carlos* (1676); *The Orphan* (1680); *Caius Marius* (1680); *The Soldier's Fortune* (1681); *The Atheists* (1684); and especially *Venice Preserved* (1682), one of the best historical tragedies. D. in London, Apr. 14, 1685.

Revised by H. A. BEERS.

Oude, or **Oudh**. owd: a province of British India, forming with the Northwest Provinces one of the thirteen local government and administrative divisions; bounded S. by the Ganges and N. by Nepal. It consists of a large plain watered by the Goggra, Gumti, Sye, and other tributaries of the Ganges. Area, 24,217 sq. miles; pop. (1891) 12,650,831, mostly Hindus. The soil is extremely fertile and well cultivated; all the choicest products of India grow in abundance. The inhabitants are very warlike; they serve in all Indian armies, and formed the famous Sepoy regiments in 1857. Capital, Lucknow.

Oudenarde: See AUDENARDE.

Oudinot, oo'déé nō', CHARLES NICOLAS, Duke of Reggio: marshal of France; b. at Bar-le-Duc, in the department of Meuse, France, Apr. 26, 1767; was commander of a battalion in 1792, brigadier-general in 1794, general of division in 1799, and distinguished himself especially in the battle of Friedland and at Wagram, when he was made a marshal and created duke. His greatest feat was his maneuver in order to protect the crossing of the Beresina in 1812. In the battle of Leipzig he was wounded, but recovered soon, and remained faithful to Napoleon to the very last. During the Hundred Days he stayed on his estates. After the Restoration he was made a peer of France and commander of the national guard. In 1823 he led the First Corps during the invasion of Spain. D. in Paris, Sept. 13, 1847.—His son, NICOLAS CHARLES VICTOR: b. Nov. 3, 1791; general in 1835; commanded in 1849 the expedition against the Roman republic, and compelled the city of Rome to unconditional surrender July 2. He protested in the chamber of peers against the *coup d'état*, and was imprisoned, but shortly after was restored to liberty. D. July 7, 1863.

Ouida: See DE LA RAMÉ.

Quimet, JOSEPH ALDERIC, LL. B., Q. C.: statesman; b. at St. Rose, P. Q., May 20, 1848; graduated LL. B. at Victoria College in 1869, and was admitted to the bar in 1870. He commanded a battalion during the Northwest rebellion campaign in 1885, and is chairman of the council of the Dominion Rifle Association. He has been a member of the Parliament of Canada since 1873; was Speaker of the House 1887-91; and May 20, 1891, was appointed a member of the Queen's Privy Council for Canada. N. M.

Oulachan, Eulachon [native (Amer.-Ind.) name], or **Candle-fish**: a fish of the smelt family (*Argentinidae*), resembling the smelt and the capelin. Its scientific name is *Thaleichthys pacificus*. In the spring the oulachan enters in great shoals the harbors and floods of British Columbia

and Washington to spawn. The Indians take the fish in immense quantities for food and oil. The fish consist almost entirely of fat. A fish with a strip of bark drawn through it serves as a candle. The oil of the oulachan has been proposed as a substitute for cod-liver oil, but at ordinary temperatures it is white and solid like butter. It is one of the most delicately flavored and delicious of all food-fishes.

Revised by D. S. JORDAN.

Oulless, oo-less', WALTER WILLIAM: portrait-painter; b. at St. Heliers, Jersey, Sept. 21, 1848; became a Royal Academician 1881; was awarded a second-class medal at the Paris Exposition of 1878; third-class medal 1889. He is one of the most noted British portrait-painters. Studio in London. W. A. C.

Ounce [from Lat. *un'cia*, a twelfth, especially of a pound or foot (whence O. Eng. *ynce* > Eng. *inch*)]: in troy weight, one-twelfth of a pound, or 480 grains; in avoirdupois weight, one-sixteenth of a pound, or 437½ grains troy. In the U. S. the apothecaries' ounce is the troy ounce; in Great Britain it is now the avoirdupois. In the U. S. the fluid ounce is one-twelfth of a wine-pint, in Great Britain the twelfth of an imperial pint.

Ounce [from Fr. *once*: Span. *onza*: Ital. *lonza* (the *l* may have been dropped in Fr. and Span. from confusion with fem. def. artic. *la*, *l'*) < Lat. *lynx* = Gr. *λύξ*, whence Eng. *lynx*]: a large cat (*Felis uncia*) of Northern India and Tibet, resembling the leopard, but lower, rougher, paler, and with a longer and more hairy tail, a thicker fur, and more irregular spots. In parts of South America the jaguar is called the ounce.

Revised by F. A. LUCAS.

Ouray: town (founded in 1876 and named after a chief of the Ute Indians); capital of Ouray co., Col. (for location, see map of Colorado, ref. 5-B); on the Uncompahgre river, at the foot of Mt. Hayden, on the Denver and Rio Grande Railroad; 15 miles N. of Silverton, 400 miles S. W. of Denver. It is in a region of grand scenery, at an elevation of 7,200 feet above sea-level; is the natural outlet for the extensive gold and silver products of the region, and is widely known as a resort for invalids because of its hot springs. It contains four churches, a national bank, a private bank, a miners' hospital, and a weekly newspaper. The entire expenses of the town are paid from high-license saloon fees. Pop. (1880) 864; (1890) 2,534.

EDITOR OF "SILVERITE-PLAINDEALER."

Ouro Preto, ō'rō-prā'tō, formerly **Villa Rica**: a city; capital of the state of Minas Geraes, Brazil; about 160 miles N. of Rio de Janeiro, with which it is connected by railway; 3,400 feet above the sea (see map of South America, ref. 6-G). It is irregularly built on hilly ground, but many of the more modern houses are well constructed and handsome. There is a thriving trade with the coast, principally in agricultural products, cheese, etc. The climate is very variable and at times insalubrious; rains and heavy fogs are frequent through the year. The place was formerly celebrated for its rich gold mines, and the hills are honey-combed with old works, most of which have been abandoned. Pop. (1892) about 20,000.

HERBERT H. SMITH.

Ouse, ooz: a river of England; flows into the Trent and forms the estuary of the Humber. Its entire length is 60 miles; it is navigable from York, 45 miles from its junction with the Trent.

Ousel: See OUZEL.

Ouseley, ooz'lē, Sir FREDERICK ARTHUR GORE: musician; son of Sir Gore Ouseley, ambassador to Persia; b. in London, England, Aug. 12, 1825; graduated at Oxford 1846; was curate of a London church 1849-51; became precentor of Hereford Cathedral 1855, and incumbent of St. Michael's, Tenbury, Worcestershire, 1856; distinguished for his attainments in music as a science; took an active part in establishing St. Michael's College, Tenbury, of which institution he was warden; became Professor of Music in Oxford University 1855; author of several esteemed anthems, a *Treatise on Harmony* (1869), a *Treatise on Counterpoint and Fugue* (1869), and a *Treatise on Musical Form and Composition in General*, which are considered valuable contributions to musical literature, and editor of several collections of ancient and modern cathedral music: *Cathedral Services* (1853), *Anglican Psalter Chants* (1872, in conjunction with Dr. Monk), etc. D. in Oxford, Apr. 6, 1889.

Ouseley, Sir WILLIAM, LL. D.: Orientalist; b. in Monmouthshire, Wales, in 1771; became cornet of dragoons

1788; left the army 1794; engaged in the study of Oriental languages at Leyden; published *Persian Miscellanies* (1795), *Oriental Collections* (3 vols., 1797), numerous other works on similar subjects, and translations from Oriental writers; was secretary to his brother, Sir Gore Ouseley, in his embassy to Persia 1810-12; published *Travels in Persia* (3 vols., 1819-23); brought to England valuable collections of Oriental literature. D. in England in 1842.—His brother, Sir GORE OUSELEY (b. about 1768; d. 1844), long a prominent member of the diplomatic corps, was a distinguished Oriental scholar and collector of manuscripts; author of a posthumous work, *Biographical Notices of Persian Poets* (1846).

Ouseley, Sir WILLIAM GORE, K. C. B., D. C. L.: diplomat; eldest son of Sir William; b. in London, England, July 26, 1797; entered the diplomatic service at an early age; was connected with the British legation at Washington in 1825, when he married a daughter of Gov. Cornelius P. Van Ness, of Vermont; filled difficult and responsible diplomatic posts in Rio de Janeiro, Buenos Ayres, Montevideo, and Asuncion during the wars originated by the dictator Rosas 1832-51; was employed on special missions in Central America and in the U. S. 1857-58; was author of *Remarks on the Statistics and Political Institutions of the United States* (1832); *Notes on the Slave Trade* (1850); *Views in South America, from Original Drawings* (1852); and many miscellaneous, political, and geographical writings. D. in London, Mar. 6, 1866.

Outagamie or Fox Indians: See ALGONQUIAN INDIANS.

Outlaw and Outlawry [*outlaw* is O. Eng. *ūtlaga*, outlaw; *ūt*, out + *lagu*, law]: in English law, an outlaw is one who has been placed out of the protection of the law on account of willfully avoiding the execution of legal process; and outlawry is the act or process by which he is deprived of the protection of the law. Outlawry has existed in England from ancient times, both in civil and in criminal proceedings, being first used, however, in criminal actions, no one being subject to be outlawed except for felony until some time after the Norman conquest. It was extended from cases of felony to misdemeanors and to civil cases, and is still applicable in criminal proceedings of every kind. In civil cases, originally, a person could be outlawed only in actions of trespass *vi et armis*, in which alone the defendant was then liable to arrest, but subsequently outlawry in civil cases was extended by statute to other actions, and it was used either to enforce the appearance in court of a person against whom a suit had been instituted or to enforce the payment of a judgment.

The process of outlawry in civil cases was early a means of oppression, and acts were passed in the reign of Elizabeth and later to prevent secret outlawries and to facilitate the reversal of outlawries; and the process was finally abolished by the Common Law Procedure Act of 1852, and by the Civil Procedure Acts Repeal Act of 1879. In criminal proceedings it is now but little used, but its existence is recognized by 33 and 34 Vict., c. 23, which act abolishes forfeiture for felony, but expressly provides that nothing therein shall affect the law of forfeiture consequent on outlawry. In some of the U. S. it has been retained as applicable in certain criminal cases, as in prosecutions for treason; but it is so seldom resorted to that it may be said to be wholly disused. Outlawry in civil cases has never existed in the U. S.

The mode of procedure in criminal and civil cases is practically the same. If summary process was issued against the defendant and failed to cause him to appear, and if the sheriff was unable to find the defendant and apprehend him upon the regular writs of arrest, a special writ was issued requiring proclamation to be made in five county courts successively that the defendant should surrender himself; and if the defendant then failed to appear, he was declared an outlaw. If afterward he publicly appeared he might be arrested and committed until the outlawry were reversed. A reversal in civil actions, where outlawry was resorted to to compel the defendant to appear, could readily be obtained upon any plausible cause, however slight, since the only object of the outlawry was to compel the appearance; but in outlawry to enforce a judgment a reversal could be had only upon satisfaction of the judgment.

Effect of Outlawry.—The maxim applicable to outlaws is, "Let them be answerable to all, and none to them." They are therefore liable upon all causes of action existing against them, but can not maintain actions for redress of injuries to them, nor are they deemed to have any legal rights enforceable by a suit at law. Anciently an outlawed felon was said

to have a wolf's head (*caput lupinum*), so that any one might kill him as he would a wolf. A different rule, however, was early established, and the life of the outlaw could be lawfully taken only by a sheriff with a warrant.

Outlawry in cases of treason or felony is deemed equivalent to conviction and attainder for the offense charged, and is attended by the same penalties of forfeiture which formerly attached to such convictions; viz., in case of treason, a forfeiture of all his property, both real and personal; and in felony, a forfeiture of goods and chattels and of the profits of his freehold estates in land during his life. (See FORFEITURE.) In civil cases and in cases of misdemeanor outlawry entailed the forfeiture of goods and chattels immediately and absolutely to the crown, and of chattels real and profits of real estate upon inquisition during the life of the outlaw. The plaintiff was permitted by the crown to collect his debt from the forfeited property of the outlaw. For further details, see Archbold's *Criminal Pleadings*; Daniel's *Chancery Practice*; Legge's *The Law of Outlawry* (London, 1779); Blackstone's *Commentaries*. F. STURGES ALLEN.

Outram, oo'trām, Sir JAMES, G. C. B.: soldier; b. in Derbyshire, England, Jan. 29, 1803; educated at Marischal College, Aberdeen; entered the military service of the East India Company 1819; distinguished himself in campaigns in Khandesh and against the wild Bhil tribes, from whom, after the peace, he formed an irregular military corps; pursued a similar policy respecting some rebel chiefs in Gujerat; was aide-de-camp of Sir John Keane in the Afghan war; took part in the capture of the Beluchi stronghold of Kelat, and, disguised as a native devotee, rode through the Bolan Pass, then held by the enemy, and conveyed the news to Kurrahee; appointed political agent in Lower Sind, with the brevet rank of major, and subsequently commissioner at Hyderabad; opposed Sir Charles Napier's aggressive policy, but had to defend the residency from attack by the populace; became resident at Satara 1845, at Baroda 1847, and at Lucknow 1854; was commander-in-chief of the British forces in the Persian war of 1856-57; arrived in India in the midst of the Sepoy rebellion; relieved Havelock at Cawnpur Sept. 15, then waived the command in favor of Havelock, whom he accompanied to the relief of Lucknow Sept. 25 in his capacity of chief commissioner of Oude; defended the residency and held the Alumbagh (Lucknow) during the subsequent siege by the rebels; aided Sir Colin Campbell in the final recapture of Lucknow Mar., 1858; was knighted and made lieutenant-general 1858; received the thanks of Parliament 1860; became a member of the supreme council of India; retired in broken health 1861. D. in Paris, Mar. 11, 1863. He was buried in Westminster Abbey, and statues of him have been erected in London and Calcutta. See his *Life*, by Sir F. J. Goldsmid (2 vols., London, 1880).

Ouvarovite: See GARNET.

Ouvard, oo'v'raar', GABRIEL JULIEN: financier; b. near Clisson, France, Oct. 11, 1770; became a merchant at Nantes, and, having secured in 1797 a contract from the Government for supplying the navy with provisions, made a profit estimated at 15,000,000 francs. He then established a large banking-house in Paris, secured other Government contracts, and undertook to discount the subsidy due from Spain and amounts due from the receivers-general, thereby obtaining control of a large part of the national finances. The scope of his financial operations continually widened. He entered into contracts for supplying the Spanish army and navy, and advanced money for the needs of the imperial court, but Napoleon, becoming distrustful of the company, forced it to give up its assets in 1806, and afterward caused the arrest and imprisonment of Ouvard, who was confined, first at Vincennes and later at Ste.-Pelagie, till 1813. After the Restoration he gained favor with the Bourbon government, which adopted a financial system proposed by him, but falling again under suspicion of fraudulent conduct in connection with contracts for supplying the French army for the Spanish expedition of 1823, he was imprisoned for five years. He afterward lived in London, where he died in Oct., 1846. See the *Mémoires* written by himself (Paris, 1826).

Ouzel, or **Ousel**, oo'zel [M. Eng. *osel* < O. Eng. *ōsl*; O. H. Germ. *amsala* > Germ. *amsel*, blackbird; cf. Lat. *merula* (for **mesula*), blackbird, whence Eng. *merl*]: a name applied in England to several birds. Thus the "ousel-cock" of Shakspeare was the European blackbird (*Merula merula*); the ring-ousel of the present day is a very similar bird, the *Merula torquata*. More frequently the name is applied to

the water-ouzel or dipper. (See **DIPPERS**.) Still other birds receive this name, among them the brook-ouzel (*Rallus aquaticus*), but nearly all are thrushes, or their allies.

Revised by F. A. LUCAS.

Oval [from Fr. *ovale*, egg-shaped, from Lat. *ovum*, egg]: a curve bearing a resemblance to the section of an egg by a plane through its axis—as for instance, an ellipse. A semi-oval formed by arcs of circles of different radii and tangent to each other is sometimes used by engineers in the construction of arches. Such curves are often called basket-handled curves or basket-handled arches. The Cartesian *oval* is a plane curve of the fourth order, first studied by Descartes, from whom it derives its name. The scientific interest attached to it arises from the fact that the surface generated by revolving it about its axis is a surface of *accurate convergence* (that is, a surface which must divide two media of different refracting power, in order that rays of light coming from one point may deviate so as to pass accurately through another point).

Ovam'po, or **Ovambo**: a Bantu people in the northern part of German Southwest Africa, living along the left bank of the Cunene river and some distance S. Ten divisions or tribes of this people have been described by explorers, and they are supposed to number about 100,000. Except near the coast the soil is fertile, but water is not abundant. The people are warlike, industrious, ingenious, and unusually honest. They regard stock-raising as of secondary importance, though they have many cattle. They raise great quantities of native grain. For agricultural purposes their land is the best in German Southwest Africa, but (1894) is undeveloped, owing to the sandy coast strip and lack of transportation facilities.

Revised by C. C. ADAMS.

Ovan'do, **NICOLAS**, de: administrator; b. at Valladolid, Spain, about 1460. He was a distinguished knight of the Order of Alcantara, and held high positions in the Spanish court. In 1501 he was appointed governor of Española, with jurisdiction over all the Spanish discoveries in the New World, except those which had been granted to Pinzon and Ojeda. He left San Lucas Feb. 13, 1502, with the largest fleet which had yet been fitted out for the West Indies, consisting of thirty ships with 2,500 colonists; arrived at Santo Domingo on Apr. 15, and governed until July, 1509. During this period the colony was financially prosperous, but the greater part of the Indian population was destroyed through the system of enforced labor. He refused to let Columbus land in July, 1502. D. in Madrid, about 1518. H. H. S.

Ovaries [Lat. *ovarium*, deriv. of *ovum*, egg]: the organs in any animal which produce the female reproductive bodies—ova or eggs. These organs have very different conditions in different groups, but a few general statements may be made. The ovary is one of the two sexual organs, or *gonads*, the other being the male organ, or *testis*, which produces the male generative element, or spermatozoa. While in most animals these two occur in different individuals—i. e. the sexes are separate, they may occur together in the same individual, and in exceptional cases the same organ may be ovary in one region, testis in another; or, again, it may act a while as testis and later produce eggs. These facts, with many others, show that ovaries and testes are homologous structures, no instance being known which would not fall in such a category.

In the Hydrozoa the gonads are ectodermal, in the Scyphozoa entodermal; in all other animals they arise from the middle layer (mesoderm; see **EMBRYOLOGY**), and, where a body-cavity (coelom) is present, as specializations of its walls. In the lower forms the ovaries may be numerous, but in the higher animals there are usually two—right and left—but these may fuse to form an unpaired organ. In the vertebrates the number two holds, and the organs are placed on either side of the backbone.

The ovaries in adult women are situated on either side of the uterus, in the iliac fossæ; they are included in separate processes from the two pelvic duplicatures of the peritoneum, which are called the broad ligaments. Each ovary is also attached by a round fibrous cord, the ovarian ligament, to the side of the uterus, and by a lesser fibrous cord to the fringed edge of the Fallopian oviduct. These three ligaments support and retain the ovary in its proper position. The ovary is an oblong, ovoid, flattened body, of whitish color and uneven surface. It is one-third to half an inch thick, three-quarters of an inch wide, 1 to 1½ inches long, and weighs from 1 to 2 drachms. (For general description of the minute structure of the ovaries and of the devel-

opment of the ova, see **HISTOLOGY**, *Genital Organs*.) The physiological function of the ovary is the formation of ova, their maturation, and their final discharge at periodic menstrual epochs. The distended follicle at the time of rupture

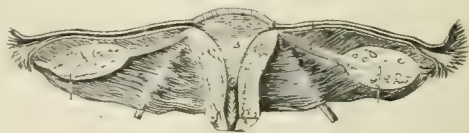


FIG. 1.—Relation of uterus, Fallopian tubes, and ovaries.

may equal in size one-third of the ovary, and many scars exist where former ruptures have taken place. When the ovule escapes from the Graafian follicle it is carried by a gentle current of fluid on the peritoneal surface of the broad ligament and tubo-ovarian ligament to the interior of the tube by which it is conveyed to the uterine cavity. The current setting toward the abdominal ostium of the tube is the result of the action of the ciliated epithelium within the tube and on its fimbria. It is unknown where the ovule is impregnated, although the majority hold that impregnation is in the tube; but intra-uterine impregnation is at least possible. Should impregnation not occur, the ovum disintegrates or passes off with the menstrual discharge. The activity of the ovary develops at puberty—usually the fifteenth or sixteenth year—and ceases with the climacteric—forty-fifth to fifty-second year. The remarkable functional activity of the ovary, including periodic congestions, ruptures, and cicatrization, renders it peculiarly liable to disease. Neuralgia, congestion, and inflammation of the ovary are frequent diseases in women—often temporary and slight, at times chronic, depressing strength and health, and causing hysteria and dementia. Solid tumors, fibrous and cancerous, affect the ovary less often than the uterus. Ovarian dropsy originates in the dropical distension of one or more Graafian follicles by albuminoid serum. This may arise when the follicles are too deeply situated to rupture and discharge the contained ovum, or prevented by thickening of the surface from previous inflammation; it may also begin by accumulation in the cavity of the corpus luteum. A cyst may be *unilocular*, having but one cavity and arising originally from one follicle; or *multilocular*, having several compartments. In the latter case the mode of formation is yet in dispute, but it is something more than the simple distension of the Graafian follicles with fluid. A proliferation of connective-tissue elements with cystic degeneration, a proliferation of the egg cords in the primordial ovary, and a pathological development of the epithelial cells have been regarded as the cause. The ovarian cyst may contain many quarts of transparent, albuminoid serum.



FIG. 2.—Graafian vesicle about to rupture: scars of former rupture.

Ovariectomy, the surgical operation of evacuating ovarian dropsy and eradicating the cyst, was first performed in America by Dr. Ephraim McDowell, of Kentucky; this first case resulted in recovery. Dr. McDowell operated thirteen times—eight successfully. It is now accepted and extensively performed in all countries. The improvement of technique in abdominal surgery has now made this one of the simplest and most successful operations in gynecology, unless there should be complicating factors, like universal adhesions or suppuration of the sac. A complete list of ovarian tumors is as follows: Carcinoma, sarcoma, papilloma, fibroma, cysto-carcinoma, cysto-sarcoma, cysto-fibroma, cysto-papilloma, dermoid, myxo-adenoma (ovarian cysts, monocystic and polycystic), hydrops folliculorum (distension of the Graafian follicles with fluid). Dermoid cysts of the ovaries are the most peculiar tumors of the body. They are the result of implantation of epidermal structures upon the mass of cells from which the ovary develops during embryonal existence. As a consequence, structures like teeth, hair, sebaceous matter, quite foreign to the ovary itself, are discovered in the tumors. These cysts are prone to degenerative and inflammatory action, especially after childbirth. Aside from this complication, however, they are no more difficult to deal with than the commoner varieties of ovarian cysts. One of the most serious diseases of the ovaries is in-

fectious inflammation and suppuration, following usually childbirth or gonorrhœa, and commonly associated with pyosalpinx and pelvic peritonitis. A timely abdominal section will usually save the patient, but the pus from an ovarian abscess is peculiarly virulent, and diffuse septic peritonitis is always to be dreaded. Revised by B. C. HIRST.

Ovariotomy: See OVARIES.

Ovary (of a flower): See FLOWER.

Ovenbird, or Golden-crowned Thrush: a North American bird (*Scircus auricapillus*) of the family *Mniotiltidae*. It is called ovenbird from the shape of its nest, which is built upon the ground and roofed over with a dome-shaped covering. It is a shy, retiring bird, of an olive-brown color, 6 inches long, and is often seen running along the ground. The name ovenbird is also given to certain South American birds of the genera *Furnarius* and *Coccyzus*, belonging to the family *Furnariidae*. They are remarkably bold little birds, and build a dome-shaped nest which is divided by a partition into two rooms, the innermost of which contains the eggs. Revised by F. A. LUCAS.

Overbeck, FREDERICK: painter; b. at Lubeck, Germany, July 3, 1789; studied painting in Vienna from 1806 to 1809; settled in 1810 at Rome; embraced Roman Catholicism in 1814; was an apostle of the sentimental religious school in art; held beauty subordinate to piety; attempted to revive the devotional art of a former ascetic period, and founded a school which was numerously attended and celebrated in its day. His works expressed deep religious feeling, but are thin and artificial. Discarding as heresy the ideas of the moderns, he earned the title Nazarene, which was bestowed on the men of his school. He chose sacred subjects: *The Entrance of Christ into Jerusalem* (Lubeck); *Christ on the Mount of Olives* (Hamburg); *The Entombment* (Lubeck); and *The Triumph of Religion* (Frankfort). These are his best pieces. The great frescoes on the Monte Pincio and in the Villa Massimi were executed by Overbeck in conjunction with others. D. in Rome, Nov. 12, 1869.

Overbeck, JOHANNES ADOLPH: archaeologist; b. at Antwerp, Belgium, Mar. 27, 1826; studied in Bonn; privat docent 1850; was called to Leipzig as professor of archaeology and director of the archaeological collections. His best-known works, alike distinguished for their learning and their style, are *Kunstarchäologische Vorlesungen* (1853); *Pompeii* (4th ed. 1884); *Die antiken Schriftquellen zur Geschichte der bildenden Künste bei den Griechen* (1868); *Griechische Kunstmythologie* (5 parts, 1871-87); and *Geschichte der griechischen Plastik* (2 vols., 4th ed. 1892), his masterpiece. ALFRED GUDEMAN.

Overbeek de Meijer, GILLIS, van, M. D.: surgeon and hygienist; b. at Rotterdam, Holland, in 1831; studied in the military medical school in Utrecht 1847-51; was a surgeon in the Dutch navy 1851-66; graduated M. D. from the University of Leyden in 1865; was sanitary inspector of the provinces of Gelderland and Utrecht 1866-77; in 1877 was appointed Professor of Hygiene and State Medicine in the University of Utrecht. His most important work is *Scheepgezondheidsleer* (Tiel, 1861). S. T. A.

Overberg, BERNHARD: ecclesiastic and author; b. at Hückel, in the principality of Osnabrück, Hanover, May 1, 1754; was educated in the Franciscan gymnasium at Rheine-on-the-Ems; studied theology at Münster; was ordained a priest in 1780, and was in 1783 appointed teacher in the episcopal seminary. In 1789 he took up his residence in the house of the Princess Galitzin as her confessor, and he exercised a great influence not only on her, but also on her children and on her whole circle. In 1809 he was made director of the episcopal seminary—a position which gave him control over all educational affairs of the diocese. D. at Münster, Nov. 9, 1826. He published *Christkatholisches Handbuch* (1804; 7th ed. 1854); *Katechismus der christkatholischen Lehre* (1804; 2d ed. 1831); *Hausregeln* (1807), etc. His *Life* was written by C. F. Krabbe (Münster, 1831; Eng. trans., Derby, 1843). See Josef Gallaud, *Amalie von Galitzin* (Cologne, 1880). Revised by S. M. JACKSON.

Overbury, Sir THOMAS: statesman and author; b. at Hmington, Warwickshire, England, in 1581; educated at Queen's College, Oxford, and graduated 1598; traveled on the Continent; became a resident of Edinburgh 1601, where he was an intimate friend of Robert Carr, afterward Viscount Rochester and Earl of Somerset; was knighted 1608; traveled on the Continent 1609; wrote *Observations upon the State of the Seventeen United Provinces*; incurred the

enmity of his former friend, Lord Rochester, and of the Countess of Essex, by his opposition to their criminal intrigues; refused a foreign mission offered him as a means of removing him from the kingdom, and was thereupon thrown into the Tower, where he was cruelly treated, and died Sept. 15, 1613. In 1619 Lord Rochester, then Earl of Somerset, and his countess were convicted of having poisoned Overbury. His popular volume of *Characters* was published posthumously in 1614. Revised by H. A. BEERS.

Overreaching: See FARRIERY.

Overskou, THOMAS: dramatist; b. in Copenhagen, Denmark, Oct. 11, 1798. He was first apprenticed to a joiner, but in 1818 took to the stage and played minor parts. His first comedy, *1826* (1826), was a failure, but three dramas, published anonymously (1828), were successfully performed. Of these, *Østergade og Vestergade*, in the style of Sheridan, is his best work. Of his other comedies *Capriciosa* still keeps its place in the repertory of the Royal Theater; but Overskou's most important contribution to literature is *Den danske Skueplads i dens Historie fra dens Begyndelse til vor Tid* (History of the Danish Theater, 7 vols., Copenhagen, 1854-76). D. Nov. 7, 1873. D. K. DODGE.

Overt Act: an open act from which criminal intent is inferred.

Overture [from O. Fr. *overture* (> Fr. *ouverture*), an opening, deriv. of *ovrir*, open]; the name given to the introductory movement, symphony, or elaborate prelude occurring in oratorios, operas, cantatas, and similar compositions. The overture, though complete in itself, is generally so framed as to bring the mind of the hearer into a correspondence of tone and sympathy with the leading traits of the work to which it is prefixed. To effect this it is sometimes sufficient to exhibit in the overture the prevailing sentiment or coloring of the earlier movements (at least) of the work it announces. In other cases the composer ingeniously weaves into the overture some of the leading ideas of the work itself by brief anticipations of its melodies, or anything striking in its modulations, harmonies, or rhythmical forms, thereby predisposing the mind of the hearer to enjoy the recurrence of those points in the after-part of the performance. The introduction of the overture as a distinct and highly wrought species of composition is ascribed to Scarlatti, a Neapolitan of the latter part of the seventeenth century, before whose time its place was occupied by meager preludes or prefatory symphonies, of little account beyond that of an ordinary opening strain. Revised by DUDLEY BUCK.

Overweg, ADOLF: explorer; b. at Hamburg, Germany, July 24, 1822; studied natural science, especially geology, at Bonn and Berlin; joined Barth and Richardson on their explorations of Central Africa in 1850. D. near Lake Tchad, Sept. 27, 1852. His observations, among which was the discovery that the Desert of Sahara is an elevated plateau, and not, as had hitherto been supposed, a depressed plain, were communicated in *Monatsberichte der Gesellschaft für Erdkunde* (Berlin, vols. viii. and ix.), and Petermann's *Zeitschrift für allgemeine Erdkunde* (Gotha, vol. i.).

Overyssel: a province of the Netherlands, lying between the Zuyder Zee in the W., and Hanover and Westphalia in the E.; area, 1,291 sq. miles. The province is intersected by numerous canals; the soil is mostly light, in many places sandy and covered with heath, in others affording good pasture-grounds. Rye, barley, oats, hemp, potatoes, and buckwheat are raised. Cattle-rearing, digging of turf, and linen manufactures are extensively carried on. Pop. (1893) 302,508. Chief cities, Zwolle, Deventer, and Kampen.

Ovibos: See MUSK-ox.

Ovid, or (full Latin name) Publius Ovidius Naso: poet; b. Mar. 20, 43 B. C., at Sulmo, in the country of the Peligni, about 90 miles from Rome, of a rich equestrian family; received an elegant education in the schools of the rhetoricians; traveled afterward in Greece, Asia Minor, and Sicily, and lived then for many years in Rome, idle, frivolous, but brilliant; was intimately connected with Macer and Propertius; acquainted with Horace, moving with freedom and ease in the court circles; admired by all for his wit and his verses, and enjoying, as it seems, to the very dregs, all that could be enjoyed at Rome, until, in the latter part of the year 8 A. D., Augustus suddenly banished him to Tomi. The reason is not known with certainty. Augustus was doubtless offended by the obscenity and immoral tendency of the

Ars Amatoria, but the book had been in free circulation for ten years before this time, and this can not have been more than a pretext. It is more probable that the direct cause was some participation as a confidant in the intrigue of Silanus and Julia, the granddaughter of Augustus, who suffered banishment in the same year with Ovid. At Tomi, a small Getic town on the frontier of the empire, at the delta of the Danube, the fastidious favorite of the metropolis found life intolerable, and month after month sent the most humble supplications to Augustus, but the emperor was immovable, and the poet died in exile in 18 A. D. His works comprise *Heroides*, twenty-one letters from heroines to their lovers, of which fourteen are regarded as genuine; *Amores*, love-elegies, in three books; *Ars Amatoria*, in three books; *Remedia Amoris*; *Metamorphoses*, in fifteen books; *Fasti*, an unfinished poetical commentary on the Roman calendar, in six books; *Tristia*, five books; *Epistola ex Ponto*, four books; *Ibis*, a bitter invective directed against an unknown person; *Halieutica*, a fragmentary didactic poem on fishes. The tragedy *Medea* is lost. The most remarkable editions of his collected works are the *editio princeps* (Rome, 1471), that by Heinsius (Leyden, 1629), and that by Burmann (Amsterdam, 1727); recent text editions by Riese (Leipzig, 1871-74), and Merkel and Ehwald (Leipzig, 1888); separate editions, especially of the *Metamorphoses*, are very numerous. Among the translations, likewise very numerous in all modern languages, is one of the *Metamorphoses* by Dryden, Addison, Congreve, and others, edited by Garth. Of all Latin poets Ovid stands nearest to modern civilization, partly on account of his fresh and vivid sense of the beauties of nature—a point in which the Latin literature is generally deficient—partly because his subject is love. His representations of this feeling are often sensuous, but they are graceful and strikingly true. He also excels other Latin poets in the elegance of his form, especially in the character and rhythm of his verses. Revised by M. WARREN.

Oviducts: See FALLOPIAN TUBES.

Ovie'do: town of Spain; capital of the province of Oviedo, formerly called Asturias (see map of Spain, ref. 12-D). It is finely laid out, with a large and elegant public square in the center, from which the four main streets lead in opposite directions. It has a beautiful cathedral dating from the eighth century, which contains the remains of fourteen early kings and queens of Asturias; a splendid aqueduct, which provides eleven fountains with abundance of good water; a university (founded in 1574) with a large public library; and manufactures of arms, hats, linen, and leather. In the vicinity are hot springs, which are much used for bathing. Pop. (1887) 42,716.

Oviedo, or Oviedo y Valdés. ō-vē-ā dū-ē-vaīl-dās', GONZALO FERNANDEZ, de: historian; b. in Madrid, Spain, in 1478. He was long attached to the Spanish court, witnessed the first return of Columbus 1493, and was intimate with most of the prominent explorers of the New World. In 1514-17 he was with Pedrarias at Darien as a treasury officer; subsequently he was governor of Cartagena, and *alcaide* of the fort at Santo Domingo, and he crossed the Atlantic several times. Appointed royal historiographer he devoted himself especially to the history of America, for which his experience especially fitted him. His principal work is *Historia natural y general de las Indias*, in fifty books. Of these nineteen were published at Seville, 1535, and the twentieth at Valladolid soon after. There were numerous editions and translations of these twenty books, but the first complete edition was published by the Madrid Academy 1851-55. The *Historia* was the first general account of the discoveries in America, and it has remained a standard authority. Oviedo also wrote chronicles of the reigns of Ferdinand and Isabella and Charles V., but these, with his other writings, have never been published. A history of Nicaragua, translated into French from his manuscript, was printed in the Ternaux-Compans collection. D. at Valladolid, 1557.

HERBERT H. SMITH.

Ovip'arous Animals [*oviparous* is from Lat. *ovi'parus*; *o'vum*, egg + *pa'rere*, bring forth]: those animals which bring forth eggs. The term is largely one of convenience, not of strict scientific value, for all animals reproduce by eggs, the difference consisting in the stage of development in which separation from the mother is effected. Strictly speaking, then, oviparous animals are those in which the egg (see *Ovum*) leaves the maternal body before it has proceeded far in development. In some cases, as in many sharks and snakes, an intermediate condition exists. Here

the egg, inclosed in protective membranes, is retained inside of the mother until the young is fully formed, without, however, any intimate (placental) connection existing between parent and offspring. For these forms the term *ovoviviparous* is used. In the contrasted or *viviparous* forms the egg is small, and the young receives nourishment throughout its whole fetal life from the mother. All mammals, except the Monotremata (which are oviparous), are viviparous.

J. S. KINGSLEY.

Ovisacs: See GRAAFIAN VESICLES.

Ovoca: See AVOCA.

O'vule [from Mediæv. Lat. *o'vulum*, dimin. of Lat. *o'vum*, egg]: in botany, a young seed, especially before fertilization. The ovule is morphologically a surface outgrowth, and is to be regarded as a trichome structure, homologous with hairs, scales, prickles, etc. In its earliest stages it is a few-celled mass of cells, projecting above the surface, and having a hemispherical or conical, and later a cylindrical, form, which may remain straight or become somewhat curved upon itself. As it grows a ridge arises upon it encircling it like a collar, and this by extension finally becomes a coat which incloses it. In many plants a second coat forms below (outside of) the first (Fig. 1).

When an ovule has completed the growth of its one or two coats we may then distinguish the stalk (*funiculus*), the integument, and the ovule body (*nucellus*). At the summit of the ovule the integument does not quite close, leaving a minute opening (*micropyle*).

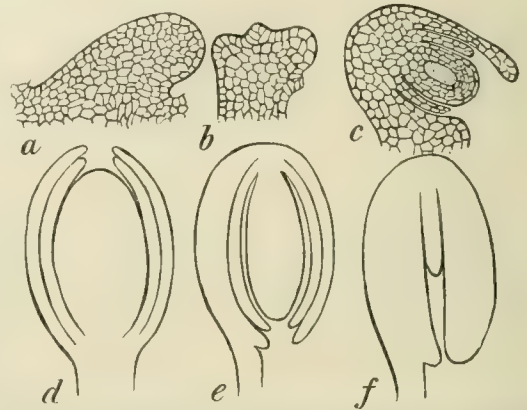


FIG. 1.—a b c, development of ovule of evening primrose; d, straight (orthotropous) ovule; e, inverted (anatropous) ovule; d e, with large nucellus, and two coats; f, with small nucellus and one thick coat.

In the lower Monocotyledons and Dicotyledons the nucellus is relatively large, but in the higher orders of both sub-classes (Orchidales and most Gamopetalæ) it is relatively very small, consisting of an axial row surrounded by a single layer of cells. The ovules of all, or nearly all, Monocotyledons have two coats, as is the rule with the choripetalous Dicotyledons, while in the Gamopetalæ there is usually but one coat.

Early in the growth of the nucellus an axial cell enlarges (at this stage known as the *archesporium*) and undergoes division, usually into three to four, or rarely into many cells. One of these daughter-cells, commonly the lowermost, enlarges at the expense of the others, and becomes the "embryo-sac." In Gymnosperms the nucleus divides repeatedly, and the daughter-nuclei become the nuclei of cells which are massed together in a rounded or egg-shaped prothallium. In the latter flask-shaped archegones are developed, each of which contains a single germ-cell (oosphere or egg-cell).

In Angiosperms the development of the embryo sac is somewhat different (Fig. 2, a to i). The primitive nucleus divides, each daughter-cell moving to opposite ends of the cell. Here each divides again, and afterward each couple divides once more, thus giving rise to four nuclei at each end. Now a nucleus from each tetrad moves to the center of the cell, where they unite into a single nucleus, the nucleus of the embryo sac. The nuclei at the base of the sac become invested with protoplasm and soon form a mass of cells, the *endosperm*. In the meantime the upper nuclei also have become surrounded by protoplasm, and two of these cells are elongated and enlarged; these are the synergids.

The third nucleus usually lies a little deeper, and with its protoplasm constitutes the germ-cell (oosphere or egg-cell).

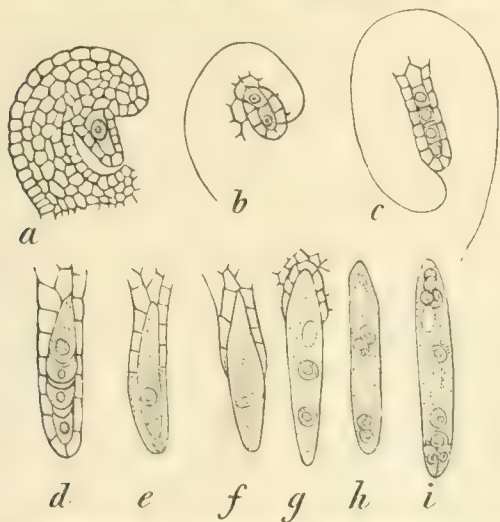


FIG. 2. Development of the embryo-sac of *Aster* and *Solidago* (after Martin).

After the germ-cell is fertilized (by union with the nucleus of the pollen-tube) it clothes itself with a wall of cellulose, thus constituting the first cell of the new plant. The subsequent development of the embryo belongs to EMBRYOLOGY (*q. v.*). See also FLOWER. CHARLES E. BESSEY.

Ovum [= Lat., egg]: the female reproductive body in all animals. In its simplest condition it is merely a cell of the body specialized for the purpose of the reproduction of the species, and distinguishable from the other cells chiefly from its larger size. In most forms, however, it has additional features of a nutritive or protective nature. Thus to the protoplasm of the cell there may be added *food-yolk* which is to nourish the germ, and which is frequently so abundant as to render the egg very large. This food-yolk may be variously arranged, and according to its distribution the subsequent development of the egg (see EMBRYOLOGY) is modified. In some cases (e. g. the fresh-water *Hydra*) protective envelopes are absent. In others they occur, and may be grouped in two categories, primary and secondary. To the first belong the *vitelline membrane*, usually a thin but firm envelope covering the egg and secreted either by the egg or by the tissue in which the egg was formed. This envelope frequently has an opening (*micropyle*) for the entrance of food, and later for the entrance of the impregnating spermatozoon. In some cases, too, the vitelline membrane is perforated by fine tubules, in which case it is called a *zona radiata*. The secondary envelopes are formed by the ducts which convey the egg from the place of its origin (ovary) to the exterior. Of these the most prominent are the shell of the eggs of birds and reptiles, and homologous structures in other forms. The egg as it leaves the ovary is not ready for development; it has first to undergo processes of maturation and impregnation (see EMBRYOLOGY), although in exceptional cases (see PARTHENOGENESIS) the egg may develop without the latter process. The common hen's egg contains not only the essential cell with nucleus and protoplasm, but yolk, membrane, white, and shell. In the hen's egg, as laid, development has proceeded some distance, its products being found in the light spot invariably uppermost on the yolk. See HISTOLOGY (*Generative Organs*). J. S. KINGSLEY.

Owatonna: city; capital of Steele co., Minn. (for location, see map of Minnesota, ref. 11-F); on the Straight river, and the Chi. and N. W. and the Chi. Mil. and St. P. railways; 71 miles S. of Minneapolis, 90 miles W. of Winoona. It is the seat of Pillsbury Academy (Baptist, chartered in 1877), which in 1894 had six buildings that cost over \$300,000, and of the State School for Dependent Children. There are 10 churches, 2 national banks with combined capital of \$140,000, electric light, water, and sewerage plants, and 2 weekly newspapers. The city is a trade center for a large section, and has 3 flour-mills and manufacturing of churns, seeders, fanning-mills, soap, carriages and

wagons, and patent medicines. Pop. (1880) 3,161; (1890) 3,849; (1895) 4,891. Editor of "JOURNAL."

Owego: village; capital of Tioga co., N. Y. (for location, see map of New York, ref. 6-F); on the Susquehanna river, and the Del., Lack. and W., the Erie, and the Lehigh Valley railways; 237 miles W. of New York city. It is in an agricultural region, has a large lumber-trade, and is a popular summer resort. It contains a public library (founded in 1868) with over 5,000 volumes, 3 national banks with combined capital of \$250,000, and a daily and 3 weekly papers, and has flour, planing, and woolen mills, foundries, and machine-shops, wagon-works, and other manufactories. Pop. (1880) 5,325; (1890) 5,141. Editor of "RECORD."

Owen, DAVID DALE, M. D.: geologist; son of Robert Owen, the socialist; b. at New Lanark, Scotland, June 24, 1807; was educated at Hofwyl, Switzerland; went to the U. S. with his father in 1823 to assist him in his social experiment at New Harmony; subsequently studied geology and other natural sciences. In 1837 he made a geological reconnaissance of the State of Indiana; subsequently made an examination of the mineral lands of Iowa, and in 1848 was employed by the Government to take charge of a geological survey of Wisconsin, Iowa, and Minnesota. The results of this survey were published in a quarto volume by Congress in 1852. From 1852 to 1857 he was employed in a geological survey of Kentucky, the results of which were published in four volumes. In 1857 he was appointed State geologist of Arkansas, and the report of his survey was subsequently published in one volume. D. at New Harmony, Ind., Nov. 13, 1860.

Owen, JOHN, D. D.: theologian; b. at Stadham, Oxfordshire, England, in 1616; was educated at Queen's College, Oxford, 1628-37; was an early advocate of the parliamentary cause, and an adversary of Laud's measures; received the living of Fordham, Essex, 1642, which he exchanged for a Presbyterian pastorate at Coggeshall, near by, 1646, where he introduced independent church government. In 1649 he became private chaplain to Oliver Cromwell; in 1651 dean of Christ Church, Oxford; was vice-chancellor of the university 1652-57; was deprived of his deanery 1660, and retired to Stadham; declined a call to Boston, Mass., 1663, and an invitation to become president of Harvard College in 1670; removed to London in 1673; thence, after his second marriage, 1677, to his wife's estate at Ealing, Middlesex, where he died Aug. 24, 1683. He was a man of great piety, learning, and magnanimity, the author of more than eighty theological works, doctrinal, practical, and polemical. His *Exposition of the Epistle to the Hebrews* (1668-84) is his chief work. Though a zealous opponent of Arminianism, Presbyterianism, Episcopacy, and papacy, all parties held him in high esteem. His works, in W. H. Gould's edition (Edinburgh, 1850-55), occupy 24 vols. 8vo; reprinted in Philadelphia (17 vols., 1865-69). See his *Life* by W. Orme (London, 1820). Revised by S. M. JACKSON.

Owen, JOHN JASON, D. D., LL. D.: teacher and author; b. at Colebrook, Conn., Aug. 13, 1803; graduated at Middlebury College, Vt., in 1829, and at the Theological Seminary, Andover, Mass., in 1831; entered the Presbyterian ministry in 1832; became in 1836 president of Cornelius Institute, New York; Professor of Latin and Greek in the New York Free Academy 1848, and its vice-principal in 1853; vice-president of the College of the City of New York 1866; prepared editions, with notes, of Xenophon's *Anabasis* (1843); Homer's *Odyssey* (1844); of the *Cyropædia* (1846); of *Thucydides* (1848); of the *Iliad* (1851); the text of the Acts of the Apostles, with notes (1850); a Greek reader (1852); a *Commentary on the Gospels* (3 vols., 1857, seq.). D. in New York city, Apr. 18, 1869.

Owen, Sir RICHARD, K. C. B., F. R. S., LL. D., D. C. L., etc.: comparative anatomist and paleontologist; b. at Lancaster, England, July 20, 1804; served for a time in the navy; studied medicine at Edinburgh and St. Bartholomew's, London; succeeded Sir Charles Bell as Hunterian professor in the Royal College of Surgeons in 1836; became superintendent of the natural history department of the British Museum in 1855, and retired in 1884. He was Fullerian professor in the Royal Institution, a member of many learned societies, and the recipient of many honors. Owen succeeded Cuvier as the leading vertebrate paleontologist of the world. His most important general works are *Lectures on Comparative Anatomy and Physiology of Invertebrates* (1843) (1843); *Lectures on the Comparative Anatomy of the Vertebrates* (1845); *Lectures on the Comparative Anatomy of the Fishes* (1846); *Lectures on the Comparative Anatomy of the Reptiles* (1847); *Lectures on the Comparative Anatomy of the Birds* (1848); *Lectures on the Comparative Anatomy of the Mammals* (1849); *Lectures on the Comparative Anatomy of the Man* (1850); *Lectures on the Comparative Anatomy of the Human Embryo* (1851); *Lectures on the Comparative Anatomy of the Human Fetus* (1852); *Lectures on the Comparative Anatomy of the Human Adult* (1853); *Lectures on the Comparative Anatomy of the Human Old Age* (1854); *Lectures on the Comparative Anatomy of the Human Disease* (1855); *Lectures on the Comparative Anatomy of the Human Death* (1856); *Lectures on the Comparative Anatomy of the Human Resurrection* (1857); *Lectures on the Comparative Anatomy of the Human Paradise* (1858); *Lectures on the Comparative Anatomy of the Human Hell* (1859); *Lectures on the Comparative Anatomy of the Human Heaven* (1860); *Lectures on the Comparative Anatomy of the Human Eternity* (1861); *Lectures on the Comparative Anatomy of the Human Immortality* (1862); *Lectures on the Comparative Anatomy of the Human Immortality* (1863); *Lectures on the Comparative Anatomy of the Human Immortality* (1864); *Lectures on the Comparative Anatomy of the Human Immortality* (1865); *Lectures on the Comparative Anatomy of the Human Immortality* (1866); *Lectures on the Comparative Anatomy of the Human Immortality* (1867); *Lectures on the Comparative Anatomy of the Human Immortality* (1868); *Lectures on the Comparative Anatomy of the Human Immortality* (1869); *Lectures on the Comparative Anatomy of the Human Immortality* (1870); *Lectures on the Comparative Anatomy of the Human Immortality* (1871); *Lectures on the Comparative Anatomy of the Human Immortality* (1872); *Lectures on the Comparative Anatomy of the Human Immortality* (1873); *Lectures on the Comparative Anatomy of the Human Immortality* (1874); *Lectures on the Comparative Anatomy of the Human Immortality* (1875); *Lectures on the Comparative Anatomy of the Human Immortality* (1876); *Lectures on the Comparative Anatomy of the Human Immortality* (1877); *Lectures on the Comparative Anatomy of the Human Immortality* (1878); *Lectures on the Comparative Anatomy of the Human Immortality* (1879); *Lectures on the Comparative Anatomy of the Human Immortality* (1880); *Lectures on the Comparative Anatomy of the Human Immortality* (1881); *Lectures on the Comparative Anatomy of the Human Immortality* (1882); *Lectures on the Comparative Anatomy of the Human Immortality* (1883); *Lectures on the Comparative Anatomy of the Human Immortality* (1884); *Lectures on the Comparative Anatomy of the Human Immortality* (1885); *Lectures on the Comparative Anatomy of the Human Immortality* (1886); *Lectures on the Comparative Anatomy of the Human Immortality* (1887); *Lectures on the Comparative Anatomy of the Human Immortality* (1888); *Lectures on the Comparative Anatomy of the Human Immortality* (1889); *Lectures on the Comparative Anatomy of the Human Immortality* (1890); *Lectures on the Comparative Anatomy of the Human Immortality* (1891); *Lectures on the Comparative Anatomy of the Human Immortality* (1892); *Lectures on the Comparative Anatomy of the Human Immortality* (1893); *Lectures on the Comparative Anatomy of the Human Immortality* (1894); *Lectures on the Comparative Anatomy of the Human Immortality* (1895); *Lectures on the Comparative Anatomy of the Human Immortality* (1896); *Lectures on the Comparative Anatomy of the Human Immortality* (1897); *Lectures on the Comparative Anatomy of the Human Immortality* (1898); *Lectures on the Comparative Anatomy of the Human Immortality* (1899); *Lectures on the Comparative Anatomy of the Human Immortality* (1900).

ogy of Vertebrate Animals (1846); *Odontography* (1840-45); *On the Archetypes and Homologies of the Vertebrate System* (1848); *On the Nature of Limbs* (1849); *Palæontology* (1861). He was also a voluminous contributor to the memoirs of scientific societies. D. at Richmond Park, Surrey, Dec. 18, 1892. Revised by G. K. GILBERT.

Owen, ROBERT: social reformer; b. at Newtown, Montgomeryshire, North Wales, Mar. 14, 1771; the son of poor parents, was forced to earn his own living while still a boy, but was very successful in business, and at the age of eighteen became a partner in a cotton-mill. He induced his firm to buy the cotton-mills of New Lanark, Scotland, where he put into effect a co-operative scheme for the benefit of his employees. It worked well at first, and New Lanark became famous for the prosperity of its inhabitants. He then directed his attention to social questions on a broader scale, publishing in 1812 *New Views of Society, or Essays upon the Formation of the Human Character*, and subsequently *Book of the New Moral World*, in which he advocated doctrines of human equality and the abolition of class distinctions. Having won a large fortune in his business, he was able to give these works and various tracts embodying his views a wide circulation. The Duke of Kent became his patron, and his followers were numerous. His religious views exposed him to much obloquy and a bitter opposition, and after the death of his patron he went to the U. S. in 1823 and founded at his own expense a communist society at New Harmony, Ind. The scheme proving a failure, he returned to England, where he tried several similar experiments with the same result. He also failed in an attempt to establish a "labor exchange" in London. In 1828, by invitation of the Government of Mexico, he went to that country in the hope of carrying out his socialistic schemes, but was disappointed. In spite of his failures he was universally esteemed for his integrity and benevolence. His later years were spent in efforts to promote a religion of reason and to improve the condition of the working-classes, and in his old age he became a believer in Spiritualism. D. at Newtown, Nov. 19, 1858. His followers bore the name of Owenites, and were among the founders of the English Chart-ist movement. Revised by F. M. COLBY.

Owen, ROBERT DALE, LL. D.: author; eldest son of Robert Owen; b. in Glasgow, Scotland, Nov. 7, 1801; educated at Fellenberg's College, near Berne, Switzerland; removed to the U. S. with his father in 1823, and assisted him in his efforts to found the colony of New Harmony, Ind. On the failure of that experiment he visited France and England, but returned to the U. S. in 1827 and became a citizen; he settled in New Harmony, Ind., where for three successive years (1835-38) he was elected a member of the Legislature. From 1843 to 1847 he represented the first district of Indiana in Congress, acting with the Democratic party; took an active part in the settlement of the northwestern boundary question; introduced the bill organizing the Smithsonian Institution, and served for a time as one of the regents. It was through his efforts that Indiana conferred independent property rights upon women. He was minister to Naples 1855-58. During the civil war in the U. S. he was an earnest advocate of the policy of emancipating the slaves, and his letters on that subject to the President and the members of the cabinet were widely read. His chief works are *Outlines of the System of Education at New Lanark* (Glasgow, 1824); *Moral Physiology* (New York, 1831); *Discussion with Origen Bachelor on the Personality of God and the Authenticity of the Bible* (New York, 1832); *Pocahontas*, an historical drama (New York, 1837); *Hints on Public Architecture*, illustrated (New York, 1849); *Footfalls on the Boundary of Another World* (Philadelphia, 1860); *The Wrong of Slavery and the Right of Freedom* (Philadelphia, 1864); *Beyond the Breakers*, a novel (Philadelphia, 1870); *The Debatable Land between this World and the Next* (New York, 1872); *Trading my Way*, an autobiography (New York, 1874). Mr. Owen received the degree of LL. D. from the University of Indiana in 1872. D. at Lake George, N. Y., June 24, 1877.

Owens, JOHN EDWARD: comedian; b. in Liverpool, England, May 4, 1824; was taken by his father to the U. S. in 1834. He was educated in Philadelphia, and for some time employed there in business. On Aug. 20, 1846, he made his *début* in the Masonic Hall, Philadelphia, and immediately gained the interest and sympathy of the public by a peculiar blending of humor and pathos. In 1849 he was manager of the Baltimore museum, in 1854 of the Charles Street theater

of Baltimore, in 1859 of the Varieties theater of New Orleans. In 1852 he made his first tour in England. His two greatest creations were probably *Solon Shingle* (first played at the opening of the Adelphi theater in London, 1865) and *John Unit* (first played in New York in 1869). In 1882 he accepted an engagement with the New York Madison Square Company, and played in *Esmeralda* in many of the larger cities of the U. S. His declining health during his last few years caused him to retire from the stage. D. near Towson, Md., Dec. 6, 1886. Revised by B. B. VALLENTINE.

Owensboro: city; capital of Daviess co., Ky. (for location, see map of Kentucky, ref. 3-E); on the Ohio river, and the Louisv. and Nashv. and the Louisv., St. L. and Tex. railways; 40 miles S. E. of Evansville, Ind., 150 miles S. W. of Louisville. It is in the center of the Kentucky and Indiana coal-fields, and in an agricultural, tobacco, timber, building-stone, and brick-clay region; has an elevated site, and is connected with several important places on the river by a line of packets. The city contains 18 churches, a high school, and 4 ward schools, public-school property valued at \$85,000, a female college, a public-school library (founded in 1886), a U. S. Government building that cost \$50,000, 2 national banks with combined capital of \$185,000, 6 State banks (capital of 5 reported \$592,500), an incorporated bank with capital of \$100,000, and 2 daily and 6 weekly newspapers. The tobacco industry has 23 factories and stemmeries, in which 2,000 persons are employed and 18,000,000 lb. of tobacco handled annually, and the whisky industry has in the city and its vicinity 14 distilleries, operated on a capital of \$1,500,000, and yielding sourmash whisky to the value of \$5,500,000 annually. There are 4 planing and 3 flour mills, steam-shingle mill, 2 foundries and machine-shops, several brickyards, and ice, sewer-pipe, furniture, and cigar factories. Pop. (1880) 6,231; (1890) 9,837.

EDITOR OF "INQUIRER."

Owen Sound: port of entry and capital of Grey co., Ontario, Canada; at the head of Owen Sound (a part of Lake Huron); 45 miles W. N. W. of Collingwood (see map of Ontario, ref. 3-C). It has a good water-power, several lumber-mills, foundries, etc. There is a good trade in lumber and grain. Pop. (1891) 7,497.

Owens River: a stream which rises in Southeastern California, S. of Mono Lake; flows southward through a desert valley bordered by lofty and exceedingly rugged mountains for a distance of about 100 miles, and empties into Owens Lake. Like most desert streams, it varies greatly in volume with the seasons, and many of its branches are dry during the summer. Owens Lake, in the western part of Inyo co., Cal., is 18 miles long and 10 miles wide. It is without outlet, and is highly charged with saline matter.

I. C. RUSSELL.

Owl [O. Eng. *ūle* < O. H. Germ. *uūila* < Germ. *eule*]; a general name for the birds of prey of the order *Striges*, most of which are nocturnal in their habits, although a few, like the snowy and hawk owls, hunt by day. They appear strongly built (but this is largely due to their long feathers), have large heads and large eyes, directed forward and surrounded by a circle of radiating feathers. The plumage is soft, flight noiseless, and sense of hearing acute. There are some 200 species of owls distributed throughout the world. They range in size from the great eagle owl (*Bubo maximus*) of Europe and Asia, over 2 feet long, to



The eagle owl.

the little gnome-owls (*Glaucidium*) of South America, some of which are less than 6 inches in length. Owls breed in old buildings, holes in rocks, and most of all in hollow trees. The smooth, white eggs are from two to four in number. A few exceptional species eat fish, but birds, and especially small rodents, form the chief food of owls. They are of more service to the farmer than any other bird.

F. A. LUCAS.

Owl-parrot, or Kakapo: a peculiar parrot (*Strigops habroptilus*) restricted to the forests of New Zealand, so called from its owl-like appearance and nocturnal habits. It is a little over 2 feet in length, heavily built, of a sage-green color mottled with brown and yellow. The bird is flightless, for while the wings are of moderate size there is no keel to the sternum, and the breast muscles are small and overlaid with fat. The kakapo climbs low trees, but passes most of its time on the ground, feeds largely on mosses, and lives in holes or fissures in the rocks. Since the introduction of dogs it has diminished in numbers.

F. A. LUCAS.

Ownership: See PROPERTY.

Owosso: city; Shiawassee co., Mich. (for location, see map of Michigan, ref. 7-J); on the Shiawassee river, and the Detroit, Gr. Haven and Mil., the Mich. Cent., and the Toledo, Ann Arb. and N. Mich. railways; 25 miles N. E. of Lansing, 78 miles N. W. of Detroit. It derives power for manufacturing from the river; is connected with Corunna, the county-seat, by a street-railway; and contains gas and electric light plants, water-works, graded public schools, 2 libraries (Ladies' and Y. M. C. A.), an incorporated bank with capital of \$100,000, a private bank, a daily and 5 weekly newspapers, and sash, door, and blind, furniture, casket, tool, cart, and other factories. Pop. (1880) 2,501; (1890) 6,564; (1894) 8,272.

EDITOR OF "REPORTER."

Ox: See CATTLE and MUSK-OX.

Oxalates: See OXALIC ACID.

Oxalic Acid [*oxalic* is deriv. of *Oxalis*, name of a botanical genus in which the acid occurs]: an acid consisting of carbon, hydrogen, and oxygen combined in certain proportions. Salt of sorrel, which is an acid potassium oxalate, has for a period unknown been procured in Germany from certain species of oxalis and rumex. Savary first obtained oxalic acid from it in 1773 by sublimation. Scheele afterward obtained it from the same source by precipitation as oxalate of lead and subsequent decomposition of this. This latter chemist also first proved that the acid previously known as prepared by the action of nitric acid on sugar is oxalic acid. Besides the plants above mentioned there are sea-shore plants, *Salsola* and *Salicornia*, which contain it as sodium oxalate. It is found as insoluble calcium oxalate in a great number and variety of plants, and in certain morbid conditions this latter salt is formed largely in the animal body, passing off by the urine, and forming what is called the "mulberry calculus" in the bladder.

All the oxalic acid of commerce is prepared by artificial processes, of which two are in common use: 1. By the action of nitric acid on sugar, starch, or molasses. 2. By fusing a hydrate of an alkali with starch or cellulose. Sawdust is generally used. Potassium hydrate gives more than sodium, and two of potassium to one of sodium hydrate gives still more. In the latter case, when the product is treated with a strong solution of sodium carbonate, potassium carbonate dissolves and sodium oxalate, by virtue of its low solubility, remains behind. From this oxalic acid is readily prepared. When required pure for chemical purposes it is sublimed. Great care must be taken in this case not to inhale the vapor, which is highly dangerous. The commercial crystallized acid has the composition $C_2H_2O_4 + 2H_2O$. When heated, it first loses water and becomes $C_2H_2O_4$. By further heating this breaks down, yielding water, carbon monoxide, CO, and carbon dioxide, CO_2 . It dissolves in about nine parts of cold and one part of boiling water. When to its solution or that of an oxalate a lime-solution is added, there is thrown down calcium oxalate, an exceedingly insoluble substance, and for lime in solution it is the most delicate test. Except in very weak solutions, it is an exceedingly dangerous, fatal, and rapid poison, and its universal sale in shops and common use in households are greatly to be reprehended. It has been known to produce death in ten minutes, preceded by horrible agonies. It is used in the arts for cleaning leather, for discharging colors in calico-printing, and in scouring metals. For the latter purpose, clean-

ing brass and copper, it is now much used in households, as well as for removing ink-stains from fabrics. The greatest care should be exercised that it be not mistaken for Epsom salt, which it almost exactly resembles in appearance.

Oxalates.—These are compounds formed by the action of oxalic acid on bases. "Salt of sorrel" is a mixture of the acid potassium salt, KHC_2O_4 , and another acid potassium salt of the formula $KH_2C_2O_4 \cdot C_2H_2O_4 + 2H_2O$.—*Calcium oxalate*, $CaC_2O_4 + H_2O$, is very difficultly soluble in water, and is used for the purpose of detecting calcium. Calcium oxalate is found in nature in the tissues and cells of plants.—An oxalate of iron occurs in the mineral humboldtine, in brown coal.

Revised by IRA REMSEN.

Ox'alis [Mod. Lat., from Lat. *oxalis* = Gr. *ὄξαις*, a kind of sorrel, deriv. of *ὄξος*, sharp, pungent]: a genus of dicotyledonous plants, commonly known as wood-sorrel, and belonging to the GERANIUM FAMILY (*g. v.*). The sepals and petals are five each, the stamens are ten, in two alternating whorls, and the pistil is composed of five united carpels. The leaves are compound, usually palmately three-foliolate, sometimes four-foliolate, or even pinnately many-foliolate. The species (205) are mostly natives of the sub-tropical regions N. and S. of the equator. A few are natives of Europe (two or three) and North America (fourteen or fifteen); among the latter are the common wood-sorrel (*O. acetosella*), violet wood-sorrel (*O. violacea*), yellow wood-sorrel (*O. corniculata*, var. *stricta*). Many species are cultivated in greenhouses for their fine foliage and pretty flowers. Among these are *O. bowiei*, *O. cernua*, *O. hirta*, and *O. variabilis* from the Cape of Good Hope; *O. crenata*, *O. rosea*, and *O. valdiviensis* from South America; and the curious *O. tetraphylla* from Mexico.

CHARLES E. BESSEY.

Oxaluria [Mod. Lat.; *oxal-*ic + Gr. *οὔρον*, urine]: a morbid condition of the general system which favors the excessive excretion of oxalic acid by the kidneys. It is also known as the *oxalic acid diathesis*. Theories of the nature of this disorder have varied widely in the past, but it is now pretty generally conceded that oxaluria is merely a symptom of disordered metabolism—that is, the oxalic acid in the urine results from improper transformation of food or tissue elements in the processes of nutrition. This faulty metabolism is very closely allied to that which causes increase of uric acid in the blood and urine, and which constitutes the disease *gout*. Indeed oxaluria in a majority of instances is probably an expression of aberrant gout. It may, however, occur in a variety of affections, such as neurasthenia, anemia, phthisis, and others, not at all similar to gout. The mere presence of the oxalate of lime in the urine, even in large quantities, must not be taken as sufficient to establish the diagnosis; for after a diet including rhubarb, cranberries, and other vegetables, oxalates are quite naturally present in the urine. The constant excretion of large quantities of oxalic acid in the urine is, however, highly significant. In such cases a characteristic train of symptoms is usually noted, such as emaciation, nervousness, painful susceptibility to external impressions, and hypochondriasis. The patients are incapable of exerting themselves in the least without suffering from fatigue; they are irritable and easily excited. A prominent symptom is a severe and constant pain or sense of weight across the loins. It will be noted that these symptoms are largely of a dyspeptic type. In typical cases of oxaluria of gouty origin we rarely fail to find these symptoms, and especially the nervous and melancholic tendency, but oxaluria may exist and go on to the formation of concretions of oxalate of lime in the kidney without any symptoms at all. Oxalate of lime occurs in the urine in the form of minute octohedral or dumb-bell-shaped crystals, varying in size from a ten-thousandth to a thousandth of an inch in diameter. The formation of oxalic acid in the blood is occasioned by the malassimilation of certain articles of diet, but in exactly what manner has not yet been determined by physiologists. Sugar and all saccharine or starchy matters should be avoided as much as possible, because, as in lithæmia, the readily oxidizable sugars and starches consume all available oxygen and interfere with albuminous transformation. Attention should be paid to the general health, and particularly to the digestive organs. As medicines, the mineral acids, given either alone or combined with tonics, are the favorite remedies.

Revised by WILLIAM F.

Oxbird: See DUNLIN.

Ox'enden. ASHTOX, D. D.: bishop; b. at Broome Parke, near Canterbury, England, in 1808; educated at University

College, London; was rector of Pluckly-with-Pevington, Kent, 1848-69; became honorary canon of Canterbury Cathedral 1864, and Bishop of Montreal, primate, and metropolitan of Canada 1869; resigned his bishopric in Apr., 1878, feeling himself no longer equal to the fatigues of his diocese, but was instituted to the vicarage of St. Stephen, near Canterbury, in May, 1879. He has published *Decision; Prayers for Private Use; Sermons on the Christian Life; God's Message to the Poor; A Plain History of the Christian Church; The Pathway of Safety; Baptism simply Explained; The Lord's Supper simply Explained; Lectures on the Gospel; The Pastoral Office; Fervent Prayer; The Barham Tracts*, etc. His writings have had a very large circulation both in Great Britain and in the U. S.

Revised by W. S. PERRY.

Oxenford, JOHN: playwright and translator; b. at Camberwell, London, England, in 1812; was called to the bar 1833; was many years theatrical critic for the *London Times*; wrote several dramas and songs, and translated a number of German poems and prose works. Among his works for the stage are *My Fellow-clerk* (1835); *Twice Killed* (1835); *A Day Well Spent* (1836); *Porter's Knot* (1869), etc. Among his translations are *Autobiography by Goethe; Conversations of Eckermann with Goethe*; and Kuno Fischer's *Essay on Lord Bacon and his Philosophy*. D. in London, Feb. 22, 1877. Revised by H. A. BEERS.

Oxenham, HENRY NUTCOMBE: theologian; b. at Harrow, Middlesex, England, Nov. 15, 1829; was educated in the school of his native town and in Baliol College, Oxford; studied theology; became curate of Downinghall, Bucks, in 1854, of St. Bartholomew's, Cripplegate, London, in 1856; joined the Roman Catholic Church in 1857, and was for a time a member of the London Oratory, afterward successively professor of St. Edmund's College, Ware, and master at the Oratory school, Birmingham. D. Mar. 23, 1888. Among his works were *Poems* (1854; 3d ed. 1871); *Church Parties* (1857); *Catholic Doctrine of the Atonement* (1865; 3d revised and enlarged ed. 1881); *Letter to Father Lockhart on Dr. Pusey's Eirenicon* (1866; 2d ed. 1871); *Catholic Eschatology and Universalism: an Essay on the Doctrine of Future Retribution* (1876; 2d ed. 1878); *Eirenicon of the Eighteenth Century*, with introduction, notes, and appendices (1879); *Short Studies, Ethical and Religious* (1888); besides translations of various works by Döllinger, Hefele, and others.

Revised by W. S. PERRY.

Oxensjerna, ox'en-sheer-naä, AXEL, Count: statesman; b. at Fänö, Upland, Sweden, June 16, 1583; studied theology and jurisprudence at Rostock, Jena, and Wittenberg, and was employed, after his return to Sweden in 1602, by Charles IX. in several important diplomatic negotiations, which he carried through with great sagacity and dignity. On the accession of Gustavus Adolphus in 1611 he was made chancellor of Sweden, and as such he negotiated the Peace of Knärd with Denmark in 1613 and of Stolbowa with Russia in 1617, and the armistice with Poland in 1629, and accompanied Gustavus Adolphus during his campaigns in Germany, taking charge of all diplomatic affairs. After the fall of Gustavus Adolphus at Lützen in 1632 he was empowered by the Swedish representatives to continue the war, and at the congress of Heilbronn in 1633 the Protestant princes chose him head of the league against the emperor. He concluded an alliance with Holland and France, and returned in 1636 to Sweden as chief of the government during the minority of Gustavus Adolphus's daughter Christina. When she became of age in 1644 his influence decreased, and when she abdicated he retired altogether into private life. He died in Stockholm, Aug. 28, 1654. The second part of *Historia Belli Sueco-Germanici*, of which Chemnitz wrote the first part, is generally ascribed to Oxensjerna, who was an accomplished scholar.

Revised by R. B. ANDERSON.

Oxford: an old and famous city of England, the capital of Oxfordshire. It is situated 52 miles W. N. W. (63 by rail) of London, on the Thames (here called the Isis), near its junction with the Cherwell, among rich and beautiful surroundings, and contains a great number of splendid edifices (see map of England, ref. 11-I). Its trade and manufactures are comparatively insignificant; it is as a seat of learning it has acquired its fame, its university being the oldest and most celebrated institution of the kind in the United Kingdom. (See OXFORD UNIVERSITY.) It is also the seat of a bishopric, and it returns one member to Parliament. Pop. (1891) 45,741.

Oxford: city (laid out in 1836, burned down during the war of 1861-65); capital of Lafayette co., Miss. (for location, see map of Mississippi, ref. 4-G); on the Illinois Central Railroad; 73 miles S. E. of Memphis, Tenn., 157 miles N. by E. of Jackson. It is the seat of the UNIVERSITY OF MISSISSIPPI (q. v.), of Union Female College (Cumberland Presbyterian, chartered in 1854), and of Warren Female Institute (Baptist, opened in 1866); and contains 5 large brick church buildings for white people and 3 frame ones for colored, graded school building that cost \$15,000, U. S. Government building, 2 State banks with combined capital of \$110,000, and 2 weekly newspapers. The industrial works include a cotton mill and gin, cotton-compress, planing-mill, and a canning-factory. Pop. (1880) 1,534; (1890) 1,546; (1894) including suburbs, 2,000. EDITOR OF "WEEKLY EAGLE."

Oxford: town; capital of Granville co., N. C. (for location, see map of North Carolina, ref. 2-G); on the Southern Railway; 46 miles N. of Raleigh. It is in a grain and tobacco growing region, has several large tobacco warehouses and manufactories, and contains an orphan asylum, a private bank, and two weekly periodicals. Pop. (1880) 1,349; (1890) 2,907.

Oxford: village; Butler co., O. (for location, see map of Ohio, ref. 6-B); on the Cin., Hamilton and Dayton Railroad; 39 miles N. W. of Cincinnati. It is the seat of MIAMI UNIVERSITY (q. v.), of Oxford College, and of Western Female Seminary, and has a national bank with capital of \$50,000, and 2 daily papers and 2 monthly periodicals. Pop. (1880) 1,743; (1890) 1,922. EDITOR OF "NEWS."

Oxford: borough: Chester co., Pa. (for location, see map of Pennsylvania, ref. 6-I); on the Lancaster, Ox. and South, and the Phila., Wil. and Balto. railways; 28 miles W. of Wilmington, Del., about midway between Philadelphia and Baltimore. It is in an agricultural region; contains 8 churches, 3 schools, public library, water-works supplied from artesian wells, electric lights, 2 national banks with combined capital of \$200,000, a private bank, and a weekly newspaper; and has a flour-mill and candy and carriage factories. It is the seat of Oxford Academy (Presbyterian), and Lincoln University (Presbyterian) for colored students is 3½ miles N. E. of the borough. Pop. (1880) 1,502; (1890) 1,711; (1894) estimated, 2,500. EDITOR OF "PRESS."

Oxford, ROBERT HARLEY, Earl of: statesman; b. in London, England, Dec. 5, 1661; raised a cavalry regiment for the service of the Prince of Orange 1688; entered Parliament 1690 as an extreme Whig, but gradually changed his political views until they reached the opposite extreme of Toryism: was chosen speaker Feb., 1701; re-elected in the two succeeding Parliaments; was made chief Secretary of State 1704, chiefly through the influence of Miss Abigail Hill (afterward Lady Masham) with Queen Anne; was made Chancellor of the Exchequer Aug., 1710; was stabbed at the council board by the Marquis of Guiscard, a Frenchman, Mar. 12, 1711, to which event he owed a new lease of public and royal favor; was created Earl of Oxford and Mortimer May 24, and Lord High Treasurer May 29 of the same year; enjoyed from this time very great power, having completely supplanted Marlborough in the queen's favor, and consolidated his own popularity by the Peace of Utrecht, Apr., 1713, but was in turn supplanted by Bolingbroke and dismissed July 27, 1714. Regarded with distrust by George I., he was impeached of high treason by Parliament Aug., 1715; committed to the Tower; acquitted June, 1717; lived thenceforth in retirement; accumulated immense collections of books and manuscripts (see HARLEIAN COLLECTION), and was author of some pamphlets of little merit. D. in London, May 21, 1724.

Oxford Movement: See TRACTARIANISM.

Oxfordshire: an inland county of England, bordering S. on the Thames, and on the other sides on Bucks, Gloucestershire, Warwickshire, and Northamptonshire. Area, 755 sq. miles. The surface is mostly level, but undulating in the southern part, where a branch of the Chiltern Hills rises to a height of nearly 700 feet. The county is watered by several streams, including the Windrush, Evenlode, Cherwell, and Thame, which are affluents of the Thames. The soil is a mixture of gravel and loam, and very fertile. Agriculture and dairy-farming are in an advanced state. Wheat, barley, turnips, butter, and cheese are produced in large quantities. Ironstone is worked near Banbury, while blankets are manufactured at Witney, and paper at Henley and Shiplake. Pop. (1891) 185,938. Principal town, Oxford.

Oxford University: an institution of learning at Oxford, England. The first fairly authenticated notice of Oxford as a seat of learning dates from the time of Edward the Confessor. The first charter was granted to the university by John; in 1201, according to Anthony Wood, the university numbered within its walls 3,000 students. Later on, in the time of Henry III., Wood states that there were 30,000 students at Oxford; "but among these a company of varlets, who pretended to be scholars, shuffled themselves in, and did act much villainy by thieving, whoring, quarrelling, etc." The distinguishing characteristic of the Universities of Oxford and Cambridge is the existence of a number of separate corporations or colleges. There have been colleges at many universities, but nowhere have they ever reached anything like the same influence and importance as at Oxford and Cambridge. The origin of the colleges was due to benevolent persons who desired to relieve a certain number of poor scholars from some of the hardships of their life at the mediæval universities, and in order to do this provided a building in which such scholars could live a common life, and also an endowment for their maintenance. From Henry III.'s time date the foundations of three colleges—University (1249), erected on the site of a much earlier foundation; Balliol (1263), Merton (1270). In the time of Richard II. many members of the university warmly espoused the doctrines of Wyckliff, and in the persecutions that followed on this avowal many of the colleges were thinned, some, indeed, being quite deserted for a short time. The university found a generous patron in Richard III., who, among other bounties, granted the privilege to the university of importing or exporting books at will. During the reign of Edward VI. royal commissioners were appointed, with full powers to examine the affairs of the university. In consequence, the form of government in the university was completely altered; but in the next reign the old order of things was re-established. Queen Elizabeth's reign is remarkable in the history of Oxford University for the foundation by Sir Thomas Bodley of the Bodleian Library, and for the passing of the act which confirmed the university as a corporate body; also Jesus College was established in this reign. Shortly after the succession of James I. the two universities had the privilege granted of sending each two members to Parliament. During the troublous times of Charles I. the university sided throughout with the king, and suffered severely in consequence. In 1650 Cromwell was elected chancellor of the university, when several of the more obnoxious among the royalists were removed, to be reinstated at the Restoration. Under the tyranny of James II. the university came violently into collision with the crown; on the refusal of Magdalen College to receive a president forced upon it by the king all the members of that college, with the exception of two, were expelled. However, at the approach of William of Orange they were reinstated by the tyrant. From this period the university has proceeded on an even course.

Following is a list of the colleges, with statistics for 1893:

Founded.	COLLEGES	Income from endowments	Under graduates	Members of convocation	Members on the books.
1437	All Souls	£15,397	7	91	111
1263	Balliol	5,623	237	406	826
1569	Brasenose	8,825	126	336	568
1532	Christ Church	32,172	295	571	1,350
1516	Corpus	13,075	85	212	348
1314	Exeter	5,173	152	523	825
1874	Hertford		76	175	312
1571	Jesus	10,748	95	112	298
1869	Keeble		296	178	611
1427	Linsolin	4,303	89	159	263
1456	Magdalen	24,888	178	274	519
1250	Merton	14,616	140	235	413
1386	New College	15,800	248	509	784
1326	Oriel	5,621	90	233	402
1624	Pembroke	3,063	76	180	308
1340	Queen's	11,863	119	295	539
1555	St. John's	11,910	118	342	598
1574	Trinity	5,145	172	300	608
1249	University	6,688	120	290	565
1613	Wadham	4,155	89	204	415
1714	Worcester	2,283	95	242	426
	HALLS				
1269	St. Edmund		39	37	101
1325	St. Mary		50	40	116
	Marston's		27	1	32
	Turrell's		8	1	13
	Grindley's		3		4
	Non coll. students		246	92	473
	Totals		3,197	6,087	12,465

The highest officer in the university is the chancellor; the election is determined by the members in convocation, and the office is held for life. For the last 200 years it has been the custom to elect some distinguished nobleman who has been educated at Oxford; the Marquis of Salisbury is the present chancellor. There is no stipend attached to this office. The chancellor's deputy, the vice-chancellor, is nominated by the chancellor from among the heads of colleges; the office is held for four years, and is endowed with a salary of £600 a year. To assist the chancellor and vice-chancellor two other officers are appointed—the high steward and deputy steward. The appointments are at the disposal of the chancellor, subject to the approval of convocation. The business of the university is transacted in two separate assemblies—the house of congregation and the house of convocation. In the former the business is confined to granting ordinary degrees and confirming the nomination of examiners made by the vice-chancellor and the proctors. All other business is conducted in the house of convocation. To facilitate the ordinary legislation of the university there meets every week during term time the hebdomadal council, composed of the heads of colleges and others. Not the least important among the university officers are the proctors. The business of these gentlemen is to guard against any breach of discipline on the part of members of the university. The proctors are two in number, and are assisted by four pro-proctors. Both proctors and pro-proctors must have attained the standing of master of arts, the former for at least four years previous to election.

Before entering the university a preliminary examination, the matriculation, must be undergone, varying in difficulty according to the status of the college. Shortly after entering the student is confronted by responsions, the first public examination; for this a slight knowledge of classics and mathematics is required. In order to get a degree the student must have resided at least twelve continuous terms at the university, and must have passed the necessary examinations. The study of ancient literature, history, and philosophy—*literæ humaniores*—is the study most largely encouraged at Oxford; the degree is usually acquired in the classical schools. There are also schools in modern history, civil law, and theology, in which the examinations are usually attended by men who have passed through the classical schools. For those who go to study mathematics, natural science, etc., there are also schools in those subjects. Attached to each college are fellowships and scholarships, awarded in most cases by open competition. Until lately fellowships were nearly all clerical, but now, to a great extent, restrictions have been removed, and the fellowships are thrown open to the whole university as they become vacant. In most colleges the fellowships are held for life, so long as the holder remains unmarried; but a sensible change is now largely adopted by making the fellowships tenable for ten years, whether the holders choose to marry or not. Scholarships are awarded after competition to undergraduates who have not exceeded a certain number of terms from matriculation, and to young men entering the university; there is in most colleges a limit of age. The value of the scholarships is about £80 or £100 a year, tenable for five years. Instruction is conducted mainly by the college tutors; lectures are also delivered by the university professors. The university year is divided into four terms—Michaelmas, Hilary, Easter, and Trinity. The intervals between terms are short, with the exception of the long vacation, which lasts from the first or second week in June to Oct. 10. *Oxford and her Colleges*, by Goldwin Smith (New York, 1894), is a delightful sketch of the university. See also *Historical Register of the University of Oxford 1888*.

Revised by C. H. THURBER.

Ox-gall: the bile of the domestic ox (*fel bovinum*). It is used in the arts in scouring wool, since into its complicated composition there enters abundance of soda, which gives it a soapy quality. When properly refined from its coagulable and coloring matters it is used by artists in mixing colors, which it often improves in tint, while it fixes them and makes them flow better. It is also used in some kinds of artists' varnish and in cleansing ivory tablets for artists' use. In medicine it is sometimes given when a deficiency of bile is suspected to exist, to aid digestion of fats in the small bowel; in enemata it is believed to dissolve scybalous masses, and as an external application some practitioners consider it powerfully discentent.

Revised by H. A. HARE.

Oxides: See OXYGEN.

Oxley. JAMES MACDONALD, LL.B.: author; b. in Halifax, Nova Scotia, Oct. 22, 1855; educated at Dalhousie, Halifax, and Harvard Universities; was admitted to the bar, and practiced from 1877 till 1883, when he was appointed legal adviser to the Marine Department, Ottawa. He resigned this office in 1891, and engaged in the life-insurance business in Ottawa, and in 1892 in Montreal. Many of his books have been republished in England. Among his published works are *Nova Scotia Decisions* (3 vols., Halifax, 1880-83); *Young's Admiralty Decision* (Toronto, 1882); *Bert Lloyd's Boyhood* (Philadelphia, 1889); *Up among the Ice Floes* (1890); *The Chore-boy of Camp Kipewau* (1891); *Donald Grant's Development* (1892); *Fergus MacTavish* (1892); *The Great Ship Gryphon* (1893); *Archie of Athabaska* (Boston, 1893). NEIL MACDONALD.

Oxlip: See PRIMROSE.

Oxpecker: See BEEF-EATER.

Oxus, Amoo', or Amu, also called **Amoo Darya** (anc. *Oxus*; Arab. *Gihon*): a river of Western Asia, which rises on the Belur Tagh, nearly 15,000 feet above the level of the sea; receives many affluents from the mountains of Turkestan and the Hindu Kush, flows through Turkestan, and falls into the Aral Sea. The length of its course is 1,610 miles. According to the treaty of peace concluded in July, 1873, between Russia and Khiva, this river became the permanent boundary-line between Khiva and Bokhara.

Oxychlorides, sometimes called **Basic Chlorides**: a class of compounds sometimes formed by the direct action of an oxide of a metal upon the chloride of the same metal, as in the cases of lime, magnesia, zinc, etc. In the latter two cases important cements are founded upon the formation of such oxychlorides. Other classes of oxychlorides are formed by the partial decomposing action of water upon the chlorides of some metals, acting by removing a portion of the acid, as in the cases of antimony and bismuth. There are some native mineral oxychlorides, as atacamite and tal-lingite, oxychlorides of copper, and matlockite and mendipite, oxychlorides of lead. Other elements besides the metals form oxychlorides, such as silicon, carbon, sulphur, selenium, nitrogen, phosphorus. Oxychloride of phosphorus, POCl_3 , is a compound of considerable interest.

Oxygen [Gr. *ὀξύς*, sharp, acid + *-gen* of Gr. *γεννᾶν*, and Lat. *generare*, produce]: the most abundant of all the elements existing in the earth.

Name.—The word oxygen was applied by Lavoisier to represent the generalization which he had arrived at, and which in his day was almost universally accepted, that oxygen was the sole "acidifying principle." Since then it has become more and more apparent that the class of substances called "acids" does not owe its characteristics to the presence of oxygen, and that hydrogen is far better entitled to the designation of the "acidifying principle," if there be any such thing. Thus the term oxygen must be recognized as one of the most remarkable and unfortunate cases we have of a name founded upon a fragmentary and entirely incorrect generalization. In the German language, likewise, oxygen is *Sauerstoff* (acid stuff or material), again perpetuating Lavoisier's view. Condorcet called it "vital air." Scheele called it *Feuerluft*, fiery or fire-supporting air.

History.—Priestley, Aug. 1, 1774, first discovered and prepared in a pure state the life and fire-sustaining gaseous principle of air, which he called "dephlogisticated air," as he was, even up to the time of his death, an adherent of the phlogistic theory of Stahl. He prepared pure oxygen by heating red oxide of mercury, which is dissociated by heat into metallic mercury and oxygen gas. Priestley, who, from his many important discoveries and inventions relative to different gases and the manipulation of gaseous bodies, is known as the "father of pneumatic chemistry," knew well how to collect, preserve, and experiment upon the new gas. He thus easily proved its identity with the active element of the air. To commemorate this great event in scientific history the chemists of the U. S. assembled Aug. 1, 1874, 100 years later, at the grave of Priestley, on the banks of the Susquehanna, at Northumberland, Pa., to celebrate the "centennial of chemistry." One year later than Priestley, in 1775, the great Swedish chemist Scheele made independently the same discovery. Lavoisier may be justly regarded as the discoverer or propounder of the true theory of fire, oxidation, and combustion, as consisting in combination with oxygen of the air. Grothuss, and especially H. Davy, investigated flame, and advanced some steps in a theory thereof.

Occurrence in Nature.—Oxygen is in an enormous degree the most abundant, as it is in many respects the most important, of the elements of matter, upon our earth at least. The only other element that can compare with it in abundance is silicon, the special element of mineral silicates. Even in these oxygen preponderates largely. The following figures show the proportions of oxygen and silicon in some of the commonest of the minerals that make up nearly the whole mass of the known earth:

MINERALS.	Oxygen per 100.	Silicon per 100.
Quartz	54.0	46.0
Feldspar (orthoclase)	46.75	29.6
Mica muscovite	48.27	21.0
Pyroxene	44.6	25.3
Amphibole	46.8	27.6
Limestone	48.0—carbon.	12.0

Oxygen constitutes nearly half the total weight of known matter, and silicon not far from one-third. Of water, the liquid part of the earth, oxygen forms eight-ninths. Of living matter, vegetable and animal, oxygen also forms by far the largest element, by reason of the fact that water is so predominant a constituent of these. Apart, however, from the water existing as such in living beings, much oxygen is contained in their solid or "plastic" constituents when perfectly dry. Thus cellulose and starch both contain 49.38 per cent. of oxygen, albumen 23.5, and gelatin 27.5. Of normal atmospheric air oxygen constitutes from 20.8 to 20.9 per cent. by volume, and by weight about 23 per cent.

Preparation.—Of accomplishing this there are many methods besides that of Priestley above referred to. Peroxides of manganese and barium both evolve oxygen when strongly heated. Peroxide of barium will take the oxygen up again at a lower temperature from a current of moist air, and the alternation of these two operations upon this peroxide, or, which is the same thing, upon anhydrous baryta, constitutes Boussingault's method of making oxygen. The method of Tessie du Motay, by which oxygen has been manufactured for illuminating purposes, consists in the exposure alternately of a salt of manganic acid to a current of air and to one of steam. Sulphuric acid will evolve oxygen from a number of substances when heated therewith, such as bichromate of potash, permanganate of potash, peroxide of manganese, peroxide of lead, etc. It may also be obtained by electrolysis of water. Deville and Debray proposed two new methods, both of which furnish it at first in admixture with sulphurous oxide gas, one being to pass sulphuric acid in vapor over heated platinum, the other to heat white vitriol, or sulphate of zinc, to a high temperature. The method in most general use, both in chemical laboratories and in the manufacture of oxygen for commerce, is to heat potassium chlorate to fusion. The evolution of the oxygen is greatly facilitated and hastened by pulverization of this substance and mixture with small proportions of peroxide of manganese.

Chemical Properties.—Oxygen is a colorless and inodorous gas which has been liquefied by Caillietet in Paris, by Pictet at Geneva, and by Dewar in London, by the application of great pressure and cold. It is magnetic—more so than any other gaseous substance. Its density, air being unity, is 1.10561. Bunsen found that ice-cold water can hold in solution 4.111 per cent. of its volume of oxygen, and water at 20° C. (= 68° F.) only 2.838 per cent. When pure, it manifests the most energetic affinities. A combustible body, as a charred splinter of wood, a candle, or the like, if having but a spark of fire adherent, instantly kindles into flame when immersed in oxygen. In this way it may be distinguished from all other gases except laughing-gas, which has the same power. Oxygen will itself burn with flame in an atmosphere of a combustible gas like hydrogen. Even gaseous ammonia may be substituted for the hydrogen in this experiment. When it burns with hydrogen, two volumes of the latter combine with one volume of oxygen, and the three volumes condense to two volumes of steam. The product of the union of oxygen with another element is called an oxide. Thus when lead is heated in contact with the air it combines with oxygen, forming lead oxide, PbO ; charcoal, or carbon, burns, forming carbon dioxide, CO_2 ; phosphorus burns, forming phosphorus pentoxide, P_2O_5 .

Uses of Oxygen.—Outside of the applications of oxygen as a purely scientific and analytical agent in the chemical laboratory, its practical uses have not yet been developed to any great extent, in consequence of the large expense of obtaining it free from nitrogen. Dr. Hare's applications of

it for producing intense heat for fusing metals, and intense light by the invention properly called Hare's lime-light, remain yet the most important uses. In France some hundreds of pounds of platinumidium have been melted at once by Hare's method.

Ozone.—This is a modification of oxygen which, up to this time, stands almost if not altogether alone in some respects. Allotropic modifications of solid and liquid substances are exceedingly common, but those of gaseous bodies are little known, ozone being the only one that has been at all studied. As in the case of all allotropic changes, when oxygen passes to the form of ozone there is found to be a change of volume. Ozone is formed when oxygen is submitted to various agents and operations. The electric spark and the slow oxidation of phosphorus are two of the most familiar. The oxygen formed by electrolysis contains it; also that evolved from a mixture of sulphuric acid and permanganate of potash. It is always readily detectable, when masking odors are absent, by its very singular and characteristic odor, which, once perceived, is always recognizable again.

Revised by IRA REMSEN.

MEDICINAL USES OF OXYGEN.—Oxygen is locally irritating to raw surfaces, exciting inflammation if too long applied. Inhaled in health with proper precautions to remove carbonic acid and other products of expiration from the inspired gas, it is perfectly respirable, and does not produce much substantial change in the rate of performance of the functions. This circumstance is accounted for by the fact, proved by experiment, that in health the blood can take up as much oxygen from ordinary atmospheric air as when supplied with the pure gas—in other words, as much as it is capable of absorbing—the only difference in the two cases being that where oxygen alone is breathed, the highest point of saturation is reached more speedily than where air is employed. When from any cause there is defective respiration, and the system suffers in consequence from imperfect oxygenation of the blood, the inhaling of pure or slightly diluted oxygen, by enabling something like the normal quantity of the gas to be presented to the blood at each inspiration, affords prompt and decided relief, and is, of course, *pro tanto*, of great benefit. Hence in such affections as asthma, pulmonary emphysema, croup, diphtheria, dyspnoea from heart disease, etc., inhalations of oxygen are often exceedingly useful. In other diseases, generally those of mal-nutrition, such as consumption of the lungs, anæmia, severe dyspepsia, indolent ulcers, etc., experience has shown that in some cases much benefit has followed inhalations of oxygen. Where ulceration or active inflammation is present, the use of the gas requires care, lest its irritant effects do harm. Oxygen for medicinal use must be perfectly pure, and is best prepared by decomposition of potassium chlorate. It is inhaled from a bag connected with the mouth by a tube provided with a proper mouthpiece to keep the expired air from mixing with the gas; and the nostrils being left free, enough air is at the same time inspired to dilute the oxygen somewhat. Inhalations morning and evening of from 1 to 4 gal. generally suffice in chronic affections, but in acute disease the amount must be determined by the necessities of the case. For medicinal use, cylinders holding from 100 to 200 gal. of gas compressed into a moderate compass are exceedingly convenient as portable reservoirs from which to supply the inhaling apparatus. See HYDROGEN PEROXIDE for local uses.

Revised by H. A. HARE.

Oxygenated Water: See HYDROGEN PEROXIDE.

Oxyhæmoglobin: a combination of hæmoglobin, the coloring-matter of the blood, with oxygen. This compound readily renders up its oxygen to the tissues when reduced hæmoglobin results, which in turn becomes oxyhæmoglobin after the blood is aerated in the lungs. The bright-red color of arterial blood is due to this compound, while the darker color of venous blood is due to reduced hæmoglobin.

W. P.

Oxyhydrogen Blowpipe: an apparatus invented in 1801 by Dr. Robert Hare, of Philadelphia, for the purpose of producing a very high temperature by burning hydrogen and oxygen together. It is now extensively used for melting platinum and for producing the calcium light, by rendering a piece of lime intensely hot. (See LIME-LIGHT.) The best form is a jet consisting of a tube for the delivery of oxygen, with a larger tube around it, the hydrogen being delivered through the annular space.

Oyer [from Anglo-Fr. from O. Fr. *oier* > Fr. *ouïr* < Lat. *audire*, hear]: in law, a hearing by the common-law rules of pleading. A party to an action who alleged in his pleading any deed upon which he based his claim or his justification in defense was required to make profert of such deed (that is, produce it in court), and thereupon the other party was entitled to demand oyer of the deed, or to hear it read, in order that he might have an opportunity to learn its contents or ascertain its genuineness, and thus be able to prepare his answer or defense. Anciently, when the pleadings were oral, profert consisted in actually bringing the deed into court, and upon a demand of oyer it was read aloud by the party introducing it; but when pleading was conducted by written instruments, profert was made by a merely formal allegation that the deed was brought into court, and a demand of oyer was made in writing upon the party alleging the deed, who was then bound to deliver it into the other's hands for inspection, and, if required, to leave with him a copy. Oyer was demandable only of deeds or instruments under seal, and of letters testamentary or letters of administration, and not of private writings having no seal. The practice of demanding oyer has been superseded in England and generally in the U. S. by more convenient methods, prescribed by statutes, as discovery under oath by one party upon an order obtained by the other, or the inspection of papers upon an order or due notice. See PLEADING.

Abridged by F. STURGES ALLEN.

Oyer and Terminer [from Anglo-Fr. *oyer* (from O. Fr. *oïr*), hear, and *terminer*, limit, determine]: in England, a phrase forming part of the designation of certain higher criminal courts of original jurisdiction, and of the Commission (*q. v.*) by which they are directed to be held. General commissions of oyer and terminer are issued to the justices of Assize (*q. v.*) and other special persons (generally at the same time with the commission of JAIL DELIVERY, *q. v.*) directing them to hear and determine all treasons, felonies, and misdemeanors arising within their jurisdiction. This commission differs from the commission of jail delivery principally in the circumstance that the justices of oyer and terminer can proceed only upon an indictment taken before themselves, whereas justices of jail delivery must try all found in the prison they are to deliver. A special commission of oyer and terminer is issued when there is a sudden insurrection, or riot, or public outrage which demands speedy redress, to hasten the administration of justice and assist the regular courts. The courts of oyer and terminer are of very ancient origin, and their constitution has been hardly altered at all since the time of Edward III. In the U. S. the phrase oyer and terminer is sometimes used in designating criminal courts, but the jurisdiction and organization is generally prescribed by statute. In the State of New York the court of oyer and terminer is the highest court of original jurisdiction.

F. S. ALLEN.

Oyo, or Awyaw: the capital of Central Yoruba, in West Africa, N. of the Slave Coast. It is the center of one of the most important native agricultural regions in Africa. The people are fully clothed in well-dyed native cloths, and live in adobe houses built around court-yards. Pop. (1891) estimated, 60,000. See YORUBA.

Oyster [from O. Fr. *oistre* > Fr. *huître* < *os'trea*, *os'treum* = Gr. *ὀστρεον*, oyster]: the English name common to the species of the family *Ostreidae* and genus *Ostrea*. All the species of the genus are much alike, and agree in the following characters: The animal has the mantle margin double and finely fringed; the gills are nearly equal; the lips plain; the palpi triangular and attached; the shell is irregular and rough; the left valve adherent and convex; the right free and flat or concave; the hinge toothless. The genus is almost cosmopolitan in range, but is not represented in the polar seas. About seventy recent species have been recognized by various authors, but the true species are probably considerably less. The most notable are the oysters of Europe (*Ostrea edulis*) and the Eastern U. S. (*Ostrea virginiana*). The former is a comparatively small species, found generally in the European seas, and has a copery flavor; the latter is the common large American species; it has none of the copery taste characteristic of the European species. The European species is hermaphroditic, the American dioecious. Both species are subject to considerable variation in form, and the American has by some authors been differentiated into two—a northern roundish form (*Ostrea borealis*), and a southern longish one (*Ostrea virginica*).

Revised by J. S. KINGSLEY.

Oyster-catcher: a name applied to the wading birds of the genus *Hematopus*, because they feed on small oysters and other molluscs. There are six or eight widely scattered species, all readily recognized by their stout, brightly colored, compressed bills, and striking black and white plumage, whence the English name of sea-pie. The American oyster-catcher (*Hematopus palliatus*) is about 18 inches long; the head and neck are glossy black; back, wings, and outer part of tail blackish brown; under parts, base of tail, and a conspicuous wing patch white. The European bird (*H. ostrilegus*), which is a straggler to Greenland, is slightly smaller, and is darker. F. A. LUCAS.

Oyster-culture and Oyster-fisheries: the method of raising oysters for market and the means employed for taking them. The shell-heaps of Europe and North America testify to the antiquity of oyster-fisheries. At an early date the Romans imported oysters from Britain, while the oyster industry is still an important branch of the fisheries of various nations, notably of the U. S., Great Britain, and France, in the order given. Oysters are found at various depths, largely depending on the temperature of the water, but in the U. S. the majority are taken in water from 15 to 30 feet deep, although dredges are used down to 15 fathoms. The French and British dredge ordinarily down to 30 fathoms. In shallow water oysters are taken with "tongs," implements like a pair of huge, long-handled rakes, so hinged together as to open and shut like a pair of scissors. In deeper water dredges are used, these being essentially coarse-meshed nets of heavy twine or iron chainwork, secured to a rectangular iron frame, which scrapes over the bottom. The frame is about twice as wide as high, being usually 3 or 4 feet across, and the long sides are sharpened, or more usually furnished with large projecting teeth. The dredge is attached by a long rope to a small winch worked by one or two men, and the larger vessels carry two dredges. TONGING is prosecuted from small boats, dredging from larger vessels, these ranging from 5 to 50 tons burden, and while some exceed this size, the majority are under 30 tons. Oysters are taken at all seasons of the year, but during the warm months, roughly speaking from May to September, the oysters are spawning and are protected by law on public beds. The number of oysters consumed is enormous, so much so that, in most cases, the natural supply can by no means keep pace with the demand, and, as Mr. Stevenson puts it in a recent report on the oyster industry of Maryland, "in every region of the world where the oyster industry has assumed any commercial importance, it has passed, or is apparently passing, through the following four stages: First, the natural reefs in their primitive condition, furnishing the entire supply of oysters; second, those reefs somewhat depleted, producing small oysters, many of which are transplanted to private grounds, and under individual protection permitted to mature; third, the public beds so far depleted that the supply available is very irregular and uncertain, and consists almost entirely of small oysters, which are transplanted to private areas; fourth, the entire dependence of the industry on areas of ground under individual ownership or protection.

"In Europe the greater number of the oyster-producing localities are in the condition of the fourth stage. In the U. S. . . . the industry still depends largely on the public reefs; but were it not for the supply of seed oysters obtained from more southern waters, all those States N. of Connecticut would be practically in the condition of the fourth stage. Connecticut, New York, New Jersey, and Delaware . . . are rapidly passing from the third to the fourth condition. The oyster industry of Chesapeake Bay is in the second stage, but the history of the fishery in other States and countries excites grave fears as to its long continuance in this condition." Oyster-culture proper, that is the raising of oysters from the spawn or spat produced upon the spot, is most extensively and successfully practiced in France. The spawn is collected upon wooden hurdles or tiles, from which the young oysters are removed and transferred to the beds to grow. In the U. S. considerable attention has been paid to the extension or preservation of private oyster-beds by throwing over quantities of oyster or scallop shells on which the spat can collect, but so far it has been found most profitable to transplant young or small oysters from the public grounds to private beds. This practice may be said to have been initiated in Europe by

Sergius Orata, who "bedded" oysters at Baia 95 B. C. The Japanese are successful ostreaculturists, and the art has been practiced by the Chinese for 1800 years.

The following table from *The Oyster Industry of Maryland* (1894) shows the oyster product of the world:

COUNTRY.	Bushels.	Value.
U. S.	29,796,387	\$16,638,805
Great Britain	2,760,000	6,200,000
France	2,000,000	5,000,000
Holland	70,000	444,000
Italy	65,000	200,000
Canada	152,580	183,846
Germany	13,000	75,000
Miscellaneous	400,000	600,000
Totals.	35,256,967	\$29,341,651

In the U. S. Maryland leads with 11,632,117 bush., having a value of \$5,866,120. Connecticut leads in oyster-bedding, while California is remarkable for her rapid development of the oyster industry, her product being worth \$698,257. The secondary products of oyster-fisheries, in the shape of shells, have a considerable value. Formerly oysters, raw or burned into lime, were extensively used for manure along the eastern seaboard of the U. S., and the poorer qualities are still so employed in some parts of the Southern States. The refuse shells from the large canneries are burned into lime for use in making gas, or are used as a flux in the manufacture of certain kinds of iron. For information concerning the oyster-fishery, see the Quarto Fishery Reports; the special bulletin of the tenth census of the U. S. on the *Oyster Industry*, by Ernest Ingersoll; the bulletins of the U. S. Fish Commission; *Oysters and All About Them*, by John R. Philpots (London, 1890). F. A. LUCAS.

Oyster-plant: See SALSIFY.

Ozæ'na [Mod. Lat., from Lat. *ozæ'na* = Gr. *ὄζαινα*, a fetid polypus in the nose, deriv. of *ὄζειν*, smell]: a disease of the nose, characterized by a discharge of fetid muco-purulent matter from the nostril. Any case of chronic catarrh of the nose may become ozæna if the condition of the patient is depressed. It may depend upon caries, and may be a symptom of cancer, syphilis, glanders, or scurvy. It often follows scarlatina, or even a severe cold. General tonic treatment, good food, and weak local disinfectants are indicated in simple ozæna; but if there be caries, or any specific disease of which it is a symptom, such disease will require attention.

Ozark Mountains: a series of steep and heavily timbered ridges of Southern Missouri, extending into Arkansas and the Indian Territory. They are nowhere of great elevation. They are believed to possess great mineral wealth.

O'zerov, VLADISLAV ALEKSANDROVICH: poet; b. in the government of Tver, Russia, Sept. 29, 1770. He was well educated, and after a career of some years in the army he entered the civil service. His first literary ventures met with scant success, but in 1804 his tragedy *Edipus at Athens*, though little more than a translation from the French writer Ducis, at once achieved great popularity. In the following year his *Fingal* (taken from Ossian) was equally fortunate, and in 1807 he won his greatest triumph with his *Dimitrii Donskoi* (name of an early prince of Moscow, who defeated the Tatars), a patriotic piece first put on the stage a few days before the battle of Eylau and full of allusions to the struggle then going on between Russia and France. His last play, *Polyxena* (1809), if not up to its predecessors, was nevertheless favorably received by the public. D. Nov., 1816. Ozerov is commonly regarded as the last Russian dramatist of the classical school, but he belongs to the romantic in the choice of some of his subjects and in the sentimentality of his works. His style is stately, his verse smooth and melodious, and his feeling usually genuine and well expressed (8th edition of complete works, 1856). His *Fingal* has been translated into French verse (by Dalmas, St. Petersburg, 1818) and prose. A. C. COOLIDGE.

Ozokerite [from Gr. *ὄζειν*, smell + *κρός*, wax]: a brownish-yellow, wax-like substance found in bituminous sandstones. The largest deposits are in Moldavia and in Utah. In combination with India-rubber, asbestos, etc., it is used to insulate electrical conductors.

Ozone: See OXYGEN.

P



: the sixteenth letter of the English alphabet.

Form.—The form P is that of the Roman alphabet derived from the early Greek Ϙ, ϙ, or in its square-cornered form ϙ. The Semitic form of the letter was פ. Its original shape was an ellipse, and hence its Semitic name.

Name.—The Semitic name of the letter was *pē*, i. e. mouth, which became in Greek πῆ, later πῆ. The Latin phonetic name *pe* passed through the French *pe* into English as *pe*, now pronounced as rhyming with *tree*.

Sound.—It is a voiceless labial explosive, formed by breaking a closure at the lips with voiceless breath, as in *pat*, or by effecting a check through closing the lips, as in *up*. Sometimes there is in the latter case an additional after-puff caused by again breaking the closure; thus after *s*, as in *asp*, where the after-puff constitutes the only characterization of the sound. Before *n*, *s*, *t*, the *p* is silent, as in *pacanatics*, *psalm*, *script*, *Phoenix*, also in *cupboard*, *raspberry*, and after *m* finally or before *t*, as in *jump*, *tempt*, it has the effect of giving a sharp and definite conclusion to the nasal.

Source.—The sound *p* represents in Teutonic words a Teutonic *p* < Indo-Eur. *b*, which was, however, of rare occurrence, and initially did not exist. Hence no genuine Teutonic word in English begins with *p*. Example of non-initial *p*: *sleep*. O. Eng. *slapan*; Germ. *schlafen*; cf. O. Bulg. *slabŭ*, weak; Lat. *labare*, totter. The sound is secondarily developed in, e. g., *empty* < O. Eng. *æmtig*, *Hampton* < O. Eng. *Hamtūn*. Otherwise *p* occurs in loan-words, (a) from Latin through O. Eng., as *pound*; O. Eng. *pond*, Lat. *pondo*; (b) from Latin through O. Fr., as *people* from O. Fr. *pueple* < Lat. *populus*; (c) from Lat. through some other Romanic language, as *piate*, Ital. Lat. *piata* (Gr. *πλατεία*); (d) from Latin or Greek direct, as *pastor*, *pathos*; (e) from various other sources, as *plaid* (Celtic), *punch* (Hindi).

Symbolism.—P = phosphorus (in chemistry); Publius (in Latin); *pondere*, by weight; P. C. = *Patres Conscripti* (Latin); P. M. = *post meridiem*, afternoon; postmaster; Pontifex Maximus (Latin); Pb = plumbum, lead (in chemistry). See ABBREVIATIONS. BENJ. IDE WHEELER.

Paca, *pa'ka* [Portug., from the native name]: one of the largest of rodent mammals (*Catalogus paca*), a native of South and Central America. It is 2 feet long and generally dark brown with streaks and patches of white. The zygomatic arch is prodigiously developed, so that the cheek pouches are protected by a bony case. Its tail is very small.



The brown paca

It is destructive to sugar-cane and other growing crops, burrows in the earth, and is remarkably cleanly in its habits. It is clumsy in build, but very active. When wild it bites fiercely if hard pressed. In captivity it is harmless and somewhat stupid. It is valued as food, but is usually very fat and oily. Its fur is worthless, but its thick skin makes a good leather.

Paca, WILLIAM: jurist and Governor of Maryland; b. at Wye Hall, Harford co., Md., Oct. 31, 1740; graduated at

Philadelphia College 1758; studied law in the Middle Temple, London, and became a lawyer at Annapolis, Md.; was a leading patriot in 1774; was in Congress 1774-79, and again 1786; signed the Declaration of Independence; was in the State Senate 1777-79; chief justice of Maryland 1778-80; chief justice of the State court of appeals for admiralty and prize cases 1780-82; Governor of Maryland 1782, 1786; was in the convention of 1788 which ratified the U. S. Constitution; was a U. S. district judge 1789-99. D. in 1799.

Pachio'nian Bodies [Mod. Lat. *glandulae Pacchioni*], Pacchionian glands, named in honor of their discoverer, Antonio Pacchioni (1665-1726): a group of numerous small whitish bodies found, in man, on the inner surface of the dura mater, and also within the superior longitudinal sinus and on portions of the pia mater, whence indeed they are originally developed, making their way outward into the dura mater and producing, by pressure and absorption, little depressions in the inner surface of the skull. They are very rarely found in subjects under three years of age, and are sometimes absent in adults. They are not glands, but fibro-cellular nodules. Their use is not known.

Pace and Pacing: See GAITS.

Pachu'ca: capital of the state of Hidalgo, Mexico; on a branch of the railway from Mexico to Vera Cruz; 55 miles N. N. E. of Mexico city (see map of Mexico, ref. 7-II). It lies in a valley at the foot of a mountain chain which separates it from the valley of Mexico, and 8,150 feet above the sea. Pachuca is noted for its silver mines, which are among the most important in the republic. It is said that they were worked by the Aztecs before the conquest. The Spaniards early took possession of them, and it was here that the amalgamation or *patio* process was discovered by Bartolomé Medina in 1557. In 1893 there were 14 reduction-mills, and from 70,000 to 90,000 tons of ore are reduced annually. Pop. (1892) 32,815.

HERBERT H. SMITH.

Pachyderm'ata [Mod. Lat.; Gr. *παχύς*, thick + *δέρμα*, *derma*, skin]: a name applied by Cuvier to an order containing the horses, tapirs, pigs, elephants, and related forms, including all non-ruminating ungulates. The sea-cows, and even the walrus, have been placed in this "order" by some writers, but the members of this heterogeneous group are now distributed in other orders. F. A. L.

Pacificator. The: See FERRY, PAUL.

Pacific Ocean: that part of the aqueous envelope of the earth which separates America from Asia and the East Indies. It is the most extensive and the deepest of the oceans. On the S. it merges with the southern ocean, the parallel of 40° being usually taken as an arbitrary limit. On the N. and E. it is separated from Asia and the Indian Ocean by a chain of seas more or less inclosed by islands and peninsulas. These—the Bering, Okhotsk, Japan, Yellow, China, Sulu, Celebes, Banda, Java, and Arafura Seas—are all regarded as its dependencies. The ocean proper has an area of 50,000,000 sq. miles, or three-eighths of the water-surface of the globe; with its dependencies, 55,500,000, or two-fifths. Its mean depth is 2,475 fathoms, and it contains about three-sevenths of the water of the globe. Counting also the dependencies, the mean depth is 2,285 fathoms, and the ratio of volume five-elevenths. The mean depth is also the general depth, three-fourths of the bottom lying between the planes of 2,000 and 3,000 fathoms.

Configuration of the Bed. The most extensive plateau lies in the southwestern part of the ocean, and is of an extremely irregular character. From the island of New Guinea it extends E. by S. to the Friendly islands, including also the Fiji, Samoan, Ellice, and Solomon islands, and the New Hebrides. A southward arm extends to New Zealand; another southward arm, bearing New Caledonia, extends to Queensland, and a branch from this joins New Zealand. The area thus indicated rises above the 2,000-fathom line, and considerable parts of it approach within 1,000 fathoms of the surface, while a great number of peaks reach the air. The Caroline islands occupy another plateau, from which narrow branches extend southward to New Ireland and

northwestward, via the Ladrone islands, to Japan. Other plateaus of some extent are occupied by the Marshall and Low groups, and a narrow ridge, 1,600 miles in length, extends W. N. W. from the Sandwich islands, sending a few peaks to the surface. An extensive but imperfectly surveyed plateau lies off the coast of Chili.

There is a broad deep between New Zealand and Chatham island on the W. and the Isle of Maria Theresa on the E. A more extensive deep of irregular outline follows the coast of the Kurile and Japanese islands and extends E. in lat. 25° N. Its deepest portion lies close to the line of islands, and includes soundings of about 5,000 fathoms. The vast bed of the Pacific has been surveyed with care in only a few districts, but in those it has been found to be very irregular in detail, abounding in mountains and valleys. It is believed that the peaks whose summits are known as islands and shoals constitute but a small part of the Pacific mountain system.

Circulation.—The parts of the ocean lying N. and S. of the equator are called respectively the North Pacific and the South Pacific, and though the assumed dividing line is arbitrary, it coincides approximately with a natural division related to the system of currents. Each part has its own great eddy, set in motion by the planetary winds, and the reverse current which separates these lies but a few degrees N. of the equator. In the North Pacific a great current runs westward in the tropics, another great current eastward in the temperate zone, and the circuit is completed by a southward current along the California coast and a northward current along the coasts of the Philippine and Japanese islands. The heat-bearing northward current is known along the coast of Japan as the Kuro Siwa, and is the counterpart of that portion of the North Atlantic circulation called the Gulf Stream. N. E. of the principal eddy is a secondary eddy occupying the Gulf of Alaska. It follows the Alaskan coast from Charlotte island northward, westward, and southwestward to the vicinity of Unalaska, where it turns to the S. and E. A monsoon current, following the coast of Central America and Southern Mexico, runs to the northwestward in summer and is reversed in winter. The great eddy of the South Pacific flows westward near the equator and eastward in middle temperate latitudes, where it joins with the circumpolar eddy of the southern ocean and follows the South American coast northward to Cape Blanco. The return southward current is divided by the islands into many streams, and a distinct eddy is recognized between Australia and New Zealand. This is not a reverse eddy, like that of the Alaskan Gulf, but turns from right to left like the great eddy with which it is associated, following the New Zealand coast northward and the Australian southward.

Islands.—The Pacific is distinguished by the abundance of islands, pelagic and continental. The pelagic, which are of great number, are of small extent, and are the summits of conical volcanic mountains built by submarine eruption from the bottom of the sea. Many of those lying within the tropics are capped or surrounded by coral reefs. The continental islands, containing not only volcanic but sedimentary rocks, are for the most part of greater extent and are grouped about the western margin.

See also OCEAN, DEEP-SEA EXPLORATION, and the names of the various islands and archipelagoes. G. K. GILBERT.

Pacini *Corpuscles* [named from Filippo Pacini, an Italian anatomist; b. May 25, 1812; d. July 9, 1883]: peculiar structures found as peripheral nerve terminations. They are met with in the subcutaneous layer on the palms of the hands and soles of the feet; on the sympathetic nerve plexuses; behind the peritoneum near the pancreas; and sometimes in the mesentery. Their shape in man is oval or like an egg; the diameter is from one-twentieth to one-sixth of an inch. The structure seems to consist of several concentric layers of connective tissue surrounding the terminal extremity of a nerve-fiber. The corpuscle seems to be one of the modes of termination of the nerves of general sensibility. See HISTOLOGY (*Peripheral Terminations of the Nerves*).

Pacinotti, *pañ-chéé-not-tée*, ANTONIO: electrician; b. at Pisa, Italy, in 1841. He is the author of a number of interesting investigations in electricity, but is chiefly known through his invention (1860) of a dynamo-electric machine having a ring armature with closed coils, identical in principle with that subsequently used by Gramme in his well-known dynamos. E. L. N.

Packard, ALPHEUS SPRING, M. D., Ph. D.: entomologist; b. at Brunswick, Me., Feb. 19, 1839; graduated at Bowdoin College 1861; studied natural history under Agassiz, de-

voting himself particularly to entomology; graduated in medicine at the Maine Medical College 1864; made several scientific expeditions; was for several years lecturer on entomology at Bowdoin College, a curator of the Peabody Academy of Sciences at Salem, Mass., and one of the editors of *The American Naturalist*; in 1878 was appointed Professor of Geology and Zoölogy in Brown University, Providence, R. I.; for several years was a member of the U. S. Entomological Commission. His writings have been very numerous, the principal ones being *Observations on the Glacial Phenomena of Labrador and Maine, with a View of the Recent Invertebrate Fauna of Labrador* (1867); *A Guide to the Study of Insects* (1869); *Our Common Insects* (1873); *Half Hours with Insects* (1875); *Life Histories* (1876); *Zoölogy* (1879); *Entomology for Beginners* (1888), and many more technical papers, chiefly on insects and Limulus.

Revised by D. S. JORDAN.

Packfong: the name in common commercial use for Pak-tong, or German silver. See PAKTONG.

Pactolus (in Gr. Πάκτωλος, now *Sarabat*): a small stream, barely 10 feet wide and a foot deep, of Lydia in Asia Minor, which flows from Mt. Tomolus into the Hermus. It was formerly famous for the gold contained in its mud, and was the mythical source of the wealth of Croesus; but for many centuries no gold has been obtained here. See Perrot and Chipiez, *History of Art in Phrygia, Lydia, Caria, and Lycia* (London, 1892; pp. 247-253). J. R. S. S.

Pacuvius, MARCUS: dramatist; b. at Brundisium, Italy, about 220 B. C.; nephew of the poet Ennius; lived in Rome; became celebrated as a painter as well as a writer; retired when an old man to Tarentum, where he died about 132 B. C. Pacuvius wrote *saturæ* after the manner of Ennius, and at least one historical drama (*prætexta*), with the title *Paulus*, but his fame rested chiefly upon his tragedies, in which he followed Greek models (Sophocles and Euripides). The fragments of twelve tragedies which have come down to us are found in Ribbeck's *Tragicorum Latinorum Fragmenta* (Leipzig, 2d ed. 1871). See also L. Müller, *De Pacuvii Fabulis* (Berlin, 1889). M. WARREN.

Padang: a division of the Dutch dominions on the west coast of Sumatra, consisting of the districts of Upper and Lower Padang, and containing the city of Padang, occupied by the Dutch since the seventeenth century. The territory comprises some of the loveliest regions found anywhere in the tropical zone. Only the low and marshy coast-land is oppressively hot and unhealthy; the slopes of the high, volcanic mountains have a most agreeable climate and a very fertile soil. The products are coffee, pepper, indigo, and caoutchouc, and gold, iron, copper, and quicksilver. Coffee is extensively cultivated, especially in Upper Padang. Pop. of the district about 1,000,000. The city, which is the residence of the governor, contains a Malay population living in bamboo huts on the left bank of the river, and a population of Europeans and Chinese living in houses of stone on the more elevated right bank. The place is the most prosperous on the west coast and has a large trade. Pop. 25,000. Revised by C. C. ADAMS.

Paddle-fish: popular name of a fish of the Mississippi basin; remarkable for having the nose prolonged into a thin, flat, bony, paddle-shaped appendage, sometimes about as long as the body. Its scientific name is *Polyodon spathula*. It has no scales, has a tough but shark-like flesh, and uses its snout for the purpose of digging in the mud in search of food, which consists of small organisms. It is also called spoonbill and duckbill catfish. Revised by D. S. JORDAN.

Paddock, BENJAMIN HENRY, S. T. D.: bishop; b. at Norwich, Conn., Feb. 28, 1828; graduated at Trinity College, Hartford, 1848; was assistant teacher in the Episcopal Academy, Cheshire, Conn., 1848-49; graduated at the General Theological Seminary 1852; was made deacon 1852, and became assistant minister in the Church of the Epiphany, New York; ordained priest 1853, and became rector of St. Luke's, Portland, Me., but resigned on account of ill-health, and became rector of Trinity Church, Norwich, Conn.; became rector of Christ Church, Detroit, Mich., 1860; declined the missionary bishopric of Oregon and Washington Territory 1868; took charge of Grace Church, Brooklyn, N. Y., 1869; elected bishop of Massachusetts, and consecrated in Brooklyn, Sept. 17, 1873. D. in Boston, Mass., Mar. 9, 1891. Among his published writings are *Ten Years in the Episcopate* (1883) and *The First Century of the Diocese of Massachusetts* (1885).

Pa'derborn: town; in the province of Westphalia, Prussia; 50 miles S. W. of Hanover (see map of German Empire, ref. 3 E). It has a cathedral built at different dates, from the eleventh to the thirteenth century, under which the sources of the Pader burst forth, many good educational institutions, breweries, distilleries, and manufactures of tobacco, oil-cloth, hats, and paper. Pop. (1896) 17,986.

Paderewski, *pa-dŕ-rees-skŏe*, *LOUÏS JAX:* pianist; b. at Podolia, Poland (Russia), Nov. 6, 1860; began to play the piano when three years old; received instruction from local teachers; in 1872 went to Warsaw, and later to Berlin, continuing his studies in both cities. When eighteen years of age he was nominated professor in the Warsaw Conservatory; in 1884 abandoned teaching, and took a course of three years' study at Vienna under Leschetitzky, and made his *début* as a professional pianist in 1887 in Vienna. Since then he has given many concerts, everywhere awakening the greatest enthusiasm. Beginning in 1891 he has made several concert tours in the U. S. which have added to his fame and very materially to his wealth.

D. E. HERVEY.

Padilla, *pă-deel'yă*, **JUAN, de:** Spanish revolutionist; b. about 1484; joined in the revolt of the Castilian towns against the Flemish officials of Charles V. in 1520, and soon became the leader of the movement. The rebellion was at first partially successful. The insurgents deposed the regent, Cardinal Adrian, of Utrecht, placed the queen-mother at the head of the Government, and demanded of Charles V. a reform of the constitution in the interests of the people; but the nobility, alienated by the democratic spirit of these measures, opposed Padilla, and succeeded in supplanting him in the command by a noble of inferior ability. The insurgents after several reverses recalled Padilla, but, though he gained some advantages, the policy of the revolutionary junta in granting an armistice permitted his ill-disciplined forces to melt away. The royalists forced a battle at Villalar Apr. 23, 1521, defeated the rebels, and captured Padilla, who was executed on the following day.—His widow, **MARIA PACHECO**, held out against the royalists till the spring of 1522, when she fled to Portugal. D. there in 1531.

Pad'ua (Ital. *Padova*, Lat. *Patavium*): a city of North Italy; 23 miles W. by S. of Venice; on two branches of the Bacchiglione, just above their confluence with the Brenta (see map of Italy, ref. 3-D). The city is a triangular inclosure, surrounded by a wall $8\frac{1}{2}$ miles in length, the base of the triangle being toward the W. Its streets are not generally attractive; the houses are high, and built upon arcades; but some of the squares and public buildings are very fine. The municipal palace is a rhomboidal structure, built on arches and surrounded by *loggie*, and containing a highly ornamented hall, the Sala della Ragione, which has given its name to the whole building, and is said to be the largest vaulted room in Europe. The university originated in the early part of the thirteenth century, but the present buildings date from the close of the fifteenth. There were (1891) 63 teachers and 1,316 students. The university library, with 158,500 volumes and 2,500 MSS., is in the Palazzo del Capitano. The Church of St. Antony (1232-1307), of mixed architecture, is surmounted by seven cupolas, the center one of which is over the chapel containing the bones of St. Antony. Padua is a town of great antiquity. At the beginning of the Christian era it was the largest and most prosperous town of Northern Italy. It was plundered by Alaric and Attila, and only partially recovered under Charlemagne, and suffered varying fortunes until in 1405 it was conquered by Venice, in whose possession it remained until it was given in 1797 to Austria, which held it, except from 1805-14, until 1866, when it was united to the kingdom of Italy. There is yet very little commercial or industrial activity in the city. Pop. (1892) 79,500.

Paducah: city (laid out in 1827, incorporated in 1856); capital of McCracken co., Ky. (for location, see map of Kentucky, ref. 4-C); at the junction of the Ohio and the Tennessee rivers; on the Chesapeake, Ohio and S. W., the Paducah, Tenn. and Ala., and the St. Louis, Alt. and Terre Haute railways; 48 miles N. E. of Cairo, 140 miles S. W. of Evansville. It is in a coal, iron, agricultural, and hardwood region, and is principally engaged in manufacturing, agricultural, and river trade. There are lines of daily packets up and down the Ohio river, semi-weekly packets on the Ohio and the Cumberland rivers, and tri-weekly packets on the Tennessee river. The city has gas and electric light plants, a fine system of water-works, electric street-rail-

way, paid fire department, 3 public parks, 6 hotels, 2 hospitals, and U. S. Government building. It is the second primary tobacco-market in the country, having several tobacco-factories and 5 acres of tobacco-warehouses. Other industrial establishments are a ship-yard where steamboats and barges are built, marine railways, ship-timber mill, and wheel-factory. There are 12 churches for white people, and 7 for colored, 7 public-school buildings, public-school property valued at over \$92,000, 3 national banks with combined capital of \$550,000, 2 State banks with capital of \$200,000, and 2 daily and 4 weekly newspapers. Pop. (1800) 8,036; (1890) 13,076; (1892) estimated, 18,000.

EDITOR OF "NEWS."

Padus: See **PO**.

Pæan [Lat. — Gr. *παῖν*, a hymn to Apollo as helper; later to other gods; *παῖν* is the Doric form, *παῖν* the Attic]; among the ancient Greeks, a hymn of thanksgiving and joy, such as was sung especially before and after battles. The pæan was originally addressed to the Pythian Apollo, afterward to other gods and even to men. The word is now used to signify a loud and joyous song.

Pædogen'esis [Mod. Lat., from Gr. *παῖς*, *παῖδος*, child + *γένεσις*, production]; that acceleration in the life-history of certain animals (as, for instance, the Mexican axolotl and certain flies—*Cecidomyia*) in which the larvæ are capable of reproduction. In the latter forms the larvæ produce other larvæ, which feed upon the parent, and eventually escape from the body by its complete destruction. J. S. K.

Pæonine: See **ROSOLIC ACID**.

Pæs'tum (in Gr. *Ποσειδωνία*, mod. Ital. *Pesto*): an ancient town of Southern Italy, on the Gulf of Salerno, about 40 miles S. E. of Naples (see map of Italy, ref. 7-F). It was originally a Greek colony from Sybaris, called Posidonia; it was afterward taken by the Lucanians, who named it *Pes-tum*, then by the Romans, and it was finally burned by the Saracens in the ninth century. The ruined walls form a pentagon 3 miles in circumference, the north and east sides being best preserved; one of the eastern gates still exists, and an old street of tombs is traceable beyond the ruins of another. Three very ancient Doric temples remain in a good state of preservation. The largest, that of Neptune, is pure in style, is 196 feet in length and 79 feet in width, with a peristyle of 36 fluted columns (28 feet in height, $7\frac{1}{2}$ feet in diameter), supporting an architrave without moulding, and frieze with the usual triglyphs; the pediments at the two ends are surrounded by a cornice, and are of similar architecture. The cella is of the same form as the exterior, has two rows of eight columns each, and these are surmounted by smaller ones to support the roofs of the aisles, the cella itself having been hypæthral or uncovered. The temple of Ceres (some say of Vesta) has thirteen columns on its flanks and an open vestibule within the peristyle. Between these two temples are the ruins of, probably, a Roman theater and amphitheater. The so-called basilica, S. of the temple of Neptune, is remarkable for having nine columns on its front, with a row of eighteen running down the center of the cella.

Pæz, *paa'ăth*, **JOSÉ ANTONIO:** general; b. in the province of Barinas, Venezuela, June 13, 1790. He joined the patriots in 1810; quickly attained prominence as a leader of the *llanero* cavalry; was made general of division in 1819; took a leading part in the victory of Carabobo 1821; and captured Puerto Cabello, the last Spanish port in Venezuela, in 1823. From 1823 to 1826 he was military commandant of Caracas; having been superseded, he led a rebellion, but was pardoned by Bolívar, and given the military and civil command of Venezuela, with the title of *jefe superior* (1827). In 1829 he headed the revolutionary movement which resulted (1830) in the final dissolution of the old republic of Colombia and the complete independence of Venezuela. Under the centralist constitution, which was then adopted, he was president of Venezuela Mar. 18, 1831, to Feb. 9, 1835. After commanding the army for four years, and putting down two rebellions, he was again president Feb. 1, 1839, to Jan. 28, 1843. In Jan., 1848, he declared against Monagas, but after more than a year of civil war he was defeated, imprisoned for ten months, and finally banished for several years. In 1860 he was minister to the U. S. On the deposition of Guál (Aug. 29, 1860) Pæz was proclaimed dictator by the army. He held the post during nearly three years of almost constant civil war, and was finally defeated by the federalists under Falcón and Guzmán.

Blanco, May, 1863. Most of the remainder of his life was passed in New York, where he died May 7, 1873. He published his *Autobiography* in 1867. HERBERT H. SMITH.

Paganini, pāā-gāā-nee-nēē, NICOLÒ: violinist; b. at Genoa, Italy, Feb. 18, 1784; son of a commission broker; gave, when nine years of age, his first public concert as a violin-player in his native city, and produced an extraordinary enthusiasm by his performance of *La Carmagnole* and the variations upon this air. From 1805 to 1808 he was first violinist to the Princess Eliza of Lucca, a sister of Napoleon. Afterward he led for many years a most adventurous life, sometimes playing for bread in a market-place and sometimes refusing to play though a fortune was offered him. From 1828 to 1833 he made a concert tour from Vienna through Germany, to Paris and London, astonishing every one by his extraordinary playing. Wealthy, but with broken health, he returned in 1834 to Parma, where he bought the Villa Gagona. D. at Nice, May 27, 1840. His compositions, of which the *Carnival of Venice* is one of the most famous, include a sonata, *Napoleon*, composed for one string. None has great musical worth, but for the violinist they are of great interest. His most successful imitator was his pupil Savori.

Paganism [from Late Lat. *paganus* *mus*, deriv. of *paganus*, pagan, liter., villager, peasant (as the old religion lingered longest in the villages), deriv. of *pagus*, district, the country]: a name for heathenism, now used as a general term including all polytheistic religions in opposition to Christianity, Judaism, and Mohammedanism; in the Middle Ages it also included Mohammedanism. In Germany it is also applied to tendencies within Christianity itself which are deemed polytheistic in their nature, such as the worship of the Virgin and the saints in the Roman Catholic Church. Revised by S. M. JACKSON.

Page, DAVID PERKINS: educator; b. at Epping, N. H., July 4, 1810; for his education spent two terms in Hampton Academy, and then taught school, receiving, in 1845, the principalship of the newly established Albany Normal School, where he served till his death Jan. 1, 1848. He possessed in a rare degree the qualities of a great teacher. His *Theory and Practice of Teaching* (1847) has had a prodigious influence. C. H. T.

Page, THOMAS NELSON: author; b. at Oakland, Hanover co., Va., Apr. 23, 1853. His great-grandfather on his mother's side was THOMAS NELSON (q. v.); on his paternal side his great-grandfather was Col. John Page, one of the foremost patriots of the Revolution, member of committee of safety, and Governor of Virginia 1801-03. Thomas Nelson Page was educated at Washington and Lee University and the University of Virginia for the law; still practices in Richmond, Va.; is author of *In Ole Virginia*, or *Marse Chan and Other Stories* (1887); *Two Little Confederates* (1889); *Bejo' de War*, dialect poems published with A. C. Gordon (1890); *On Newfound River* (1891); *Elsket and Other Stories* (1891); *Among the Camps* (1891); *The Old South*, essays social and political (1892); *Pastime Stories* (1894). C. H. THURBER.

Page, WILLIAM: painter; b. at Albany, N. Y., Jan. 23, 1811. He studied with Herring, the portrait-painter, and with S. F. B. Morse; painted portraits in Albany and New York with eminent success; executed a few compositions, a *Holy Family*, *The Infancy of Henri IV.*, and others; resided in Rome and Florence several years; returned to New York in 1860, and resided there. Page was known as an experimenter in color, and painted many extraordinary pictures to illustrate his ideas—a *Flight into Egypt*, *Moses and Aaron on Horeb*. His *Venus* became famous; it was an attempt to embody what the artist thought the practice of Titian. Page was president of the National Academy, and wrote and lectured on art. He was a man of enthusiastic temperament and daring genius, poetic, and eloquent. D. at Tottenville, N. Y., Oct. 1, 1885.

Pages: See GARNIER-PAGÈS.

Pag'et, Sir JAMES, F. R. S., LL. D., D. C. L.: surgeon; b. at Yarmouth, England, Jan. 11, 1814; studied in St. Bartholomew's Hospital, London; in 1836 became a member and in 1843 a fellow of the Royal College of Surgeons; became assistant surgeon, surgeon, and consulting surgeon to St. Bartholomew's; sergeant-surgeon to the Queen; surgeon to the Prince of Wales; vice-chancellor of the University of London; was made a baronet in 1871; is president of the Royal College of Surgeons. In his earliest surgical studies he paid great attention to pathology, and through his efforts its importance was recognized throughout English-speaking

countries, and for years his *Lectures on Surgical Pathology*, a work that has passed through many editions, has been a text-book in the medical colleges of Great Britain and the U. S. In 1857 he delivered the Croonian lectures, his topic being the cause of the rhythmic motion of the heart. In 1877 he delivered the Hunterian oration. In 1882 he delivered the Bradshawe lectures, on some rare and new diseases. In 1887 he delivered the Morton lecture on cancer.

S. T. ARMSTRONG.

Paget, VIOLET: author; b. in England, 1857. She has resided for many years in Italy, and under the pseudonym of *Vernon Lee* has published many brilliant and suggestive studies of art, literature, and general aesthetics. Among her books are *Studies of the Eighteenth Century in Italy* (1880); *Belcaro* (1882); *Ottolie* (1883); *Euphorion* (1884); *Miss Brown*, a novel (1884); *Baldwin* (1886); and *Juvenilia* (1887). H. A. B.

Pago'da [from Portug. *pagoda*, from Pers. (and Hind.) *but-kadah*; *but*, idol + *kadah*, house; cf. Chinese *peh-kuh-t'a*, pagoda, liter., white bone tower]: a name applied to a great variety of tower-like, many-storied buildings in the East Indies, China, Japan, etc., used originally to contain relics and other objects of veneration or worship.

Pahlavī, pe-le-vee', or **Pehlevī**: the mediæval Persian of Sassanian times (A. D. 226-651); in a broader sense, Persian from the period of the Achæmenidæ to the rise of the modern language after the Mohammedan conquest. By its etymology the term *Pahlavī* means Parthian (Old. Pers. Inscr. *Parthava*, whence *Pahlav* and *Pahlavī*, relating to the Parthians). In mediæval Oriental literature the appellation *Pahlavī*, owing to the greatness of the Parthian sway, is sometimes extended to denote anything ancient Persian. The restricted usage, however, limiting the application of the name to the language and writings of the Sassanian Zoroastrians down to the ninth century is the more correct, and is in modern times the general one.

1. *Pahlavī Language*.—The Pahlavī is preserved in the form of inscriptions and in an extensive written literature. The language, though it is Persian, presents a strange non-Iranian appearance; there is a curious admixture of Semitic (Aramaic) words and Iranian elements. The fundamental words, those of commonest usage, are Semitic, and Semitic words also stand beside Iranian equivalents; but they are often treated in a way that is quite un-Semitic, or, again, they assume an Iranian look by receiving Iranian endings. This Semitic preponderance, however, is superficial rather than real. Pahlavī, when written, is indeed largely Semitic, but when read it becomes Iranian. We have the authority of Ammianus Marcellinus (xix., 2, 11), and more explicitly of the Arab writer, Ibn Mokaffa', for the fact that, although Semitic words were written, the Persians in reading Pahlavī regularly substituted Iranian equivalents for Semitic vocables, and the speech when sounded became all Iranian. For example, in Pahlavī *bisrā* (Aramaic, meat, was written, but *gōšt* (Persian) was pronounced; again, *lahmā*, bread, may have been written, but *nān* (Persian) was read; although the Semitic *malkān* *malkā* was inscribed on the monuments, the Persians called their "king of kings" *shāhān shāh* in true Iranian style. The phenomenon is thus to be explained: The Persians of Parthian times adopted a Semitic alphabet, but, beside using its characters for writing their own words, they went a step further and adopted for convenience a certain number of written Semitic words to stand for their Iranian equivalents, which were regularly read as if Iranian—much as on a small scale in English the Latin *i. e.*, *e. g.*, *viz.*, *&c.*, *£* (*libra*) are read by us as "that is," "for example," "namely," "and," "and so forth," "pound," being foreign to the eye when written, but becoming native to the ear when read. In Pahlavī there were some 400 of these Semitic logograms, beside about 100 obsolete forms of actual old Iranian words for which the ordinary current Persian words were substituted in reading. This disguised and obsolete element in Pahlavī is known as the *Hūzvarīsh* portion of the language. In strict reality, therefore, the *Hūzvarīsh*, or *Uzvarīsh* (misreading for *Aūzvarīshn*), is a form of writing rather than a form of speech. Etymologically the term *Aūzvarīshn* has been explained by Haug and West as "antiquity, decrepitude," or perhaps "obsolete," although Darmesteter suggests the explanation "perversion, alteration, disguise," as applicable to the peculiarity of writing.

It often happens that the disguised Pahlavī is transliterated into Avestan or Modern Persian characters, and the Semitic element is eliminated by substitution and ambiguity

disappears: such a text is called *Pāzand* (Avesta *partis zānti*), re-explanation, a term which is applied also to the purely original part of the Pahlavi texts themselves which do not require transposing. This designation was also originally applied to the "re-explanation" of the Pahlavi version of the Avesta, which itself was an explanation, interpretation, or commentary. (See *AVESTA*.) The appellation *Pāzi* is also sometimes given to this transcribed Pāzand.

The two forms above mentioned in which the Pahlavi language is preserved are (1) inscriptions and coins, (2) manuscripts. The earliest rock-inscription, belonging to the first Sassanian monarch, Artakshir Pāpakān (A. D. 226-240), is a trilingual record, being engraved in Greek and in the characters of the so-called Chaldaeo-Pahlavi and Sassanian Pahlavi. The early inscriptions are of great service in helping toward the solution of the problems which Pahlavi presents—problems arising not so much from the grammatical and syntactical structure of the language as from the defective alphabet and the peculiar manner of writing the speech. The book Pahlavi alphabet has only fourteen letters to discharge the duty of a complete alphabet; owing to this paucity a single sign has to assume a number of offices; the separate signs, moreover, are further obscured by being combined into ligatures whose elements are exceedingly difficult to decipher. The single symbol **𐬀**, for example, may denote *s, qī, qad, qag, qaj, dī, dad, dag, daj, gī, gad, gaj, jī, jad, jag, jaj*. The difficulty of determining the precise reading of an obscure group of letters may therefore be imagined, but with regard to the meaning there is generally not a great deal of difficulty; old glossaries, moreover, have been preserved which give useful assistance on the subject. It may be added that Pahlavi is an analytic language, and its declensional and inflectional system is much reduced, which renders the grammar and the syntax simple.

2. *Pahlavi Literature*.—(Omitting the rock-records of Artakshir Pāpakān (A. D. 226-240) and his successors above referred to, as well as some early impressions on coins, the extent of Pahlavi literature may be estimated to be about the same as that of the Old Testament. In point of time the literature may be placed between the years A. D. 226 and A. D. 881. Nearly a hundred works have been preserved; these are in part translations of older Avesta texts, or they are works written on religious subjects, though some of them deal with legendary or miscellaneous topics. The principal literary monuments of the language are: (a) the Pahlavi version of the Avesta (see *AVESTA*); (b) *Bundahish*, a sort of Iranian Genesis and Revelation; (c) *Dinkard*, on matters of religion; (d) *Dādistān-i Dīnik*, religious discussions; (e) *Mainūg-i Khirad*, spirit of wisdom, doctrinal teaching; and (f) *Arđā-ī Virāf nāmak*, an Iranian apocalypse; as well as other works chiefly religious in character. The most important of the Pahlavi texts have been translated by West, the most eminent authority on Pahlavi; translations of separate works have also been contributed by other scholars. Pahlavi literature is indispensable for the study of Zoroastrianism, and is important in connection with theological and philosophical studies in general.

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A. V. WELLES JARVIS.

Pah Ute Indians: See SHOSHONIAN INDIANS.

Pailleron, *prā ye-rōn*, ÉDOUARD JULES HENRI: poet and dramatist; b. in Paris, France, Sept. 17, 1834. He began life as a lawyer's clerk, but in 1860 appeared as an author with a volume of satiric verse, *Les Parasites*, and a one-act comedy, *Le Parasite*. He continued to write successfully for the theater, at first in verse, producing among other pieces *Le Mur mitoyen* (1861); *Le Dernier Quartier* (1863); *Le Monde où l'on s'ennuie* (1868); *Les Faux Minceurs* (1869); *Hélène* (1872); *L'Âge ingrat* (1879). His greatest success was made by *Le monde où l'on s'ennuie* (1881). He has since written *Le Narcotique* (1882) and *La Souris* (1887). He was elected to the Academy in 1882. A. G. C.

Pain: a peculiar sensation of discomfort or suffering caused by disturbances of the sensory nerves or nerve-cells, which cause a condition of over-excitement. Any of our sensations may become painful if the stimulus is sufficiently strong and prolonged—thus the skin touched lightly affords normal tactile sensations, but if the pressure is severe the impressions become painful; moderate light does not prove of discomfort to the normal eye, but if intense the pain may be severe. Pain may be caused by mechanical, thermal, chemical, electrical or other means, but it is generally due to injuries and various disorders of nutrition and inflammation. There are many varieties—it may be sharp, shooting and lancinating, as in neuralgias; sharp and intermittent, as in colic; sharp, severe and constant, as in peritonitis; dull and gnawing, as in inflammation of the bowels; dull and sickening, as in certain disorders of the ovaries and testicles; throbbing, as in toothache and suppurations; burning, as in inflammations; pressing, constricting or boring, as in various forms of headaches; dragging, as in womb troubles.

Pain is seldom constant in its degree, being generally subject to intermissions or periodic exacerbations. It also varies greatly in its intensity and quality, depending upon the degree of irritation and the special nerve that is excited. Some nerves are infinitely more sensitive than others, so that the same degree of irritation applied to two different nerves may cause severe pain on the one hand and but an insignificant effect on the other. Pain experienced in different parts may be of the same intensity, yet one is borne much easier than another owing to the difference in its quality. The exquisiteness of the pain when the nerves of the teeth or ear are affected is not equalled by that produced in any other part of the body. Pain is said to be referred by the mind to the particular part of the body which is irritated, but this is not strictly true—thus in case of severe toothache the irritation may be confined to the root of a tooth, yet sensations of pain may be referred to the whole side of the face, indeed even to both sides. Irritation of a sensory nerve at any part gives rise to sensations of pain which are referred to the peripheral distribution of the nerve; thus it is that people who have suffered the loss of arms or legs often experience pain just as though the sensations were actually coming from the parts that have long since been amputated—in such cases the cut ends of the nerves in the stump are excited, and the sensations thus produced are referred by the mind to the parts formerly supplied by their fibers.

It is important to observe that the presence of pain invariably indicates an abnormal condition, and that it is one of the most frequent and potent means of nature to warn us of disordered states. Pain is relieved by various methods, the first and most important being the removal of the cause. The use of the hot-salt bag is often efficient in relieving toothache, pain in the bowels, etc.; cold is similarly but less successfully resorted to. The use of drugs, such as opium, morphine, anaesthetics, narcotics, etc., is dangerous, except in the hands of a physician. E. T. REICHERT.

Pain and Pleasure: certain conditions of consciousness which depend upon physical and mental events. No adequate definitions can be given: pain and pleasure must be felt. Yet the physical and mental conditions which give so-called hedonic tone to consciousness may be pointed out.

1. *Too much stimulation is a cause of pain.* This is true, in the first place, of high intensities in stimulation. The actual experience of such painful intensities in the cases of special sensation leads us to look for it in all forms of sensibility. A blinding light is painful; a loud noise

very close to the ear, rapid friction of the skin, great pressure upon the muscles, etc., all give rise to painful feeling. It is true also that very strong tastes and decided odors are disagreeable or soon become so; but the case of these sensations seems to differ in some respect from that of the senses which report acute pain, properly so called. Sensations of temperature, again, either heat or cold, give us positive pain when the degree of either stimulus is very intense. It is possible that the apparent difference between taste and smell and the other sensations, in this respect, may be due to the fact that in them the end organ seems to have a chemical function, while the other end organs are largely mechanical; but it is enough here to point out the fact that some tastes and odors seem to be always pleasurable, and others always unpleasant. The same cause of pain is also seen when the stimulation is of long *duration*, and when it is widely *extended* on the skin, etc. A number of pin-points drawn over the skin give pain, when one of them would not.

2. *Inflammation* is painful, both when local in the muscles and skin, etc., and also when the nervous system is in a state of high excitability.

3. *Summation of stimuli* as a cause of pain. By summation is meant the adding up of processes on the nervous centers so that a greater result is worked in consciousness. Several electric sparks become painful to the eye by stimulation when one is not.

4. *Appetites or impulses when denied* give rise to pains of want. Such pains are usually periodical, and indicate a lack injurious to the organism.

Besides the above, several more special conditions bring about a painful reaction. Exposure to air is a cause of pain to tissue normally protected by the skin; disuse, or too slight stimulation, occasions pain in the more complex of the special senses, as sight; lack of accommodation of the organ to its stimulus has sometimes disagreeable tone, which is exaggerated when the stimulation is intense. The tone of the organic feelings seems to arise from any obstruction of the organic functions, such as laceration, cramp, repletion, etc. Intermittency of stimulation is also a frequent cause of pain, probably from the failure of the organ to accommodate to the broken stimulus.

Empirical Facts concerning Pain.—There are, in addition, certain facts brought out by physiologists which throw light upon pleasure and pain. First may be mentioned the *intermittence of pain*, the greater or less intensity of painful feelings at successive moments, the stimulus remaining constant. It is plainly seen in electrical stimulation—a clear rhythm, or rise and fall, of the painful tone. A headache usually proceeds by throbs, a toothache by jumps, and a felon on the finger changes its feeling from a dull ache to a paroxysm of overpowering severity. That it is due to nervous causes, and indicates the ebb and flow of central processes, is claimed from such phenomena as intermittent fever; but in some cases it evidently depends upon the rhythm of the vascular system, the distension and reaction of the blood-vessels. Another kind of intermittence is brought about by the coming and going of the *attention*. The effect of the attention in increasing the intensity of affective states is familiar; hence we would expect that the concentration and withdrawal of the attention would have a marked influence upon the rise and fall of pain. Further, we know that the attention, even when concentrated as steadily as possible, is rhythmical. Another fact of painful feeling is what is called its irradiation or *diffusion*. The locality of a painful stimulus is less circumscribed as the stimulation becomes intense. Besides the intensity, or quantity, this feeling becomes massive or spread out. It is probably due to a real spreading of the cause of the painful feeling over a greater area, both on the periphery and in the central seat.

Again, we may note a *delay* in the conscious awareness of pain compared with the appearance of the sensation with which it seems to be connected. Even when the stimulation is a very strong one, the sensation is clear in consciousness before any pain is felt. A blow, for example, is felt as contact or pressure a fraction of a second before we begin to suffer from it; a burn is particularly long in reporting itself as pain. This delay may be measured by comparing the reaction time of a painful stimulus—say the decided prick of a pin—with that of a simple contact sensation at the same point on the skin. It is probably due to the fact that the full force of the pain-stimulus is not reported at once, but that the organ accommodates itself to it by a

series of partial transmissions. These transmissions are summated at the center, and the result is a sufficiently intense central stimulus to occasion a painful reaction.

Further, the duration, or *lasting quality*, of a painful state of sensibility is remarkable. Pains do not pass away, as painless sensations do, when the stimulation ceases. The recovery of the organism is very slow. What is called an after-image of some sensations seems here to be more truly an after-fact. It is probably due to the fact that the intenser degree of stimulation necessary to pain gives more decided and lasting character to the nervous change it works than feeble stimuli do. This is supported by the observation that pains are more distinctly and easily revivable than other affective experiences. A painful experience seems to hover constantly around us, and thrust its unwelcome presence into our gayest hours. When we remember that a revived image occupies the seat of the original experience, we only have to assume a more lasting effect to have resulted from a painful sensation, to account for its more easy reproduction. Finally, pain lowers the temperature of the painful region.

Analgesia, or insensibility to pain, under conditions usually painful, may be brought about by various agencies. Cold of very great intensity has this effect, pain becoming very acute and then subsiding altogether, as the temperature is lowered. The withdrawal of blood from an organ makes it insensible to pain. Lowered sensitiveness to pain, however, is likely to be preceded by exalted sensitiveness, as in the evident case of cold. Apparent absence of pain is experienced when the intensity of a painful stimulus is suddenly lowered, even though the second intensity would be painful under other circumstances.

Pain as Feeling and as Tone.—The conditions of pain now pointed out are conditions in the operation of the various modes of sensibility, general or special; that is, we have been observing pain as hedonic *tone*. The important question arises: Is pain always thus dependent on a definite form of sensibility, or is it itself, as a form of sensibility, ever found independent of its presence as tone? There are some facts which would indicate that pain has a functional independence, whatever we may say as to its anatomical independence—i. e. whether there are special nerve-fibers which conduct pain, a point on which experimental results are conflicting. For instance, pain may be destroyed without impairing any of the other sensibilities, as in analgesia brought on by chloroform; and in general, under the influence of anesthetics, pain and memory disappear first and together. On the other hand, other sensations may be destroyed, while the painful quality of their stimuli remains. Thus, under pressure, sensations of touch, temperature, and muscular movement may be destroyed while pain remains. So, also, under loss of blood in a member, sensations of touch disappear before pain, and both before temperature, electric feelings, etc.

Conditions of Pleasure.—It is not so easy to point out the physical conditions of pleasure; but in general we find them opposed to those already indicated as carrying painful tone. 1. *Moderate stimulation is pleasurable.* This is readily seen in the exercise of the special sense functions; the eye is pleased with mild colors, and the ear with pure tones. Gentle touch, quiet muscular reaction, moderate tastes are usually agreeable; and it is true of moderate durations and areas of stimulation, as well as of moderate intensities.

There are striking exceptions, however, to this rule. A great many sensations are always painful; when not giving a painful reaction, the organs involved do not affect consciousness at all. So the organic feelings. Certain tastes and odors, also, are always disagreeable. Further, the condition of neutrality seems very nearly reached in the normal exercise of some of the sense functions, as, for example, sight and hearing.

2. *Pleasure arises from the adjustment of an organ to its stimulus.* Muscular sensations are pleasurable within the range of easy effort. Stimuli of longer duration, which give time for the full adjustment of the organ, pass from the painful to the pleasurable. Feelings for which we are ready by anticipation are enjoyable. Yet this is also subject to the qualification that perfect adjustment seems in many cases (eye and ear) to have no feeling accompaniments whatever, either of pleasure or pain.

3. *Activity is enjoyable.* By this is meant function within the limits set by the two conditions already mentioned. If activity is pleasurable, it is the moderate activity of a well-adjusted organ. Yet there seems to be more massive organic

conditions of activity which are pleasurable, even when such a general function involves some particular pain. The football player enjoys his sport, even though he is never free from the pain of bruises or scratches. In such cases, the vigor and energy of the larger organs brought into play seem to overpower the protests of the smaller, and silence their complaints. A pain which would make one wretched if suffered in passive silence is forgotten altogether in the pleasure of diligent employment. This larger activity, however, which brings pleasure, must itself conform to the conditions of moderation and adjustment. Moreover, these pleasures of activity, such as pleasures of the chase, of sports, of general vigor, are more positive apparently than any other physical pleasures. The claim already noticed, that in the absence of pain many states are not really pleasurable, but merely neutral as regards tone, does not seem to be well taken in this case. A condition of fresh muscular vigor seems to intrude itself into consciousness of its own force, and we become aware of pleasant occupation with no evident reference to the corresponding state of pain. Indeed, the opposite pleasures which result from a cessation of muscular pain—the so-called pleasures of rest—are something quite distinct from these pleasures of activity. Under this head, also, as including any function, and not simply muscular activity, the pleasures arising from the gratification of the organic appetites and instincts appear to fall. They are functions of periodical exercise, and their normal working involves periodical stimulation. They seem to involve pleasure over and above the prompting of painful appetite, though this again is in dispute. Yet it could hardly be said that all the pleasures of the table are due to the cessation of the pangs of hunger.

Relativity of Pleasure and Pain.—The fact referred to above, that many physical pleasures are only relief from preceding states of pain, finds place with other similar phenomena, under the law of relativity. First, we may say that the existence of either state may under certain circumstances arise from the cessation of the other. Cases of seeming pleasure, which is explained as absence of pain, have already been mentioned. Similarly, the cessation of an active pleasure may give us temporary pain and be the only cause of it. An element of higher emotion, however, generally enters in this case. Again, the intensity of pain or pleasure depends largely upon its contrast with a preceding state. After an unusual trip to the country, the painful toil of city life is all the harder to bear; so, after feasting the eyes upon a dish of luscious fruit, the beggar's plate of herbs is all the more unpalatable. So, also, the associations involved often convert pleasure into pain, and the contrary. A little clever deceit will make us enjoy a dish which before we found unpleasant.

Resulting Conception of Bodily Pleasure and Pain.—From the foregoing brief description of the conditions under which sensuous tone arises, we may put all such feelings under two larger physical categories. A careful examination of these conditions will show that all pleasures and pains involve either a state of change in the organic tissue, in the way of *integration or disintegration*, or a change in the relation of the organism to its environment, in the way of *adjustment or misadjustment*. These two aspects of the case may be considered separately. This brings us to the conclusion, when we reflect upon organic development, that in the life-process we have the *raison d'être* of pleasure and pain; but by life-process we must be careful to include life-development as well as simple life. The simple present life of an organism as constant function is more than covered by the facts as we have observed them; pleasure and pain have a prospective future reference as well—reference to a fuller development and potential growth. Accordingly, bodily pleasure may be defined as *the consciousness of that which makes for the continuance of the bodily life or its advancement*; and pain, *the conscious effect of that which makes for the decline of the bodily life or its limitation*.

Intellectual Pleasures and Pains.—The further question concerning the higher pleasures of our ideal life of thought and emotion is equally important. Certain conditions of this higher tone may be mentioned also.

1. *Some degree of ideal change.* As physical pain arises from physical function, so higher pain comes with apperception considered as mental function; and in general, the degree of function, measured in terms of the emotional excitement to which it gives rise, indicates also the degree of pleasure or pain. Ideal change, the rearrangement of elements in the apperceptive content of consciousness, is ac-

cordingly the general condition of particular ideal tone. We may, accordingly, at once make use of the conception of bodily tone already arrived at, substituting for the physical the apperceptive function, and for the adjustment of end organs that of attention; and expect to find an adequate conception of ideal pleasure and pain. Accordingly, we reach a second condition.

2. *The degree, duration, and relative adjustment of attention:* determining ideal tone as pleasure or as pain. Excessive concentration of the attention is painful; yet the pain is directly merged in the pain involved in the adjustment of the bodily organ. Prolonged attention becomes painful by the law of fatigue. On the other hand, moderate concentration and duration of attention are pleasurable. The conditions which involve distraction, or drawing apart, or doing violence to the attention, are painful; those giving feelings of ease, flow, variety, measured concentration, etc., are pleasurable. It is probable that the most pleasurable adjustment is that of finest and most exact discrimination. Ward formulates this and the preceding condition as follows: there is pleasure "in proportion as the maximum of attention is effectively exercised."

The determinations already reached have evident application to those states of feeling which arise around acts of the attention regardless of the nature of the object to which the attention is directed. There are other emotional states, however, which are pronounced in their contribution to the tone of consciousness. The great expressive emotions (fear, love, anger), the sympathetic, the ethical, and æsthetic are all at times controlling agents of pleasure or pain. The question at once arises: Is it possible to bring them under the formulas already enunciated? This question awaits an answer from the consideration of the genetic conditions under which objects come to be pleasure or pain giving.

1. *Objects of perception and memory excite pleasure or pain only as they have or have had some relation to our physical well or ill being.* PERCEPTION (*q. v.*) is a summing up of sensations in the form of synthesis. Now an object perceived gives us certain sensations only; but it suggests others which belong to the synthesis, and we are thus able to anticipate them. The sight of falling rain prophesies to me the unpleasantness of being wet; the sight of a lion, the pain of being eaten. The tone of perception, therefore, as far as it refers to the object, is intrinsically the prophecy of the tone of the sensations it includes and suggests. To illustrate: A child first sees a fire (yellow light sensation), grasps it (touch sensation), feels pain (sensuous tone, due to damage to the life-process). Again he sees the fire (perception, carrying in it touch and pain memories) and has fear, which is of painful tone. The point advanced is that this latter tone, of fear, also has reference to the life-process. It is nature's way of utilizing simpler pain experiences, just as perception is her way of utilizing sensational experiences. This covers the whole field of emotions which accompany reproduction—memory, passive imagination, illusions, etc. The emotions which such representations excite have qualitative coloring (expectations, dread, etc.), but their tone is again due, as the tone of perception is, to the anticipation of advantage or damage from the pictured object.

2. *The tone of the emotions which accompany conception and thought has reference both (1) to physical and (2) to intellectual well or ill being.* The reference of conception and thought to physical pleasure and pain is clear in some cases. My conception of the work of dentists, for example, has a painful tone which is as clearly a warning of physical damage as the perception of my particular dentist is. So, also, the science of dentistry, the logical framework of the art, considered merely as a branch of instruction, can not be rid of its physical suggestiveness. The medical student grows faint when he hears his first lecture on blood-letting. Consequently, a positive part of the tone of higher æsthetic, ethical, and logical emotion illustrates the law of physical well-being. In the case of æsthetic emotion, the element contributed by association is largely of this sensational character. Apart from the beauty of the purely sensuous in music, its associations are largely sensuous. A face often becomes handsome from association at the table, the theater, on the promenade, and the pleasure we take in it is a reverberation of these associated pleasures of sense.

We may ask: Does this reference to physical well-being exhaust the range of ideal pleasure and pain? Further consideration convinces us that it does not. There are emotions whose tone seems to violate the law of physical well-being. We would expect, indeed, if consciousness is a synthetic

thing, and if its synthesis becomes explicit in what we call apperception or thought, that such a new thing in nature would have its own principle of development; and we would expect, further, that its development would be a matter of conscious adaptation to its conditions of thinking and willing. The most natural view of ideal pleasure and pain therefore is to consider it an index of healthy or unhealthy mental function. As physical pleasures, at first ministering blindly to the welfare of the organism, grow to attach to objects in relation to the organism, so ideal pleasures, while attaching still to attention as a function, yet come to attach to its objects as well. On this view, the tone of many emotions reflects the state of the mental functions primarily. This view is supported by abundant evidence. The pleasures of intellectual pursuit lead their devotees to neglect the body and even to continue this course in the face of acute physical pain. Aesthetic delight is so independent of selfish motives that admiration is often called out by what is destructive and terrifying. Ethical emotion, with the happiness it always brings, may triumph over physical impulse, when they come into conflict. Consequently, we may hold that there is an element of hedonic coloring arising with the changes which occur in the content of consciousness; and we are led to define intellectual pleasure as the conscious effect of that which makes for the continuance of the apperceptive life or its advancement; and pain, the conscious effect of that which makes for the decline of the apperceptive life or its limitation. Summing up all that has been said of pleasure and pain, both bodily and ideal, we may conclude that *pleasure and pain are the affective coloring, respectively, which consciousness takes on in conditions of present or prospective well or ill being.*

Complexity of Hedonic States.—It is now clear that the hedonic coloring of consciousness, at any time, is not a simple thing. Pleasure or pain is reported from the body and from the mind, from many organs of the body at once, and from many mental factors at once. Hope and fear may be struggling within, the will may be painfully paralyzed, attention distracted, and with it all a beating sun may annoy, an aching tooth distress, and all go to make up a complex condition of tone. So mental and physical conditions may combine to produce pleasure; and all possible combinations may, and do, arise in kaleidoscopic order. The elements, however, of this complex effect may be generally distinguished in consciousness. They do not coalesce except in their general tendency to produce emotional excitement, which has its own tone. If the two hands be held under two streams of water, very hot and pleasantly cool, respectively, the two hedonic effects may be clearly distinguished from each other. So the pain of suspense arises from the excitement of alternating hope and dread, and persists apart from the pleasure and pain of those emotions themselves as they struggle in consciousness.

BIBLIOGRAPHY.—See the general works by James, Wundt, Sully, Ladd, Höffding, Baldwin) given under *PSYCHOLOGY*; also Lehmann, *Die Hauptgesetze des Menschlichen Gefühlslebens* (1892); Marshall, *Pleasure, Pain, and Aesthetics* (New York and London, 1894); James, *Psychological Review* (Sept., 1894, *The Physical Basis of Emotion*); Baldwin, *ibid* (Nov., 1894, *The Origin of Emotion*), and *Mental Development in the Child and the Race* (New York and London, 1895); Dumont, *Théorie de la Sensibilité*.

J. MARK BALDWIN.

Paine, ELIJAH: legal writer; b. at Williamstown, Vt., Apr. 10, 1796; a son of Judge Elijah Paine; graduated at Harvard in 1814; studied law at Litchfield, Conn.; assisted in preparing Wheaton's *Reports*; was a judge of the New York superior court 1850-53; author of *Paine's Reports* (U. S. circuit court, second circuit, 1810-40; 1st vol. pub. 1827, 2d vol. 1856), and a joint author of Paine and Duer's *Practice in Civil Actions and Proceedings in the State of New York* (2 vols., 1830). D. in New York, Oct. 6, 1853.

Paine, JOHN KNOWLES: composer and professor of music; b. at Portland, Me., Jan. 9, 1839; after studying at home and acquiring considerable skill as an organist, in 1858 he went to Berlin for three years, studying under Haupt, Wieprecht, and Teschner. In 1861 he returned home and gave a number of concerts. In 1862 he was appointed instructor of music in Harvard College, and in 1876 made full professor. His compositions are numerous and important. They include a grand mass in D, an oratorio, *St. Peter; The Song of Promise*, a cantata for the Cincinnati festival; *Edipus Tyrannus*, for male voices, for the

Harvard students' performance of the play; *Centennial Hymn*, words by Whittier (1876); *Columbian March and Chorus*, for the opening of the Chicago World's Fair Exhibition, Oct. 21, 1892; several cantatas, three symphonies, symphonic poems, and other orchestral pieces, songs, motets, piano solos, chamber music, and others. D. E. HERVEY.

Paine, MARTYN, M. D., LL. D.: physician; son of Judge Elijah Paine (1757-1842); b. at Williamstown, Vt., July 8, 1794; graduated at Harvard in 1818; studied medicine under Dr. John Warren, of Boston, Mass., and took his medical degree there 1816; practiced his profession at Montreal 1816-22; removed to New York city, where he became one of the leaders of the medical profession; was one of the founders of the University Medical College 1841, in which he subsequently held important professorships. Author of *The Cholera Asphyxia of New York* (1832); *Medical and Physiological Commentaries* (3 vols., 1840-44); treatises on *Materia Medica* (1842, 1848); a very valuable standard treatise on the *Institutes of Medicine* (1847); *The Soul and Instinct* (1849), and other works. D. in New York, Nov. 10, 1877.

Paine, ROBERT, D. D.: bishop; b. in Person co., N. C., Nov. 12, 1799; while in childhood removed to Tennessee; in 1818 joined the Tennessee conference of the M. E. Church, and did pastoral work till 1830; became president of La Grange College, Alabama, till 1846, when he became bishop; was a member of every general conference from 1824 to 1846; chairman of the committee of nine which reported the plan of separation on the basis of which the M. E. Church was divided; was a prominent member of the Louisville convention in 1845. He had great pulpit ability and great executive ability. His *Life and Times of Bishop McKendree* (2 vols., 1859) is highly esteemed. D. at Aberdeen, Miss., Oct. 20, 1882.

Revised by A. OSBORN.

Paine, ROBERT TREAT: jurist; b. in Boston, Mass., Mar. 11, 1731; graduated at Harvard College 1749; studied theology and acted as chaplain in the Northern army; subsequently studied law and was admitted to the bar 1759, settling at Taunton; in 1770 was prosecuting officer (in the attorney-general's absence) of Preston and his men for the massacre at Boston; elected to the legislature 1773; delegate to Continental Congress 1774-78, meanwhile filling various important positions in Massachusetts; was one of the signers of the Declaration of Independence, attorney-general of Massachusetts 1780-90, and judge of the Supreme Court of Massachusetts 1790-1804, when he resigned. With others he founded the American Academy of Massachusetts (1780). D. at Boston, May 11, 1814.

Paine, THOMAS: radical and deistical writer; b. at Thetford, England, Jan. 29, 1737; son of a Quaker stay-maker; received an indifferent education at the Thetford grammar school, but acquired a considerable range of knowledge by private study while working at his trade as a stay-maker at London, Dover, and Sandwich; served a short time on board a privateer 1756; married in 1759 the daughter of an excise-man, but was left a widower the next year; obtained a post in the revenue service 1762, was discharged for irregular conduct 1765, but restored the next year; had to wait for a vacancy and meanwhile taught school and preached; was exciseman at Lewes 1768; married the daughter of a deceased tobacconist there 1771, whose business he continued; cultivated literature; acquired so clear and forcible a style as to be chosen by the excisemen as their representative in advocating their interests, in which capacity he published a pamphlet, *The Case of the Officers of the Excise* (1772), which probably led to his introduction to Dr. Franklin, and to his dismissal from the service a second time on a trumped-up charge 1774; separated from his wife the same year for an unknown cause. Influenced by the advice of Franklin, he proceeded to America; arrived at Philadelphia Nov., 1764; obtained immediate employment as editor of the *Pennsylvania Magazine*; published in Bradford's *Pennsylvania Journal* in Mar., 1775, an article entitled *African Slavery in America*, which probably hastened the formation of the first American anti-slavery society (Apr. 14, 1775); published, Jan. 10, 1776, his celebrated and widely circulated pamphlet *Common Sense* (120,000 copies were sold in the first three months), which struck the keynote of the situation by advocating independence and a republican government; published in the *Pennsylvania Journal* of Dec. 19, 1776, the first number of *The Crisis*, which appeared at irregular intervals all during the war, and had great influence in maintaining the spirit of the army and the people; was chosen in 1777 secretary to the committee of foreign affairs, from which

post he was dismissed and censured by Congress in 1779 for revealing diplomatic secrets in a controversy with John Deane; was soon afterward elected clerk to the General Assembly of Pennsylvania; rendered good service in 1780 in promoting a subscription for relieving the distress of the army; received that year a degree from the University of Pennsylvania; went to France with Col. Laurens, whom he aided in negotiating a loan 1781; received from Congress a grant of \$3,000 (1785), from the State of New York an estate at New Rochelle, and from Pennsylvania \$500 as rewards for his services; went again to France 1787; set up the following year at Rotherham, Yorkshire, the model of the iron bridge which he had invented some years previously; published in London in 1791-92, in reply to Burke, his *Rights of Man*, a vindication of the French Revolution, which gave him immense popularity in France and led to a bestowal of citizenship and his election to the French National Convention as deputy for Calais 1792; took his seat in that body; usually acted with the Girondists; heroically opposed the execution of the king, advocating his banishment to America; was imprisoned by the faction of Robespierre in the Luxembourg, from Dec. 28, 1793, to Nov. 4, 1794. Immediately prior to his arrest he wrote part of his *Age of Reason*, and during his imprisonment finished it and published it after his release (1795); narrowly escaped the guillotine; again took his seat in the Convention; resided nearly two years in the family of James Monroe, then minister to France; wrote several political letters and pamphlets of minor importance; returned to the U. S. in 1802, making the voyage in a U. S. sloop of war; was cordially received at Washington, Philadelphia, and New York, and by Jefferson at Monticello, but insulted by the Federalists at Trenton and elsewhere; and deprecated by the religious public on account of his deism, he passed his closing years in comparative obscurity at New York and on his estate at New Rochelle. D. at New York, June 8, 1809. He was buried on his estate at New Rochelle, where a monument was erected by his admirers in 1839, though his remains were carried to England in 1819 by William Cobbett. Biographies of Paine have been written by Chalmers, Cobbett, Cheatham, Rickman, Sherwin, and G. Vale, but these are all of little value, and are superseded by that by Moncure D. Conway (2 vols., New York, 1892), who has also brought out the only complete and authoritative edition of his writings (4 vols., New York, 1894-95). — Revised by S. M. JACKSON.

Paine, WILLIAM H.: civil engineer; b. in Chester, N. H., May 17, 1828; was engaged in surveying in the western part of the U. S. until 1861, when he entered the Fourth Wisconsin Regiment and served through the civil war with distinction, being appointed captain of engineers. He was connected with the Brooklyn suspension bridge as engineer in charge, and as consulting engineer from its inauguration until 1889. Later he was engaged in construction of cable-railways. D. Dec. 31, 1890.

Painesville: village; capital of Lake co., O. (for location, see map of Ohio, ref. 1-1); on the Grand river, and the Lake Shore and Mich. S., the N. Y., Chi. and St. L., and the Pitts. and West. railways; 3 miles S. of Lake Erie, 29 miles E. N. E. of Cleveland. It is in an agricultural and fruit-growing region, and contains several foundries and machine-shops, flour-mill, tanneries, factories, Lake Erie Female Seminary (non-sectarian, chartered in 1856), 2 libraries, a national bank with capital of \$200,000, and 2 daily and 3 weekly newspapers. Pop. (1880) 3,841; (1890) 4,755.

Paint [from Fr. *peint*, deriv. of *peindre* < Lat. *pin'gere*, decorate, paint]; a name which is generally limited to mixtures of insoluble colors or pigments with certain materials which prepare them for application to surfaces of wood, iron, stone, plaster, canvas, etc., by the aid of a brush. When the colors are soluble the preparation is more properly a stain or a dye. Paints are used not only for purposes of decoration, but to protect surfaces from moisture and decay, which they accomplish by closing the pores and excluding the agents of destruction. All paints consist essentially of two parts: (1) the pigment; (2) the vehicle. *The pigments* are very varied in character; the whites are generally white lead, more or less adulterated with barytes, oxide of zinc, prepared chalk, etc.; the yellows are ochers, chromate of lead, etc.; the reds are red oxide of lead, ochers, oxides of iron, red oxide of copper, vermilion, dichromate of lead, carmine, carmine, madder, and other lakes, etc.; the blues are Prussian blue, ultramarine, smalt, Thénard's blue, verditer, etc.; the greens are verdigris, Paris green, verditer, borate

of copper, chromate of copper, oxide of iron, etc., and lake green, and green lakes, the most common being, however, a mixture of chrome yellow and Prussian blue; the browns are umber, bole, terra di Sienna, bistre, sepia, etc.; the blacks are lampblack, bone-black, anthracite, graphite, etc. (See LAKES.) *The vehicles* determine the character of the paint; we have oil-paints and water-colors.

Oil-paints.—The most common vehicle is linseed oil, which is especially valuable on account of the property it possesses of oxidizing to a resinous body, which holds the paint in a firm water-proof varnish. By boiling this oil with litharge and sulphate of zinc it acquires the property of drying very rapidly, though the color is darkened by the operation. For some purposes other oils, as nut and poppy oils, are substituted for linseed oil; the latter, being colorless, is preferred for very delicate colors, but it dries very slowly. In the preparation of oil-paints the pigment is mixed with a small quantity of raw linseed oil and ground in a mill to make the mixture homogeneous. This is put up in convenient packages for the painter, who mixes it for use with a further quantity of raw and boiled linseed oil, and colors it to any desired shade with colored pigments, which are also furnished ground in oil. As pigment and oil alone would be too thick, a third class of agents is employed in preparing paints, the *thinners*. These are either spirits (oil) of turpentine or benzine—both of which mix freely with the oil-paint and thin it to any desired degree. As it is desirable that the paint, after it has been applied to a surface, should dry speedily before it is contaminated by dust or rubbed off by accident, it is necessary to do something more than boil the linseed oil; a fourth class of substances is used, the *driers* or *siccatives*. Driers are sugar (acetate) of lead, sulphate of zinc, verdigris, binoxide of manganese, red lead, japanner's gold size, etc. By far the most powerful siccative is the borate of manganese, one one-thousandth being sufficient to hasten greatly the drying of linseed oil. This agent is supplied to the painter ground in oil in a convenient form for mixing with the paint. It is always necessary to mix the above-mentioned materials, pigment, oil, thinner, and drier, just before the paint is to be used, as, if the mixture is allowed to stand for any length of time, the pigment settles to the bottom, the thinner evaporates, and the oil absorbs oxygen, becomes thick and ropy, and a hard skin forms over it, which can not be dissolved again. To meet this difficulty a new system of mixing paint has been introduced, by which paints of any color can be made and mixed on a large scale at the factory, and put up in convenient packages which are always ready for use. Any portion which may be left over after painting any work can be returned to the package for future use. The principle involved in the preparation of these ready-mixed paints is the formation of an emulsion which holds the pigment in suspension and prevents its settling.

Water-colors.—For many purposes paints are prepared with the aid of water as a vehicle, glue or gum being added to make the pigments adhere after the evaporation of the water. Such paints can only be used for interior work, walls, and ceilings, for coloring pictures, maps, etc. They must be mixed as they are used, as a solution of glue or gum would mould or putrefy and dry up if kept for any time. The most common paint of this kind is called "kalsomine," and is a mixture of prepared chalk with a solution of glue, to which ultramarine is added to neutralize a faint yellow tint for white, and ochers, etc., for other colors. The solid cakes of water-color are made by mixing the pigments with gum and water to a thick paste, pressing in moulds, and drying in warm air. By rubbing them in water or applying a wet brush to them the color is liquefied for use. Silicate of sodium, soluble glass, has been suggested as a vehicle for pigments, and as specially adapted for application to walls and ceilings, as it produces a very hard and durable surface. Sometimes the silicate of sodium paint is applied to the ceiling, and a thin solution of the clear silicate is afterward sprayed over the entire surface. Naphthas and tars, both coal and wood, are used as vehicles for cheap paints or for paints for special purposes, as for protecting iron, ships' bottoms, etc. Poisonous pigments are also used to prevent the adhesion of barnacles and other marine animals and seaweeds to ships' bottoms, specially copper compounds, the red oxide, etc. Artists' colors are composed of very carefully prepared pigments ground in a small quantity of very fine oil, and put up in metallic tubes.

Luminous paint is made by mixing with the ordinary articles some phosphorescent powder which emits light in

the dark. Powders useful for this purpose are (1) *Canton's phosphorus*, made by calcining a mixture of oyster-shells and sulphur; (2) *Osann's phosphorus*, made by calcining oyster-shells and sulphide of antimony. The subject of phosphorescent powders is fully discussed in Gmelin's *Handbook of Chemistry* (vol. i., p. 193). C. F. CHANDLER.

Painter's Cream: a mixture of mastic, lead acetate, nut oil, and water, applied by artists to unfinished oil-paintings to prevent drying during the interruptions of the work. It is applied with a brush and washed off with water.

Painting: the laying of paint upon a surface; especially of paint in the strict sense—i. e. insoluble color mixed with some liquid or semi-liquid medium. It follows from this that painting is generally considered to be covering with thick and opaque pigment, and that the putting on of thin and nearly liquid color is called *staining*, because it is assumed to soak into the surface, or simply *coloring*. A *painting* means generally a work of fine art in color, and a painted work in light and shade only is spoken of as a "painting in monochrome," or as an "oil monochrome," or the like. **PASTEL** (*q. v.*) is included in the general art of painting, but a single work is called simply a *pastel* rather than a painting in pastel. For painting as a trade and as a preservative of wood, iron, etc., see **PAINT**; for decorative painting and the painting of ancient sculpture and architecture, see **POLYCHROMY**.

The fine art of painting includes **DRAWING** (*q. v.*). Painter artists must necessarily draw a great deal, both in the production of paintings and in study, and most of them draw in many different ways, some of their drawing passing imperceptibly into painting, or forming an inseparable part of it. **Fresco** (*q. v.*) is painting done on damp plaster, the colors being mixed with powdered lime and water. In this case the drawing has been done previously upon sheets of paper, the figures, etc., being of the full size of the intended painting and somewhat elaborately finished, and then transferred to the plaster, as explained under **Fresco**. Painting on plaster or stucco which has grown hard is unlike fresco in this, that the artist can draw directly on the plaster, as with charcoal or black chalk. The plaster is usually sprinkled with water, that the color may not dry too rapidly; then the color is applied either as **ENCAUSTIC PAINTING** (*q. v.*) or distemper or tempera, which is merely painting with colors mixed with some glutinous and adhesive matter, such as white and yolk of egg, i. e. together, yolk of egg alone, either of these with vinegar or some liquid glue. Distemper colors are diluted with water, however, and the modern *calimine* or *kalsomine* process (see **PAINT**) is only a variety of this. Ancient paintings on walls, from the time of the early Egyptian tombs to the sixteenth century, were generally upon plaster or stucco of some kind, and these paintings, when not done in fresco, are generally found protected by some varnish or glaze which enters more or less into the substance of the work. It is therefore very difficult to ascertain just how ancient paintings were executed, and great differences of opinion exist as to this. During the later Middle Ages and the early Renaissance movable pictures were painted on wood, generally in *distemper*. Frequently the frame was an elaborate semi-architectural composition of gilded wood, and this and the *panel* upon which the picture was painted were made together as one piece of joiner's work. Altar-pieces and the like were often made up of many separate paintings united by a common system of frames of rich design.

Oil-painting came into use in the fifteenth century. Its power of giving depth of color and richness of effect quickly made it popular. It was not much used, however, upon plaster surfaces. Perhaps this was because oil-painting on plaster grows dark very rapidly, or perhaps it was because plaster is not nearly so agreeable a surface to work on as the prepared canvas. At all events the greater part of the large-scale painting of European peoples has been done in oil-painting upon *canvas*, and less commonly upon *panel* or specially prepared millboard, since its general adoption about 1520. Even the largest pictures of the Venetian school, such as the *Paradise* and the *Chandlery* by Tintoretto, the *Presentation of the Virgin* by Titian, and the *Supper at Emmaus* and *Christ in the House of Simon* by Paul Veronese, are painted on canvas. Modern decorative painters too, in large paintings intended expressly for special walls which it is desired to adorn permanently, have used canvas, as in the great works of Puvis de Chavannes in the Pantheon in Paris. Indeed, most modern attempts to paint on plaster in fresco

or other recently invented processes, such as *water-glass* and *spirit-fresco*, have failed to give the good results expected, and artists have generally returned to oil-painting on canvas. This canvas may be glued fast to the wall or may be stretched on wooden frames with an air-space behind it.

The *fine art of painting* is the most elaborate and complex of all the arts that appeal to the eye. It is therefore the most difficult to understand and appreciate. At the same time, as painting much more than sculpture deals with scenes, incidents, historical events, the illustration of poems and fiction, landscape, and the representation of common objects of all sorts, so it is painting that persons not specially instructed in art are the most apt to care for. The result is that there is no fine art in which the aim of the artist in producing and the feeling of the public in admiring are so widely separated. It is very often true that the painter was hardly conscious as he worked on his picture of that which most of the admirers in the exhibition most admire and enjoy. In a picture of military subject, for instance, the incident, as of rescuing a banner, fighting for a field-piece, or the like, is what attracts most persons, and it is looked at and judged by the greater number of visitors to the gallery somewhat as a dramatic performance is judged, or the poetical narrative of an event. The painter may indeed have taken some care to arrange his figures so as to tell the story intelligibly, or even to tell it with vigor and spirit; but this will not have been his greatest care. His interest is not in the incident, but in the harmony of colors, in the light and shade, in the general composition of graceful lines and of harmonious masses. In other words, to the painter the parallelogram within his frame is a surface which he has filled with a beautiful design, while to most of the spectators it is a piece of story-telling. Painter and spectator find, indeed, one seeming point of agreement, namely, in the truth to nature of the artist's work. But this is rather seeming than real, for the truth to nature which the artist cares about is really inappreciable to most of his public. The painter has at some time noted the beauty of sunlight on certain textures and certain colors, and thinks he has there the possibility of a new artistic effect. This, when he tries to put it into his military picture, will be unsuspected by nine-tenths of those who look at the picture, though it may be the most important part of it to its author. The truth to nature which he thinks his picture contains, and of which he is proud, is generally of this sort, and it is not even suspected by the majority of the spectators. This has always been the case. The comments by ancient writers upon the pictures of their times show an interest in the incidents related and the personages portrayed, and express admiration for supposed skill in copying nature, but no appreciation of any more artistic aim in the artist. Those pictures have perished, but the sculptures of antiquity remain to show us by a sure analogy that the artists 400 years B. C. worked in as purely artistical a way as those of 1500 or of 1890 A. D. That is to say, they cared for nature chiefly because of its suggestions to them as artists; and they cared for incident, for tradition, for the great Tale of Troy or that of the Seven against Thebes, for the Niobe tragedy or the fight with the Centaurs, chiefly as affording scope and room for their own artistic conceptions. It has been thought surprising that the great painters of the Italian Renaissance and the sixteenth century were as ready to paint Madonnas as Venuses and Venuses as Madonnas. The reason for this is merely that Venus and the Madonna alike were to the painter types of feminine grace, and figures upon which he could use his skill as draughtsman and as colorist. To a painter the great thing must always be to paint; to paint as well as possible and to produce as beautiful pictures as possible; little does he care in comparison for the story which he is ordered to tell, or the conventional type which he is bade reproduce. And it is not until the student of pictures seizes this truth and begins to approach good pictures somewhat in the spirit in which they have been conceived and carried out, that much enjoyment from the study of painting is possible. This is true of the other branches of fine art. It is true indeed of the finer handicrafts that a technical and esoteric standard of excellence exists for the workman, almost unsuspected by the spectator. It is especially true of artistic painting because, as has been said above, this is the most elaborate and complex of the fine arts. One can more easily seize the sculptor's secret, or some part of it, than the manifold thing, made up of reminiscences and dreams, of light and dark, of color intermingled with light and dark and putting

on their semblance, of pure form expressible only by means of light and dark and hardly expressible at the same time with color, and of expression of face and gesture and the individuality of persons. Landscape thought is in some ways more unseizable even than figure-painting; probably no such thing as adequate written criticism on landscape-painting exists or can exist; but the student who tries to find in the picture what the painter tried to put there may have an immense delight in tracing it, and may go far toward getting a full share of the artist's delight in his work. Thus it often appears in a landscape-painting that the expression of important natural truth is mingled with artistic merit so as to be indistinguishable from it. The rocky frame of a hill is traceable under its clothing of forest or of heather and bog; this has been seen and felt by the artist, perhaps half unconsciously, and it reappears in his picture.

The painting of antiquity which is known to us is almost wholly decorative. The important works of the celebrated Greek painters have perished, and no certain idea of them can be formed. It can not be too much insisted on that the statements concerning them which we have in the works of ancient writers are of no critical value whatever. The wall decorations of Pompeii and of a few newly discovered ancient houses in Rome help us only to form an idea of the classical style of composition. Painting in the time of the decline of the Roman empire and of the Byzantine empire is chiefly known to us in ILLUMINATED MANUSCRIPTS (*q. v.*). In the Middle Ages painting on walls of churches, etc., was mainly decorative in character. In the fifteenth century in Italy there was a great increase in the power of execution among a small body of painters in Siena, Florence, and other towns; the names most important to us are those of Duccio di Buoninsegna (about 1260-1330) and Guido of Siena, his contemporary Cimabue (1240-1302), and Giotto (1266-1336). Of these, Giotto is the one who came the nearest to the skill and facility of later times, and who established many of the types of legend and of the Bible story as told in painting. His most powerful and original follower was Andrea di Cione, called Orcagna, whose important work is of the middle of the fourteenth century. Florence at that time came to possess the most important school of painting. Of the Florentines, Masaccio (1402-28) seems to have made the most surprising advance in naturalistic power, both in drawing and in conception and composition; but the work of Masolino da Panicale, perhaps his teacher, is hard to distinguish from his. Meantime the purely ecclesiastical and decorative style was maintained by Fra Angelico da Fiesole (1387-1455), Ghirlandajo (1449-94) Filippo and Filippino Lippi (1412-69 and 1457-1504), able men and delightful artists, are, in the sense of mere trained skill and executive power, somewhere between the two standards. Their work seems far more realistic and vigorous than Fra Angelico's, and yet archaic beside Masaccio's. Sandro Botticelli (1474-1515) occupies a place apart, and is one of the original designers of any period. Luca Signorelli (1441-1523) painted chiefly at Orvieto and at Cortona and near Siena; important and well-preserved frescoes exist in the Orvieto cathedral. Andrea del Sarto (1487-1531) seems to close the list of the great men of the Florentine school, except that the long life and the immense achievements of Michelangelo (1475-1564) prolong the celebrity of Florence in other cities and under very different influences. Michelangelo spent only a part of his life in painting, but his achievements in fresco put him among the few greatest masters.

Perugino (1446-1523) and his successor, Raphael (1483-1520), made the Umbrian school famous; but Raphael in early life removed to Rome, and what is called the Roman school consists mainly of him and his pupils. Mantegna (1431-1506) was a powerful and original artist, and yet his work shows the immediate influence of classic relief sculpture and also of Venetian painting. He stands almost alone as the great painter of his time in Padua and Mantua. Leonardo da Vinci (1452-1519), coming from the north and soon returning there, is connected with both the Florentine and the Milanese schools, of which latter school he is the great master.

Meantime the Venetian school took shape in the hands of the two Bellini (Giovanni, 1428-1516, and Gentile, 1421-1507). Its purely artistic value is of the very highest; color was its especial point of superiority; and in the hands of Giorgione (about 1477-1511), Titian (1477-1576), Tintoretto (1512-94), and Paolo Veronese (1528-88), it attained a splendor never reached by any other school. Only indi-

vidual painters here and there, such as Velasquez and Michelangelo, can be ranked with the great Venetians. Tiepolo (1693-1770) was the latest master of the Venetian school, and the last of those Italians who kept the ancient traditions. The Bolognese school must be mentioned, because of the great admiration which less critical ages than the present have felt for its mannered and artificial work. Ludovico Caracci (1555-1619), Annibale Caracci (1560-1609), and Domenichino (1581-1641), are the most famous names of this the so-called eclectic school. Correggio (1494-1534) is hard to class with any Italian school.

Spanish painting is of far less importance in the history of art; its greatest names are those of Francisco Zurbarán (1598-1662), Velasquez (1599-1660), one of the half-dozen giants of art, and Murillo (1613-82).

German painting has had a curiously uneven history—some great men, such as Albert Dürer (1471-1528) and Holbein (1497-1543), and long lapses of time during which little was achieved.

Dutch and Flemish painting is of the greatest importance after that of Italy. John Van Eyck (1370-about 1440) and his brother Hubert (1366-1426) are wonderful painters, excelling the Italians of their time in many respects. Memling (about 1430-95), Roger Van der Weyden (1400-64), and Quentin Matsys (1450-1529) are strictly medieval painters, but their great ability distinguishes them from other artists of the pre-Renaissance style. It must not be forgotten that the art movement of the Renaissance was much later in the north than in Italy. Rubens (1577-1640) and Vandyke (1599-1641) are of the next succeeding epoch, and close the history of Flemish art, properly so called. Then the Dutchmen took up landscape art as their special study, and Cuyp (1605-91), Hobbema (1638-1709), and Ruysdael (1630-82), founded that great landscape school which is the peculiar glory of modern art. Two men of singular genius devoted themselves to portraiture and the human figure, Frans Hals (1584-1666) and Rembrandt (1607-69). In executive power each of them belongs to the small list of unsurpassable masters.

French painting was late in its development out of mediæval decoration, and was not of supreme importance, even in the seventeenth and eighteenth centuries; but Nicholas Poussin (1594-1665), Claude Lorrain (1600-82), and Watteau (1684-1721) are of high rank as artists, and a good school of portraiture existed under Louis XV. and Louis XVI.

English painting is also recent in its development. Its greatest names are Reynolds (1723-92), Gainsborough (1727-88), and Hogarth (1697-1764).

Painting in the nineteenth century is curiously affected by the freedom of intercourse among different nations, and also by the thronging of large numbers of persons into the professional life of the painter. The aggregate amount of talent, and even of unmistakable genius, to be found in modern painting is enormously great, but it makes less impression upon the public, because of the great size of modern communities and the large comparative number of persons interested in art. The French school, centered in Paris, is much the most important of modern times. Among those who have been some time dead, Ingres (1780-1867) is the greatest master. With him may be named Géricault (1791-1824), Delacroix (1799-1863), Rousseau (1812-67), Couture (1815-79), Corot (1796-1875), and J. F. Millet (1814-75). In Great Britain the first half of the nineteenth century saw a great school of landscape art, of which J. M. W. Turner (1775-1851) was much the greatest master, but Constable (1776-1837) the one most widely known during his life, on the Continent as well as in Great Britain. The much-discussed pre-Raphaelite school produced one great and original artist, Dante Gabriel Rossetti (1828-82). Many painters have been popular and admired because of their large and showy pictures of patriotic and other historical subjects, such as Paul Delaroche (1797-1856) in France, MacIise (1806-70) in England, Cornelius (1783-1867) and Wilhelm von Kaulbach (1805-74) in Germany.

A general history of painting in ancient times and down to the close of the Renaissance has been written in German by Alfred Woltmann and Karl Woerman, and translated, with some changes, by Sidney Colvin. Kugler's *History of Art* and Mrs. Heaton's *Course History of Painting* are well used. The French *Revue d'Art et d'Archéologie* and *Revue des Beaux-Arts* contains volumes on French, Italian, Dutch, and other schools, and these volumes are being published in English translation. A very large and elaborate work is Charles Blanc's *Histoire des Peintres de l'École*.

pleted in 1876. Bryan's *Dictionary of Painters and Engravers* (new ed. 1886) is good, and Seubert's *Künstler-Lexicon* easy to use for persons with even a slight knowledge of German. The fullest biographical dictionary is Nagler's *Allgemeines Kunst-Lexicon*, but it is out of print and needs revision, and a revised edition which has been undertaken has not been carried very far. For the pictures of Christian religious subjects, Mrs. Jameson's *Sacred and Legendary Art, Legends of the Madonna, and Legends of the Monastic Orders* should be studied; also Lady Eastlake's continuation of Mrs. Jameson's *History of our Lord*; also Lord Lindsay's *Christian Art*. For Italian painting, the different books by Crowe and Cavalcaselle and by Morelli should be studied. For other schools, Crowe and Cavalcaselle, *Early Flemish Painters*; Stirling-Maxwell, *Annals of the Artists of Spain*; Redgrave, *Dictionary of Artists of the English School*, and *A Century of Painters of the English School*. All of the works of Ernest Chesneau are valuable for criticism, and those of Hamerton for their familiar and popular treatment of the art of painting.

RUSSELL STURGIS.

Paisley; town; in the county of Renfrew, Scotland; on the White Cart, 3 miles from its junction with the Clyde (see map of Scotland, ref. 12-F). It consists of an old town situated on the western bank of the river, and a new town on the opposite bank, paved and well built. The abbey (originally founded in 1203) is historically interesting, and among the modern buildings are the town-hall (1879-82) in the Italian style, the county buildings (1891) with a fine council-hall, and the Coats free library and museum (1871) with an observatory and picture-gallery. The Coats Memorial Baptist church (1891) is said to be the finest ecclesiastical structure erected in Scotland since the Reformation. Of its manufactures cotton thread occupies the first place, the two principal firms employing between them 10,000 hands. There are also works for dyeing, bleaching, distilling, and brewing, and the manufacture of woolen shawls, printed-cottons, handkerchiefs, carpets, soap, and starch; and there are ship-building yards on the Cart, which has been deepened to 18 feet since 1890. Paisley returns one member to Parliament. Pop. (1891) 64,379.

R. A. ROBERTS.

Painte Indians: See SHOSHONEAN INDIANS.

Paixhans, Fr. pron. pāk'sāñ, HENRI JOSEPH: soldier; b. at Metz, Jan. 22, 1783; was educated in the Polytechnic School at Paris; entered the army; served in Napoleon's campaigns, but left active service after the Restoration; was employed in the war ministry and on the committee on the artillery. In 1824 experiments were made at Brest, at Col. Paixhans's suggestion, upon cannon for horizontal shell-firing. The idea was taken up by the British admiralty, and the Paixhans guns were the result. He published *Considérations sur l'Artillerie* (1815); *Nouvelle Force maritime* (1822); and *Force et Faiblesse de la France* (1830). D. near Metz, Aug. 19, 1854.

Paixhans Guns: See ARTILLERY and COLUMBIAD.

Pak'enham, Sir EDWARD MICHAEL, G. C. B.: soldier; a brother of the Earl of Longford; b. in Ireland in 1779; entered the light dragoons in early life, and served with brilliant reputation under Wellington (whose quartermaster-general he became), and also in the West Indies. In 1812 became major-general; in 1814 commanded the expedition against New Orleans; was killed in the battle of New Orleans Jan. 8, 1815, an action in which he displayed great gallantry.

Paktong: the correct name of the Chinese alloy resembling German silver in appearance, which is commercially known as *packfong*, *fong* being an original error for the Chinese *tong*, or *tung*, copper. The name means "white copper," and is pronounced peh-tung in the mandarin dialect. Paktong is composed of arsenic and copper fused at a low temperature, two parts of arsenic to five of copper. It was once extensively exported to Europe and employed in making philosophical instruments and a great variety of other goods. It can not be fused, for the copper alone will remain after melting. Of late the cheaper nickel alloys have driven this substance out of the European market, but it is still extensively employed by the Chinese. It is probable that the Chinese often manufactured paktong directly from arsenical copper ores. See NICKEL.

Palacio, pāl-lā'seō-ō, RAIMUNDO ANDUEZA: politician; b. in Venezuela about 1840. He took an active part in poli-

tics; was Minister of State under Rojas Paul 1888-90, and at the close of his term was elected president, assuming office Mar. 19, 1890. In 1892 the elections were postponed; a rebellion, headed by Gen. Crespo, broke out; Palacio's forces were defeated near Caracas, and he was forced to resign and leave the country (June, 1892). H. H. S.

Paladilhe, pāl-lā'deēl', ÉMILE: composer; b. at Montpellier, Hérault, France, June 3, 1844; entered the Paris Conservatory when nine years of age; won first prize in 1857 and Prix de Rome in 1860. He has since won considerable fame as a composer of operas, the most important of which is his grand opera *Patrie*, text from Sardou's drama, produced at the Opera, Paris, Dec. 20, 1886. He has also composed a symphony, masses, and much music for vocal and instrumental solos. D. E. H.

Palae'mon. QUINTUS REMMIUS: a Roman grammarian of the first century A. D., from Vicenza, whose *Ars* was largely appropriated by later grammarians. See K. Marshall, *De Remmii Palae'monis libris grammaticis* (Leipzig, 1887).

Palæography [Gr. *palaios*, ancient + *γραφη*, a writing, deriv. of *γράφειν*, write]: the science of ancient handwriting. Palæography has to do with manuscripts, as epigraphy with inscriptions; it teaches how to decipher them and to judge of the time and place of their writing. It includes in its scope all handwritings, alphabetic and non-alphabetic, Oriental and Occidental; but its chief concern has been with manuscripts written in the Greek or in the Latin alphabet.

Of the two, Latin palæography is the older. For some time after the invention of printing, as both compositor and scholar were familiar with the mediæval script, no need of palæographic study was felt; but, as the old contractions disappeared from printed books and the new Italian hand crowded out the crabbed monastic writing, the manuscripts grew unintelligible. At the same time the exposure of such forgeries as the Constantinian Donation and the Pseudo-Isidorian decretals threw doubt on the genuineness of all ancient documents. In their eagerness to save the true at the cost of the false Catholic scholars went almost further than Protestants in their skepticism, and in 1675 the learned Jesuit Papebroch, editor of the Bollandist *Acta Sanctorum*, made a sweeping assault on all charters claiming early Frankish origin. These charters were almost wholly in the hands of the one ancient monastic order of the West, the Benedictines, and the ablest of its scholars, Mabillon, came to the rescue of the questioned documents by the publication in 1681 of his *De re diplomatica*. It created at one stroke a new science. With the sure hand of a master he laid down the criteria and rules for the determination of the age of MSS., illustrating and proving from the ample materials at his hand. Even his Jesuit opponent was convinced, and Mabillon's book remains the foremost in the literature of its subject. The voluminous *Nouveau traité de diplomatique* of his fellow Benedictines Toustain and Tassin, a half-century later (1750-65), only expands and illustrates the work of Mabillon. Thus far the new science aimed at both the decipherment of handwriting and the determination of the genuineness and worth of documents; but, when with the French Revolution the legal value of old charters was swept away, they no longer interested any but historians, while the other manuscript treasures of convent and castle, scattered now to the libraries of Europe, became the heritage of all scholars. Palæography, the science of handwriting, separated itself from diplomatics, the science of documents; and while archivists are now trained in the latter by two or three national schools, like the *École Nationale des Chartes* at Paris and that founded by Sichel at Vienna, the former has found a place in the curricula of most institutions for the higher learning. Facsimiles, multiplying with the growing ease and cheapness of pictorial reproduction, make the study possible and fruitful anywhere.

The oldest Latin MSS. extant belong to the first centuries of the Christian era. They show already in use two clearly marked hands—a formal book-hand in majuscule (capital) letters closely resembling those of the inscriptions, and a cursive (running) hand clearly derived from the other, but differing nearly as much as the small letters from the capitals of the modern alphabet. The whole story of palæography is the story of the reciprocal influence of these two hands—the majuscule growing more careless under the influence of the cursive, and the cursive more legible under the influence of the majuscule. Thus from the book-hand were developed in times still Roman the easier *uncials*, characterized especially by the rounded forms of *a, d, e, h, m*, and soon of *g, q, t, u*, all

taking on nearly their present minuscule shape. From a mixture of uncial and cursive grew, in the Germanized lands of the Continent, a group of national hands. Frankish, Lombard, Visigothic, while the Irish monks and their English disciples metamorphosed the uncial after their own fashion, but in much the same direction. Meanwhile the Roman cursive itself, stiffened into a charter-hand, had given birth to the grotesquely illegible script of the early Frankish diplomas. From the end of the eighth century, however, all these, one by one, gave way to the beautiful minuscule which had come into use at Rome, then the book-mart of the West, or, under the fostering care of Charles the Great and of Alcuin, had been evolved from the Frankish half-uncial in the convent schools of Neustria and Austrasia. Capitals were now banished to head-lines and initials, the script of letters and of charters became by degrees once more identical with that of books, and the Caroline hand was from the tenth century universal in Latin Christendom. After the twelfth century it fell indeed into that angularity which still survives in German book-type, as for long in Old English black letter; but happily the Italian scholars and printers of the Renaissance took as a model the purer Caroline forms of the old MSS., whence they drew the classical texts which were their delight. The chief difficulty of the later mediæval MSS. lies in the ever-multiplying abbreviations which had made writing almost a system of shorthand, and which even survived for a time the invention of printing.

The rise of Greek palæography followed close upon that of Latin. In 1708 the Benedictine Montfaucon published his *Palæographia Græca*, which, even longer than Mabillon's great work, remained the sole and sufficient authority in its field. Only in our own day has it been found necessary to revise his work in the light of ampler material, especially for the earlier periods. Since Montfaucon's time the field of study has been pushed centuries back by the discovery of Greek papyri at Herculaneum and in Egypt. Though we are perhaps but at the beginning of what we may hope from the latter source, we have already enough for a survey of the growth of Greek handwriting from the third century B. C. The development is strikingly parallel to that of Latin. From the first we have side by side two hands: the book-hand of literature and the running hand of ordinary use. In Greek, too, the angular capitals, in the early centuries of our era, took on the rounded forms which bear the name (borrowed from their Latin counterparts) of uncials. This remained the usual book-hand till in the ninth century there was shaped from the cursive a minuscule which thenceforward became the literary hand. Greek palæography has drawn a peculiar interest from its bearing on the transmission of the Christian Scriptures.

For the study of the non-alphabetic handwritings the best book is Wuttke's *Die Entstehung der Schrift*; for the history of the alphabet, Taylor's *The Alphabet* and Kirchhoff's *Studien zur Geschichte des griechischen Alphabets*; for the general history of handwriting, Astle's old but excellent *Origin and Progress of Writing*, Humphreys's *Origin and Progress of the Art of Writing*, Berger's *Histoire de l'Écriture dans l'Antiquité*. For Greek and Latin palæography we have at last an excellent manual in English: Thompson's *Handbook of Greek and Latin Palæography*. Of other modern introductions to palæography, the best for Greek are the German ones of Wattenbach, Girdthausen, and Blass; for Latin, the unwieldy Wailly, and the later textbooks of Wattenbach, Prou, and Paoli, while the convenient little manuals of Chassant and Leist have still a use. These must be supplemented of course by collections of facsimiles. The most comprehensive are still the *Palæographie universelle* of Silvestre, and the vast series of the Palæographical Society; but ample for the student's use are the *Schrifttafeln* of Arndt, the *Album palæographique* of the French National Library, or the *Recueil de fac-similés* of the École Nationale des Chartes. The best dictionary of abbreviations is still the old *Lexicon diplomaticum* of Walther, but the little one of Chassant and that appended to Prou's *Manuel* serve an excellent purpose, and Martin's *Record Interpreter* is of value for English documents. See MANUSCRIPTS. G. L. BOER.

Palæologus: the name of a Byzantine family which gave rulers to the BYZANTINE EMPIRE (q. v.) from 1261 to 1453. It produced many able men. One branch held the principality of Monterrat, Northern Italy (1305-1533); another ruled in the Peloponnesus (1380-1462). Sophia, only child of Thomas, chief of the latter branch, married 1472 Ivan III. the Great, Grand Duke of Russia, who in conse-

quence assumed the double-headed Byzantine eagle of Constantinople as the Russian arms. Theodore Palæologus, the last descendant of the Palæologi, died Jan. 21, 1656, and is buried in the Church of Landulph, Cornwall. See CONSTANTINE XIII. L. A. GILES, *op. cit.*

Palæontology: same as PALEONTOLOGY (q. v.).

Palæphatus (in Gr. *Παλῃφατος*): Greek mythographer of uncertain period. The language seems to point to a time not earlier than the second century B. C. To this Palæphatus, for there were several of the name, is usually ascribed a treatise *Περὶ ἀπίστων [ιστοριῶν]*, *On Incredible Tales*, which was once a favorite school-book. In the extant compilation fifty of the Greek legends are explained historically and allegorically, much after the fashion of EUCHEMERUS (q. v.), and on the general subject. The treatise has been edited by Fischer (Leipzig, 1789), and by Westermann in his *Mythographi Græci* (Brunswick, 1843). See Grote's *History of Greece* (vol. i., p. 45 foll., Am. ed.) and Wiprecht, *Questions Palæphateæ* (1892). B. L. GILDERSLLEEVE.

Palaihnihan Indians, also called **Palaiks** and **Pit River Indians** [from the Klamath word *p'laikni*, signifying mountaineers, uplanders]: a family of North American Indians, having as their habitat the territory drained by Pit river and its tributaries from Goose Lake to the mouth of Squaw creek, in Modoc, Lassen, Shasta, and Siskiyou Counties, Northern California. The following tribal divisions are recognized: Achomawi, Atumiah, Chumawa, Estakewach, Hantewa, Humawhi, Ilmawi, Pakamulli (?).

The physical appearance of the tribes of Pit river varies greatly. The Humawhi and Estakewach have been described as "most miserable, squalid, peaked-faced, mendicant, and mendacious wretches," the result chiefly of the inroads of the Modok and Mukalak (who carried into bondage their comeliest maidens and bravest youths whenever opportunity offered) and partly of warfare in former years with white settlers. The Atumiah were much superior in physique. The women of all the tribes are degraded and their positions are servile. Marriage is by purchase, and polygamy prevails. All these tribes were very indifferent hunters. They formerly trapped game in pitfalls covered with brush, grass, and earth. These pits were particularly numerous along the river, hence Pit river, after which the tribes were also named. Cremation is generally practiced in cases where the person died of an unknown disease; all others are buried in a sitting posture. The Ilmawi, however, never burn their dead. Very few of the Palaihnihan Indians survive. Some of them were removed to the Round Valley reservation, California, and these, with some natives from Potter Valley, numbered thirty-four in 1889. See INDIANS OF NORTH AMERICA; also Stephen Powers, *Tribes of California* (Cont. N. A. Ethnology, iii.), 267-274 (Washington, 1877). F. W. HODGE.

Palaik Indians: See PALAIHNIHAN INDIANS.

Palamedeidae (Mod. Lat., named from *Palamedea*, the first described genus, from Gr. *Παλαμῆδης*, a Trojan hero): a family of birds most closely related to the ducks (*Anatidae*), but resembling also the rails (*Rallidae*), and remarkable for their large feet. In general aspect they resemble the rails more than the ducks. The neck is comparatively short; the head small and decorated with a slender horn-like appendage, from 2 to 3 inches long, rising from the forehead; bill short, compressed; the wings are large and armed at the shoulder with two strong spurs; the tail rather small; legs enlarged, covered with numerous oblong and somewhat hexagonal scales, which extend on the tibiae as well as tarsi, and with larger oblong scales in transverse rows on the upper surface of the toes; the toes long, the anterior connected by slight scaly webs. In the osteology the species essentially resemble the ducks, and have been combined with them by Huxley under the name *Chenomorpha* as typical desmognathous birds. The family is composed of but two genera: (1) *Palamedea*, Linn., with one species, *P. cornuta*, and (2) *Chauna*, Illig., with two species. All are inhabitants of South America, and frequent marshy grounds and borders of lakes and rivers. They generally associate together in pairs, but sometimes in troops of many individuals. Their gait when undisturbed is slow, their flight easy and rapid; they soar to great heights; they rest in high trees, and in these they make their nests, wherein the female generally

Palanquin [viā Fr. and Portug. from Javanese *palangki*, viā Prakrit, from Sanskr. *paryāṅka*, bed, couch, liter., a sit-

ting with bent legs on the hams; *pari*, around + *añka*, hook, bend, groin]: a portable litter for conveying travelers. Palanquins are employed extensively in India, China, and other Asiatic countries. The Japanese *norimono* and *kago* are but forms of the palanquin. The Indian palanquin has a water-proof cover, with Venetian shutters at the sides. The traveler is carried in a recumbent posture. The palanquin is borne by four men, who are relieved at regular intervals by others. Quite a train of attendants accompany the palanquin on foot, and the bearers while on duty keep up a monotonous chant. The journey is often continued for long distances by day and night.

Palaprat, *pāṭlāṭ pṛāṭ*, JEAN, Seigneur de Bigot: dramatist; b. at Toulouse, France, in 1650. In 1675 he was caputlary of his city; he afterward traveled, lived for a time in Rome, and again in France as secretary of the Duke of Vendôme. D. Oct. 14, 1721. He is known chiefly as the associate of David August de Brueys (1640-1723) in the production of comedies. Their best-known work is the adaptation of the old farce *L'Avocat Patelin*; of their original works, *Le Sot toujours sot*, *Les Qui-pro-quo*, *L'Important*, *Le Muet*, *Le Grondeur*, the last is called the best comedy between Molière and Regnard.

A. G. CANFIELD.

Palatal Bones: a pair of bones in the vertebrate skull, which develop from the anterior part of the cartilage of the upper half of the anterior visceral arch ("palato-pterygoquadrate arcade"). In the sharks (in which, however, no bone exists) the corresponding cartilage serves to bear teeth, and in the lower bony vertebrates (fishes and Batrachia) the bones may be teeth-bearing. In the higher forms, however, these teeth are lost, and the bones here merely form part of the skeleton of the roof of the mouth. In man and other mammals they are irregular in shape, and form part of the floor of the nasal cavity and wall of the orbit as well.

J. S. KINGSLEY.

Palatalization, or Palatization (Germ. *mouillierung*, *palatalisierung*): the modification of a sound toward a palatal articulation. The term is specially applied in historical grammar to the palatal modification either of guttural or of dental consonants under the influence of *e*- or *i*-sounds. Thus in Indo-Iranian the Indo-Europ. velar gutturals *g*, *gʰ* became palatalized before the vowels *e*, *i*, so as to become, e. g., in Sanskrit *c*, *j*, *ḥ*, instead of *k*, *g*, *gʰ*; cf. Lat. *quod*: *quid*: Sanskr. *kas*, who?: *cid*. The Indo-Europ. perfect of root *qer*, "make," is *qeqora* > Sanskr. *cakāra*; of root *qem*, "come," is *qegoma* > Sanskr. *jagāma*. Very similar is the treatment in the Romanic languages of Lat. *c* (= *k*) in *ce* and *ci* in distinction from that in *ca*, *co*, *cu*; thus contrast on the one hand Lat. *centum* > Ital. *cento* (pron. *tʃento*): Fr. *cent* (pron. *sɛ̃t*), and on the other Lat. *causa* > Ital. *cosa* (pron. *koza*): Fr. *chose*, or Lat. *cursus* > Ital. *corso*: Fr. *cours*. The palatalization of a dental may be illustrated by the change of *n̥* (*ny*) to *ñ* in the Romanic languages, as Lat. *seniorem* > Ital. *signor*: Span. *señor*. Entirely similar are such changes as Gr. *phaniō* > *phaniō* > *phaiwa*. Changes such as *t̥* to *ts* or *tʃ*, *d̥* to *dz* or *dʒ*, which occur in various languages and play often an important part in the development of their phonology, are commonly classed as palatalizations, because the direction of the change is palatal. Cf. Eng. *ort-yard* > *orchard*, pronounced *orʃard*; Gr. *takiō* > *tássa*: Lat. *diurnus* > Ital. *giorno* (pronounced *dʒorno*): Fr. *jour*; Eng. **verdure* > *verdure* (pronounced *vɛədʒʊr*); Gr. **d̥jeus* > *Zeus*.

BENJ. IDE WHEELER.

Palatals: the sounds formed between the body of the tongue and the hard palate. They are to be distinguished from the velars or gutturals proper, which are formed between the back of the tongue and the soft palate. (See GUTTURALS.) Palatal explosives are *k* (as in *kiss*, not as in *cot*) and *g* (as in *get*, not as in *got*). Palatal spirants are *ch* or *x* (as in Germ. *ich*), and *ʒ*, the voiced variety of the same (as in Mod. Gr. *Αἰῶνα*, or in Germ. *lege*, *folge*, *regnen*). The palatal semi-vowel *y* (*i*), in Eng. *yet*, *young*, *onion*, *use* (*jūz*), approaches near to the character of a voiced palatal spirant, and is more accurately classified as such. The palatal vowels are the various forms of *e* (as in *ten*, *bat*, *baït*) and of *i* (as *it*, *hit*, *breif*). See PHONETICS.

BENJ. IDE WHEELER.

Palate [from Lat. *palātum*, roof of the mouth, palate]: the arch or roof of the mouth. It is made up of two parts, called the hard palate and soft palate, or *velum pendulum palati*. The hard palate, which is situated anteriorly, is bounded in front and at the sides by the gums and alveolar

arches, being continuous behind with the soft palate. It consists of a bony structure, formed by the union of the two palate-bones and the palatal portion of the superior maxillary bone. These palate-bones are wedged in between the superior maxillary and pterygoid process of the sphenoid. In form each palate-bone resembles the letter L, and is divided into a superior or vertical plate and an inferior or horizontal plate. The inferior surface of the horizontal plate forms the back part of the hard palate. The anterior border of each palate-bone articulates with the palate process of the superior maxillary bone. The bony structure of the hard palate is covered by periosteum, to which the mucous membrane is firmly attached. A linear ridge or raphe extends along the middle line, terminating anteriorly in a small papilla. The mucous membrane in front of and upon either side of the raphe is pale, thick, and corrugated; behind, it is smooth and deeper in color. A number of small glands are situated in the mucous membrane, the surface of which is covered with squamous epithelium. The soft palate is composed of muscular fibers covered by mucous membrane with gland structures embedded in its substance. From the middle of its lower border hangs a conical-shaped process, the *uvula*, and upon either side of the uvula, arching downward and outward from its base, are the pillars of the soft palate. The mucous membrane is thin, covered by squamous epithelium on both surfaces, except near the orifice of the Eustachian tube, where it is columnar and ciliated. The muscles of the soft palate are five in number on either side, viz., the levator palati, tensor palati, palato-glossus, palato-pharyngeus, and azygos uvulae. Upon either side of the fauces, between the anterior and posterior pillars of the soft palate, are two glandular organs, the tonsils. During the first part of deglutition the food is carried back by the tongue, pressing against the hard palate; at the same time the base of the tongue is retracted and the larynx raised with the pharynx, and carried forward under it. Then the epiglottis closes the entrance to the larynx, and over this the food glides, the palato-glossi muscles contracting at the same time that the levator and tensor palate, with the palato-pharyngei, prevent the passage of the food into the upper part of the pharynx or posterior nares. Thus the palate serves an important part in the act of swallowing or deglutition. When its muscles are paralyzed, as occurs not infrequently after diphtheria, the posterior nares are not closed during deglutition, and food, especially liquids, regurgitates at the mouth.

Revised by WILLIAM PEPPER.

Palatinate, The (in Germ. *Pfalz*): formerly a political division and independent state of Germany, consisted of two separate territories, respectively called the Upper Palatinate, now forming the northern part of the kingdom of Bavaria, and the Lower Palatinate, situated on both sides of the Rhine, and now forming the southern part of Rhenish Prussia, the northern part of the grand duchy of Baden, and the province of Bavaria, called Rhenish Bavaria. From the eleventh century these two territories belonged together and formed an hereditary monarchy, their ruler being one of the electors of the German empire; but in 1648, by the treaty of Westphalia, they were separated, the Upper Palatinate falling to Bavaria while the Lower Palatinate continued a possession of the original dynasty. In 1777 the male line of Bavaria having become extinct, the two Palatinates were reunited, but at the Peace of Lunéville, in 1801, the Lower Palatinate ceased to exist as an independent state, its territory being divided between Hesse-Darmstadt, Baden, France, Leiningen-Dachsburg, and Nassau, and the only alteration which the Congress of Vienna made in this arrangement consisted in transferring to Germany that part of the Palatinate which France had occupied, Bavaria receiving the larger part and Hesse-Darmstadt and Prussia obtaining the rest. Many of its people emigrated to Pennsylvania.

Palatine [from Mediæv. Lat. *palatinus*, palatine, orig. one having an office in a palace, spec. use of Lat. *palātīnus*, belonging to a palace or to the Palatine Hill, deriv. of *Palatium*, the Palatine Hill, the imperial residence, situated on the Palatine Hill]: a term originally applied to persons holding office in a royal palace, later to certain high administrative or judicial officers. Under the Merovingians the counts palatine were attached to the court and palace of the sovereign, and aided him in his judicial duties, but from the time of Charlemagne this title was given to powerful feudal lords who were placed in charge of remote or turbulent provinces, where they maintained a court and

palace in the sovereign's name. This was the origin of the counties palatine. In England the chief counties palatine were Chester, Durham, and Lancaster; the last to lose the distinction was Lancaster (1873). King John divided Ireland into twelve counties palatine. Scotland had anciently a county palatine of Strathern.

Palatine Hill (*Mons Palatinus*): one of the most important of the seven hills of ancient Rome. It was the site of *Roma Quadrata*, the original city. It is S. of the Capitoline Hill and S. W. of the Forum. It was the official abode of the emperors, and in mediæval times of the highest dignitaries, but has since then fallen into decay. Extensive excavations are being made, bringing to light many valuable remains of the imperial period.

Palatka: city; capital of Putnam co., Fla. (for location, see map of Florida, ref. 3-J); on the St. John's river, and the Fla. S., the Ga. S. and Fla., the Jackson., St. Aug. and Indian River, and the Jackson., Tampa and Key West railways; 30 miles S. W. of St. Augustine, 60 miles S. of Jacksonville. It is in an agricultural region, has a daily steamboat line to Jacksonville, and ships large quantities of cotton, sugar, oranges, pineapples, vegetables, and other products. It contains several hotels, a national bank with capital of \$50,000, a savings and trust company with capital of \$20,000, and a daily and a weekly newspaper. Pop. (1880) 1,616; (1890) 3,039; (1895) 2,282.

Palazzo del Campidoglio: See CAMPIDOGGIO, PALAZZO DEL.

Paleario, AONIO: b. at Veroli, in the Papal States, 1500; studied in Rome 1520-27; settled at Siena as teacher in 1530; and became one of the most prominent humanists of his age. His *De immortalitate animarum* a large didactic poem published in 1536 is his principal work, but in 1542 he published *Della pietà, della satira e della satisfactione della passione di Christo*, and immediately he was summoned before the Inquisition. He defended himself, however, so brilliantly that he was acquitted, and after that time he became very cautious. He declined an advantageous professorship in Lucca because the Roman curia was too powerful in that place. His *Acta et pontifices Romanos et eorum Asseclas* he kept carefully concealed (it was not published until 1606, at Leipzig). In 1555 he removed to Milan. He was a second time accused of heresy and summoned before the Inquisition, and, having been sent to Rome, was condemned to death Oct. 15, 1569, and burned at the stake July 3, 1570.

Palefits: See LAKE-DWELLINGS.

Pale, Irish: See ENGLISH PALE.

Palembang: a Dutch residency on the east coast of Sumatra. Area, 61,911 sq. miles. Pop. 637,500, including Malays, Chinese, Hindus, Arabs, and Europeans. The coastland is low, marshy, overgrown with jungle, and extremely hot, but it is not unhealthful, except in the immediate neighborhood of the swamps. The interior is higher, and covered with rice-fields and plantations of sugar, cotton, pepper, and tobacco, and with immense forests of gum and coconut trees. Coal and oil-springs are found, and gold dust, iron ore, sulphur, and arsenic. The capital is Palembang, where the Dutch governor resides. It is the largest town and the chief trade center in Sumatra, and is built on both sides of the Moesi, a broad and deep river, which admits the largest vessels and forms a fine harbor. The city has about 50,000 inhabitants, and carries on a very active trade both with the interior and with Java, China, and Siam.

Revised by C. C. ADAMS.

Palencia, pā-len'thē-ā (anc. *Pallantia*): a province of Spain, consisting of parts of Old Castile; area, 3,126 sq. miles. Pop. (1887) 188,954. With exception of the northern part, which is mountainous, the province is an extensive table-land, cold and treeless, but fertile, well cultivated, and rich in salt, copper, saltpeter, chalk, and coal. Wheat, wine, vegetables, and fruit are produced. The capital, Palencia, has a Gothic cathedral (1321-1504). Pop. 15,028.

Palencia, DIEGO FERNANDEZ, de: See FERNANDEZ DE PALENCIA.

Palenque: See CENTRAL AMERICAN ANTIQUITIES.

Paleontology: the science which treats of the ancient life of the globe. The name is of French origin, though, indirectly, from the Greek, *παλαιός*, ancient, *ὄντα*, being, and *λόγος*, discourse; and in its broadest sense covers the fields of paleozoology and paleobotany.

As a branch of science distinct from zoölogy and botany, paleontology owes its origin to the recognition of fossils as the remains of extinct organisms. Cuvier is generally credited with the honor of having first clearly announced the scientific opinion that organisms specifically distinct from the present inhabitants have lived upon the earth. This was done in 1796, in a paper on *The Living and Fossil Species of Elephants*, read before the French Institute of Sciences and Arts, and was founded upon the study of the bones of the Siberian mammoth and of the *Elephas americanus*, which were shown to be specifically different from those of the living Asiatic elephant.

At first the result of the study of fossil organisms was to add new species to the known genera of modern zoölogy and botany; but it was not long before it was found necessary to arrange in the classification for distinct fossil genera, and, as the science has developed, new families and orders have been defined, entirely distinct from any living groups, for the reception of the organisms whose fossil remains have been found in the rocks. Paleontology has not only enlarged the number of species and genera, etc., of animals and plants, but it has enlarged the conception of organisms. So long as these were supposed to be only such organisms as now live, the classifications had to deal with only the differences marking the present inhabitants of the globe, and the organic species was conceivable as a group of individuals having a common parentage. When, however, the idea of extinct forms, unlike anything now living, was introduced into science, the question naturally arose, how did these different kinds of organisms arise? and what relation do they bear to those now living? Paleontology primarily considers organisms as having a history, while zoölogy and botany are primarily concerned with the structure and classification of organisms; thus the former science finds its legitimate field of investigation to be the *history of organisms*. The records of this history are found chiefly in the rocks in the form of fossils, which are either the remains of the hard structures elaborated during the growth of the animal or plant, or tracks left on, or in the sands or muds during its life; but they include as well the skeletons or hard parts of recent animals to be examined after its death, or even while still living. The study of the history involves also the comparison of ancient with more recent types, and the examination of the more minute and perishable structures of living organisms, in order to explain the function or import of the hard parts alone preserved in the rocks.

The mere description of the fossil remains of organisms and their systematic classification is, properly speaking, a part of zoölogy and botany, technically described as paleozoölogy and paleobotany, while paleontology proper is wider in its scope, and is that branch of biology treating of the history of organisms, both vegetable and animal. As botany and zoölogy treat of the characters expressed in the life of the individuals, so paleontology treats of the life of the races, the former discussing the modification of the organs and tissues as adapted to the various life-functions of the individual, the latter the modification of the individual as a part of a fauna or a flora in adaptation to its environment, or as related to its ancestors or successors in the evolution of the race. Paleontology is therefore based upon the sciences of zoölogy and botany on the one hand, the nomenclature and systematic classifications of which are essential to the clear understanding of the historical relations of the organisms, and upon stratigraphical geology on the other hand, in which the records are preserved, and by which the time-relations of the fossils are determined.

The materials studied and described by the paleontologist are of two kinds, fossils and stratified rocks.

Fossils are the buried traces of organisms that have once lived, buried and preserved by natural means; the stratified rocks are the, generally, hardened layers or beds of sediments into which the original organic remains fell and were buried, and in which they have been preserved. A fossil may be an impression, footprint, or trail of the tail, or worm-boring made upon the sediments before they were hardened by the living animal itself; or it may be a bone, a tooth, or shell, or some other hard part of the animal or plant covered and preserved in its original condition; or it may be the petrified remains of some more perishable parts, which by infiltration, or chemical alteration or replacement, have become mineralized, or by pressure, heat, or other means have become metamorphosed into some stable chemical compound. In some cases fossils are the hollow cavities from which the mineral part of the fossil has been removed

by solution, and in other cases such cavities have been filled by mud or sand, or by mineral substances brought in by waters in solution and deposited in the cavities by crystallization. In all these various methods of fossilization the essential part of the fossil is not the material, either chemical or mineral, of which it is composed, but the form it holds; and there may be clear evidences that this, too, has been changed by the distortion of the rocks on which the record is made. Still it matters not of what the fossil is made; from the form it assumes is interpreted the character of the organism which made it. In this particular paleontology is but the science of ancient organisms—paleozoölogy or paleobotany. Fossils reveal the form, in almost every case, of only the hard parts of the organism, such as internal or external skeleton, organs of defense or offense, as scales, scutes, spines, and teeth, or crusts or deposits formed for protection and shelter, as shells, corals, etc. Animals composed entirely of soft tissues would therefore leave little or no record of their existence, and even of the others the preserved remains which are subject to study must be a very small proportion of the actual inhabitants of the earth.

When we consider also the mode of fossilization, the imperfection of the record becomes still more apparent.

Death comes to most animals and to some plants, not by the natural living out of the functions of the body, but by violent means, the killing by more powerful animals. In the process of taking the life and using the organism for food, not only the soft tissues but in many cases the skeletal parts are crushed and partially destroyed. Second, in the formation of sediments for deposition there is always more or less attrition, due to the grinding together of the pebbles and sand as they are tossed by the waves or borne along by the currents of rivers or seas; and thirdly, the organic tissues are unstable chemical compounds, and therefore, so long as they are left within reach of the oxygen of the air, they are liable to decomposition.

For these various reasons, although the substance of the hard parts may be preserved, it must be assumed that in the rocks the forms of only a very small percentage of the organisms that have lived can be recorded, and that those which are preserved are in great part of animals which developed durable hard parts, such as shells, skeletons, and corals; and of these, finally, the fossils must represent mainly inhabitants of the ocean, at the borders of which the great proportion of the sedimentary rocks were formed, or the inhabitants of fresh-water lakes and surrounding land, for the lakes produce deposits similar to those at the edges of the continents.

Paleontology is therefore limited to certain groups of organisms. Not all of them have left their history, and for some groups, such as the Mollusca, Corals, Crinoids, and Crustacea, the history is preserved with a considerable degree of fullness, compared with our knowledge of the living forms.

Imperfections in the stratigraphical series of rocks is another source of difficulty in reading from fossils the full history of organisms. Strata have been formed mainly within 100 miles of the edges of continents or in shallow mediterranean seas. The surface of continents in relation to the mean tide level of the oceans has been, geologically speaking, constantly changing; in one region sinking, at another emerging from the sea. The result to the strata has been that they were not formed continuously in one place, but the locality of the maximum accumulation of sediments has been constantly shifting. Hence any section now made through the strata is of limited extent, and exposes only a small part of the geological formations. The accumulation of evidence therefore requires the comparison of sections made through the strata of separate regions. The fact that at the present time the faunas of the seas at separate regions along the same coast differ in species, and at different depths out from the same point show marked differences in species, makes it evident that mere difference of species of fossils can not be taken as a certain criterion of distinct epoch for the strata containing them; but in making up the geological series of strata different sections must be combined on the basis of correlations of the strata by the contained fossils. In a general way by this means the strata of one country can be correlated with those of another, the strata containing like species being classified as belonging to the same system or formation, however widely separated geographically. The fact of geographical distribution of living species leads to the presumption that the finding of identically the same species at widely separated points on the earth may indicate, not contemporaneousness, but succession in time

sufficient to allow of the migration of the species from one region to the other.

The theory of the evolution of species, from earlier species morphologically differing from them, has led to the hypothesis that under differing conditions the evolution of a race may progress more or less rapidly, so that on one side of the globe, for instance, species may appear earlier than in another region on the opposite side, though both were evolved from a common stock. Some paleontologists therefore prefer to interpret the evidence of likeness of fossils in strata of widely separate regions as indicating "homotaxial" rather than "contemporaneous" position of the strata. Undoubtedly the correlation of strata can not be made with minute accuracy when they are widely separated geographically, but so great is the parallelism in the general progress of life for all the known world that even in the present state of science the grander divisions of the geological series can be correlated by the fossils from whatever part of the globe they come.

The geological time-scale is composed of a series of stratified rocks making up the outer crust of the earth. The separate sheets or strata were originally laid down under water, the greater portion of them under marine water, as sediments washed by water from the land. They constitute, therefore, a succession of layers one upon the other, the lower being the older and their relative stratigraphical position expressing relative order of formation.

The strata are composed of various kinds of material, broken fragments of rocks, as sand, mud, pebbles; or of shells or corals, as limestones; or of plant stems or tissues, as coal; or of volcanic ash, tufa, or schalstein; or they may be of chemical origin, in whole or in part, as are some calcareous, siliceous, and ferruginous beds; but in order to constitute geological time-records they must have been accumulated successively, one layer upon another, indicating by their superposition their chronological succession.

Subsequent disturbance of these strata has resulted at some places all along the way in folding, upturning, and breaking them; in pushing those already formed above the surface of the water, thus stopping the process of their formation and subjecting them to erosion and partial or total destruction. In other places the formation may be continuous. By similar disturbances the strata which have been above the surface may be depressed, and upon their uneven edges again receive deposits of newer strata.

The breaks thus formed in the series of strata represent intervals in the time-scale that must needs be filled out by strata in which there was no break for the particular period of time so represented.

Examination of the edges of the strata now above water and making the land of the continents has enabled the geologist to make out a continuous series of strata of a maximum of not less than 100,000 feet in thickness.

In a general sense the thickness of the strata represents duration of time, and on the basis of the estimated rate of the formation of the strata the total length of time represented by this geological time-scale is believed to be at least 50,000,000 years.

Fossils are found imbedded in these strata from the base to the top. Hence the fossils of the strata in a particular part of the series are interpreted to be the remains of organisms which lived during the period of time corresponding to their position in the geological time-scale.

Systems.—The stratigraphical series of rocks has been divided into ten divisions of greater or less thickness called systems, the relative order of which is established with certainty. Their names and order from above downward are as follows:

Time ratios, after Dana.	
10. Quaternary and Recent.	Cenozoic time
9. Tertiary.	
8. Cretaceous.	
7. Jurassic.	Mesozoic time.
6. Triassic.	
5. Carboniferous.	
4. Devonian.	Paleozoic time.
3. Silurian.	
2. Ordovician.	
1. Cambrian	Potsdam 1

Below the Cambrian are rocks which originally may have been formed in the same manner, but, so far as at present known, contain no recognizable traces of organisms.

The period of time represented by the several systems is not known in terms of human or solar chronology, but some approximation to the time-ratio expressed is determinable

by a comparison of the thickness and kinds of rocks composing each.

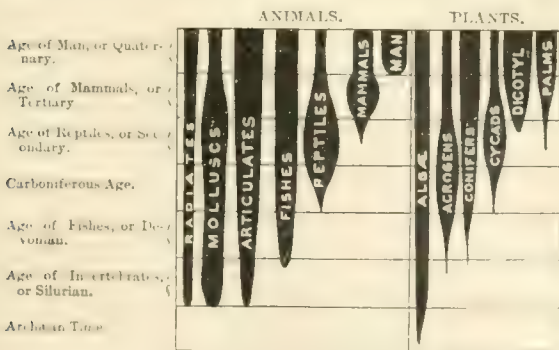
In his *Manual of Geology* Dana has estimated the time-ratios for the several systems to be approximately that of the figures opposite them in the above table, but the lower two may probably now be expressed more accurately by 5 and 5 as expressed in brackets. Grouping the systems, as is commonly done, into three great groups marked conspicuously by the dominant characteristics of the life of the time, there are formed (1) the *Paleozoic*, five times as long as the (2) *Mesozoic*, and fifteen times as long as the (3) *Cenozoic*.

In this grouping of the systems expression is given to one of the fundamental facts observed in the geological history of the globe, viz., the progressive change with the passage of time in the total life of the globe. In the *Cenozoic*, or more recently formed rocks, are found species the same as those now living, and only this part of the geological series holds fossils which generically are mainly of recent types.

In the *Mesozoic* time the life holds an intermediate character, mingling ancient with modern generic types. In *Paleozoic* time the organisms represented are almost entirely of extinct genera. This may be illustrated by the range of the gasteropods (coiled, shell-bearing mollusks, like the snail on land and the whelk in the sea). Of the 59 known families, reported in Zittel's *Paleontology* (1885), only 17 families are known to have had *Paleozoic* representatives. Taking as a further example one of these families, the *Trochidae*, out of 75 genera enumerated only a single genus of the *Paleozoic* is represented by living species; 22 *Paleozoic* genera are now extinct, and 20 of these became extinct at the close of the *Paleozoic*. Of the 31 *Cenozoic* genera about two-thirds began in the *Mesozoic*. The above is a selected example of the general principles—(1) that the organisms of *Paleozoic* time were of ancient and now extinct types in a very large majority of cases; (2) that the life of the *Mesozoic* is specifically almost completely extinct, and a majority of its genera were different from the prevailing forms now living; and (3) the further back we go the greater is the contrast between forms then living and the present life of the globe.

If we select the dominant life reported from each of the successive geological systems, we find another law expressed, viz., that there has been a continuous advance in the rank of the dominant life for each geological age. If we divide geological time on the basis of dominant life on the globe as indicated by the fossils preserved in the rocks, we have, first, the age of Invertebrates, which continued from the Cambrian practically to the base of the Devonian, for although fish, the lower division of the Vertebrates, lived in the Silurian period, and, as Walcott has shown, in the Ordovician (as fossils from Trenton rocks in Colorado have shown), the fishes were not in size, strength, or numbers the rulers of the seas till about the Devonian age. The second age is the age of Fishes, as recorded in the Devonian system of rocks; the third age is the age of Amphibians of the Carboniferous system; the fourth, or age of Reptiles, included the whole of *Mesozoic* time, in which gigantic reptiles were the rulers of land and air, as well as of the seas, if we may judge from their size, strength, and armor, both offensive and defensive. Mammals, of weak and low types (marsupials), appeared in the *Mesozoic*, but true mammals became dominant with the opening of *Cenozoic* time.

This series of facts is illustrated in the following figure from Dana's *Manual*, which shows the kinds of animals and plants which began and were dominant in each age:



It is for zoölogy and botany to classify and determine the genetic relationship of the various known animals and

plants, and that part of paleontology which deals with the description and naming of fossils alone is unsatisfactory, unless it is based upon a thorough knowledge of the structure and systematic classification of living organisms.

The study of living forms, however, does not reveal their history, and in order to fully understand the relations of living forms to each other those which have gone before them in geological time must be known; this is the particular province of paleontology.

Embryology reveals the various steps and stages through which the individual passes in attaining the adult form from the primitive ovum; and these steps of development have been found very helpful in suggesting genetic relationships not recognized in adult forms, and thus their study has served to perfect the systematic classification. Paleontology, as the science of the history of organisms and of the races of organisms, throws independent light on their systematic classification by revealing the actual order of succession of adult forms. While it may be reasonably assumed that the embryonic stages of development of the ancestors of any living organism corresponded to its own embryological development, it is not, *a priori*, necessary that the adult forms of the ancestors should have taken on characters expressed in the embryonic stages of their progeny now living. The science of paleontology, while needing light from every possible source in order to interpret its very limited and imperfect facts, has in itself the evidence of the true succession of organic forms in past geologic time, which is its chief function to elaborate and explain.

In attempting to exhibit the more conspicuous facts of paleontology a few words regarding the methods of classification may be appropriate.

Organisms are distinguished, primarily, from inorganic things by performing vital activities or functions, and, secondarily, by the organic structure or tissues which have been seen associated with or performing such functions. Dead organisms, or parts of dead organisms, are known to be such by their morphological likeness to parts or wholes of living organisms. Organisms are classified as of two kingdoms, vegetable and animal. When two or more individual organisms are compared, as, for instance, a dog and a hen, they are found to possess points of likeness and points of difference. By their like characters they are classified together, by their differences they are separated into different groups. The dog and hen both breathe, have blood, bones, and limbs, and they are both classed as Vertebrates. The one has hair, four feet, walks and nurses its young, and is called a mammal; the other has feathers, wings, and lays eggs, and is called a bird. To distinguish the subdivision of the birds other different birds must be compared with this one, and so subdivisions of various rank are established in classifying organisms, and names are given to the several divisions indicative of their rank. The chief of these are, first, the two kingdoms of animals and plants. In each of these there are sub-kingdoms, as branches or types; in each branch are different classes. The subdivisions of classes are orders, under them are families; the families are subdivided into genera; each genus includes one or more species, and species are made up of individuals. These various groupings are artificial, and receive technical scientific names, as in the illustration: *Canis* is the generic name of the dog; *familiaris* its specific name. The wolf belongs to the same genus, but it is a different species—*Canis lupus*. The dogs (*Canis*) and the foxes (*Vulpes*) are generically different, but both belong in the family *Canidae*. The *Canidae* and the *Felidae* (cats, lions, etc.), two distinct families, are both *Carnivora*, which is an order.

The order *Carnivora* and the order *Cheiroptera* (bats) are in the class *Mammalia*, and the birds and reptiles and mammals are several classes of the branch *Vertebrata*.

It is evident therefore that any individual dog is not merely a species, but that it exhibits in its structure and functions all the characteristics—1, of an organism; 2, of an animal; 3, of a vertebrate; 4, of a mammal; 5, of a *Carnivora*; 6, of a *Canidae*; 7, of a *Canis*; and 8, of the species *Canis familiaris*.

Each organism thus possesses numerous characters which are relatively of greatly varying degrees of importance from the point of view of affinity with other organisms. The particular color of its hair is less important than the number and shape of its teeth, and this, again, is of less importance than the number of its legs; or, in general, we

they constructed during life we have the record of the evolution of the type in sufficient elaboration to give a somewhat definite idea of the nature of the changes that have taken place.

Opposite each family in the following table is given the number of genera of the various families of Anthozoa recorded (at the time of the publication of Zittel's *Handbuch*) for each geological system:

Geological System	Pre-Cambrian	Cambrian	Ordovician	Silurian	Devonian	Carboniferous	Permian	Triassic	Jurassic	Cretaceous	Tertiary	Quaternary
Zoantharia												
Tetracorallia:												
Fam. 1. <i>Leptopora</i>		7	6	4								
" 2. <i>Leptopora</i>		18	25	25								
Hexacorallia:												
Fam. 1. <i>Poritidae</i>		1	8	6	5	1	2	4	11	1	1	1
" 2. <i>Madreporidae</i>										1	1	1
" 3. <i>Psilopora</i>						2	1					
" 4. <i>Leptasterias</i>								2	2	7	12	
" 5. <i>Leptasterias</i>								5	11	9	15	22
" 6. <i>Astroidea</i>						11	58	56	62	32	32	32
" 7. <i>Stylasteridae</i>								2	2	2	2	2
" 8. <i>Orthis</i>						6	4	4	4	5		
" 9. <i>Psilopora</i>									1	1		
" 10. <i>Leptasterias</i>								3	15	22	22	
Totals		1	31	9	3	17	84	111	126	131		

From this table it will be seen that of the two great divisions of the older (viz., Tetracorallia and Hexacorallia), the first division is characteristic of the Paleozoic, and the latter, although it is represented by a few genera in the Paleozoic, is as dominantly characteristic of the later half of geological time.

The imperfection of record has nothing to do with the general law here illustrated. There were the Tetracorallia with two well-characterized families, which were abundant in genera (which means that there was evolved wide difference in structure and form), and expressed by a great many species and abundance of individuals in the Paleozoic, and this whole group then became extinct (or nearly so, for there are numerous living forms which have been recently studied and are shown to be closely allied to these ancient types).

Again, the Hexacorallia represented by a few forms in the Paleozoic rapidly expanded in variety of form, number of genera, and necessarily in abundance of species and individuals, and, as we may infer, took the place in the oceans of the extinct forms that were evidently so abundant in earlier time.

To use an illustration, the genus *Zaphrentis*, one of the expleta corals, is as characteristically an ancient genus as *Fungia*, one of the Fungidae, is characteristically a modern genus.

An important geological group of the Cœlenterata is the Graptolites. They developed definite stem-like rows of cells in which the polyp lived, and they are characteristic of the lower half of the Paleozoic.

Echinodermata.—The third branch, the Echinodermata, are classified by the zoölogist as follows: viz., Crinoidea (or sea-lilies), Asteroidea (starfish), Echinoidea (sea-urchin), and Holothurians (sea-slugs, trepangs, or sea-cucumbers). Each of the first three develop hard calcareous or chitinous shell, or granules, or spines, which are easily preserved after death, and hence of them a fair record is known. The Holothurians, secreting only a leathery kind of external coating, and fragile calcareous spicular in the inner coatings, are unsatisfactory as paleontological objects of study.

The paleontological history of the several types of Echinoderms may be expressed mathematically by noting the number of different generic forms of each order known in each of the successive geological systems.

As the conditions of preservation of the remains may be supposed to be comparatively alike in the several systems, although the records are very imperfect and the specimens rare, divergence of structural development as indicated by different genera may be safely interpreted as a measure of dominance, vigor of generation, and abundance of the forms expressed in fossil condition. While it is reasonable to suppose that the tables will be greatly modified by future discoveries as to the actual number of species and genera, these discoveries will not be likely materially to change the general relations of the grand divisions of organisms to paleontological history.

The following table expresses this as based upon the facts recorded by Zittel:

	PALEOZOIC.										NEOZOIC.
	1	2	3	4	5	6	7	8	9	10	11
Crinoidea	1	48	101	65	78	9	65				100
Asteroidea		44	94	51	73	1	77				11
Echinoidea		14	4	51	51						
Leptasterias						1	12	11			
Cystoids	1	9	13	4	4						
Blastoids			2	5	4						
Echinoderms		2	2	3	12	5	15	56	83	14	
Leptasterias		2	2	3	12	1					
Asteroides			12	4	5	3	11	11	9	15	

Analysis of the table shows the general laws of evolution of the Echinoderms to be as follows:

The Crinoidea are distinctly an ancient type, represented abundantly and in great variety of generic forms in the Paleozoic, and becoming almost extinct at its close. In the Mesozoic (the Jurassic showing the earliest dominance of the genera) a new subordinal group springs into prominence, the Articulata, and they continue on to the present time, when they are chiefly of deep-sea habitat. The Tesselata and the Articulata are closely related, but possess distinct and permanent characteristics.

The Cystoids were of an irregular form and apparently of lower rank of organization than the Crinoidea, and had none or but imperfectly developed arms. As will be seen from the figures they are particularly an ancient type—the earliest to appear in the Cambrian, had their climax in the Lower Silurian or Ordovician, and became extinct at the close of the Paleozoic. Exception to this statement may be made on account of the recent discovery of forms classed with the Cystoids in the deep seas.

Extinct is used to express lack of evidence of the continuance of the race. Species, genera, and orders may still continue to live in the depths of the ocean where the conditions of life have remained remarkably uniform for geological ages, and only the deep-sea dredge can reveal the facts to us. Some remarkable finds have already been made, and it would not surprise paleontologists to hear of the discovery of many supposed extinct ancient types of life in the sea depths.

The Blastoids are a group of beautiful, symmetrical, bud-shaped Crinoidea, of the later Paleozoic; they too had their beginning and dominance and finally became extinct.

The Echinoids, or sea-urchins, are as characteristic of later geological time as the Crinoidea and Cystoids are of early time. The Palechinoids are represented in the later Paleozoic by a few characteristically inferior types of Echinoid structure. This is seen in the irregular number and the multiplication of the rows of plates making up the ambulacral and interambulacral series. The true Echinoids (*Euechinoidea*) in both orders (Regulares and Irregulares) began their evolution in the Triassic, rapidly expanded in the Jurassic and Cretaceous, and the largest number of recorded genera was not reached till Tertiary and recent times. The climax of evolution, as expressed by greatest diversity and number of generic forms and abundance of specific and individual forms, was attained for this class certainly not till the Tertiary time.

Vermes.—The fourth branch of the animal kingdom, the worms, has left traces in the earliest sedimentary formations in the form of borings or tracks. From the morphological structure of worms and its relation to that of other branches, it is altogether probable that worms were among the very earliest of animals to appear. On account of the failure to develop hard parts, except of the nature of minute jaws or teeth (Annelida), the history of worms can not be written.

Arthropoda.—The Arthropoda, producing chitinous shells or external skeletons, left valuable records of their history for the paleontologists, and from the study of the fossils we learn that this branch was probably the first to dominate among the inhabitants of the seas.

In the following table the geological range of the several orders of Crustacea (the first class of Arthropoda) is given; and opposite Trilobitæ the number of genera known in each system is given in the column corresponding to the Cambrian (C), the Ordovician (O), the Silurian (S), the Devonian

(D), and the Carboniferous (Carb.). It will be seen that the Trilobites were not only an ancient race, but that we already have knowledge of their remarkable expansion into separate genera—42 in the Cambrian, 76 in the Lower Silurian, or Ordovician time. Here, too, there were species of large size; several have been seen which attain 2 feet, or nearly that, in length. The Trilobites furnish the most abundant and characteristic fossils of the Cambrian system, and evidently were the highest and the dominant organisms of their time.

RANGE OF THE ORDERS OF CRUSTACEA.		Paleozoic				Mesozoic			Cenozoic	
		C	O	S	D	Carb.	T	J	K	Tert. Rec.
ARTHROPODA	Cirripedia									
	Copepoda									
	Ostracoda									
	Phyllopoda									
	Trilobites	12	76	22	20	4				
	Xiphosura									
	Gigantostroaca									
	Phyllocarida									
	Isopoda									
	Amphipoda									
	Stomatopoda									
	Cumacea									
	Schizopoda									
	Decapoda									

The Ostracoda, the Gigantostroaca (the Eurypterus, the Pterygotus, etc.), and the Phyllocarida are ancient types. The Decapoda (including modern crabs and lobsters) is historically a later type, beginning at the close of the Paleozoic, rapidly expanding in the Mesozoic, and including many of the dominant representatives of Crustacea of the present time.

The other classes of Arthropoda are the Myriapoda (thousand-legged worms), the Arachnoidea (spiders, scorpions, etc.), and the insects. The following table, after Scudder, expresses the fundamental facts regarding their paleontological history so far as known:

GEOLOGICAL RANGE OF THE TRACHEATA ARTHROPODA. (AFTER SCUDDER.) (CLASS: EXTINCT ORDERS.)							NAMES OF EXISTING ORDERS
		Silurian	Devonian	Carboniferous	Mesozoic	Tertiary	Recent
MYRIAPODA	Protosyngnatha						Chilopoda
	Archipolypoda						Diplopoda
							Pauropoda
ARACHNOIDEA	Anthracomartii						Acari
							Chelognathii
							Opiliones
							Pedipalpi
							Scorpiones
HEXAPODA	Palaeodictyoptera						Araneae
							Orthoptera
							Neuroptera
							Hemiptera
							Coleoptera
							Diptera
							Lepidoptera
							Hymenoptera

It will be observed that the Scorpiones are of very early origin. The modern types of insects, spiders and Myriapods, are of more recent origin, although represented by ancient and more or less synthetic types in the Paleozoic.

The oldest known insect is *Paleoblattina douvillei* Brongniart of the Middle Silurian. Although insects are so little apt to be preserved in the rocks, there are already described 2,600 fossil species.

Molluscoidea.—This branch of the animal kingdom has furnished the most detailed evidence of paleontological history with which the paleontologist is familiar.

The branch includes the two classes Polyzoa (Bryozoa) and Brachiopods. The Polyzoa individually are minute animals, but construct chitinous or calcareous, moss-like colonies of cells, which are preserved abundantly in some of the ancient rocks, and representatives still live in the seas. The Brachiopods form bivalve shells, calcareous and chitinous, which have resisted remarkably the destructive agencies of time, and are among the most frequently appearing fossils in the rocks from the earliest to the latest geological periods. See MOLLUSCOIDEA.

In his description of the *Bryozoa of Illinois*, Ulrich enumerates 138 genera classified under 26 families, all Paleozoic forms. Although individually minute the expansion of the races into modified form and the abundance of individuals characterized the Lower Silurian (Ordovician), and the Polyzoa (Bryozoa) were abundant in the Mesozoic and are still represented by a large number of species and genera in modern times.

The importance of the Brachiopods, in the interpretation of the age of Paleozoic formations, particularly demands fuller discussion than can be given here. In the present state of our knowledge the grouping of the genera into families is not satisfactory, as is the case with the Trilobites, but in order to tabulate and express the more prominent facts in the evolution, the families, as classified by Davidson, will be tabulated in the following table and their range given, without attempting to group them according to relationship, further than to designate the two ordinal groups of hinged (Clisterata) and unhinged (Tretenterata) forms:

GEOLOGICAL RANGE OF THE FAMILIES OF BRACHIOPODA. (AFTER DAVIDSON.)		Paleozoic				Mesozoic			Cenozoic	
		C	O	S	D	Cb.	T	J	K	Tert. Rec.
TRETENTERATA										
Lingulidae										
Obolidae										
Discinidae										
Craniidae										
Siphonotretidae										
Trimerellidae										
CLISTERATA										
Orthisidae										
Strophomenidae										
Productidae										
Perrinitidae										
Rhynchonellidae										
Spiriferaceae (Waagen)										
Thecididae										
Terebratulacea										

This method of illustration, to be clear, requires the following explanation: In the cases of the Lingulidae, Discinidae, and Rhynchonellidae, represented by living forms, the Lingulidae are represented in the earlier Paleozoic by several genera which are confined to that part of the scale, and the persistent form is the single genus Lingula. The persistent forms in the other two families named are single genera in each; i. e. Discina and Rhynchonella; much the same fact is true of the Craniidae. Hence it may be said of the Tretenterata that they are dominantly ancient types, confined mainly to the lower half of the Paleozoic, and are perpetuated by three genera which continued to be represented by species till the present time.

Of the Clisterata, the Orthis, Strophomena, and Spirifer families are almost entirely Paleozoic, a few rare species appearing in the Mesozoic.

Productus is characteristically of Devonian and Carboniferous age, culminating in the Carboniferous. Some allied genera are known in the Silurian and in the earlier Mesozoic.

Terebratulidae, a large and prominent group of genera, runs back with several genera into the Paleozoic, but its great expansion in genera and species is in the Mesozoic and later times. These are the most important groups of Brachiopods.

An analysis of the range of the smaller groups of forms, as given in the case of the Spiriferaceae by Waagen, will illustrate admirably the very intimate relationship existing

between the morphological differences, as expressed in the classification, and the geological time in which the different forms lived.

GEOLOGICAL RANGE OF SPIRIFERACEA, (AFTER WAAGEN.)	Paleozoic					Mesozoic			Cenozoic Ty. Rec.
	C	O	S	D	Carb.	T	J	K	
ATRYPIDÆ									
Atrypiinae									
Kontmekininae									
Zygospirinae									
ATHYRIDÆ									
Meristellinae									
Athyridinae									
NUCLEOSPIRIDÆ									
Retziinae									
Dayinae									
Ureliinae									
SPIRIFERIDÆ									
Suessinae									
Delthyridinae									
Martiniinae									
Retziarantinae									

From this table it will be seen that likeness of morphological organization, which is the basis of biological classification, is co-ordinate with sameness of time in the geological history of the races. Where a genus has a clearly marked beginning and ending, the different species of the genus are more or less abundantly and continuously represented during the period. Different species which are similar to each other, enough so to be ranked in the same genus, rarely are found in more than two or three adjoining systems, and as a rule the more closely animals are like each other the nearer together in geological time did they live, and in series of related forms the more extreme divergence is found between the earliest and the latest representatives of the race.

Minute comparison of the variations and specific differences observed in a series of forms of the same genus occurring in successive strata leaves little or no doubt of the existence of continuous races the successive members of which were genetically related, and, as races, with the passage of time they suffered gradual modification in a few or many of their characters, leading to the conviction that species which appear to breed close for a given epoch of time have descended from ancestors from which they differ morphologically enough to be ranked in different species or genera, or in some cases even in groups of higher taxonomic rank.

The slight differences observed in successive representatives of the same race of organisms are called *mutations*, and the differences expressed by the same species living at the same time, but geographically separated, or existing under differing conditions of environment, are called *varieties*.

In many cases, where the facts are sufficiently numerous to illustrate the point, it is observed that in a race of organisms great variability or plasticity of form is characteristic of the earlier stage of the history, while mutations are slow and gradual and in lines already marked out by the variability of the early types.

Mollusca.—The Mollusca are grouped into four classes: Lamellibranchiata, Gasteropoda, Pteropoda, and Cephalopoda. In each class calcareous shells of some kind are developed for most of the orders. In the Lamellibranchs, a bivalve shell like that of the clam; in Gasteropoda, a shell as in the snail. In the Pteropods a frail hyaline shell is developed by many of the recent forms; in the Cephalopods, shells like the pearly Nautilus, or internal shells like the cuttle-bone. These are types of the numerous kinds of shell produced. These hard parts are readily preserved when buried in the mud, and therefore they are prominently represented among fossil remains. In many cases their external form or contour (which, as in the Lamellibranchs, is all that is generally preserved) furnishes small evidence of the more important structural differences distinguishing species, genera, or categories of higher rank. Hence it is difficult to determine for the Paleozoic forms the finer points of their paleontological history.

Each of the classes is of early origin, beginning at least as early as the Ordovician, as will be seen in the following table.

GEOLOGICAL RANGE OF THE CHIEF TYPES OF MOLLUSCA.	Paleozoic					Mesozoic			Cenozoic Ty. Rec.
	C	O	S	D	Cr.	T	J	K	
Lamellibranchiata									
Gasteropoda									
Prosobranchiata									
Heteropoda									
Pulmonata									
Pteropoda									
Cephalopoda									
Dibranchiata									
Nautilidae									
Ammonitidae									
Goniatites									
Ceratites									
Ammonites									
Dibranchiata									
Decapoda									
Octopoda									

The evidence is clear that for Lamellibranchs and Gasteropods the greater generic expansion was as late as Mesozoic, and probably did not reach its maximum till the Tertiary, as illustrated by the fact that the greatest number of recorded genera for any particular time, previous to recent, was in the Tertiary. This fact may, of course, be due in part to the better knowledge we have of Tertiary shells, but in general the earlier forms that are found belong to fewer genera and families in both of the great classes mentioned.

The Pteropods were more prominent, both in numbers of generic types and in species and individuals, in the lower systems of the Paleozoic. Four genera with fifteen species and two varieties have been described from the Lower Cambrian of North America (Walcott), which is nearly 10 per cent. of the total known American fauna of that formation, including the Trilobites.

The Cephalopods had their chief expansion, for the Nautiloid types, in the Paleozoic, including the straight, chambered Orthoceras, the Gomphoceras, the Gyroceras, Cystoceras, etc., and the earlier representatives of the genus Nautilus which has persisted to the present time in the case of the pearly Nautilus. The Ammonite type, represented by a large number of Goniatites in the Devonian and Carboniferous, found their great expansion and abundance of species and genera in the Mesozoic, and their shells constitute one of the most important and characteristic marks of the Jurassic and Cretaceous, after which they appear to have become suddenly extinct. The Dibranchiate order, represented by the modern octopus and squid, were of still later origin, and no traces of them have been seen lower than the Trias. The order of appearance in the case of the various types of Cephalopods is clearly that of the order of rank of elaboration and of organic structure. The well-known series of genera of Cephalopods—i.e. Nautilus, Goniatites, Ceratites, Ammonites—expresses the law of progressive evolution in its simplest form, in the elaboration of the edges of the chambers as seen in the suture lines of the shells.

The physical relation borne by the successive forms of suture lines in this case is such that it would be physically impossible for the Ammonites' septum and suture to be formed by development without passing through stages represented by those of the Nautilus, Goniatites, and Ceratites successively, thus furnishing almost mathematical proof of the genetic relationship of the later to the earlier types. SEE MOLLUSCA.

Tunicata.—The few known forms referred to this branch of the animal kingdom develop no structures sufficiently durable to lead to the expectation that their fossil remains could be discovered, except under the most favorable circumstances. They may have lived in the earliest times, but at present undoubted traces of them are not known in the rocks. SEE TUNICATA.

Vertebrata.—The paleontology of the Vertebrates is discussed in other articles of this cyclopædia, and here only the grander facts will be referred to. SEE VERTEBRATA, FOSSIL.

In the first table the geological range of the several classes is given.

GEOLOGICAL RANGE OF THE CLASSES OF VERTEBRATES.	Paleozoic					Mesozoic				Cenozoic
	C	O	S	D	Car.	T	J	K	Ty. Rec.	
Leptocardii										—
Cyclostomi										—
Pisces		—	—	—	—	—	—	—	—	—
Amphibia					—	—	—	—	—	—
Sauropsida (Huxley)					—	—	—	—	—	—
Mammalia						—	—	—	—	—

Of the lower and rarer forms of Vertebrates, the Leptocardii and the Cyclostomi, only recent examples are known. The chief classes of Vertebrates made their first appearance, so far as known, and became dominant in the order of their zoölogical rank.

The fishes were the first to appear, in the types of Ganoids and heavily mailed Placoderms, and the ancient types of Cephalaspis and Pteraspis, and early types of Shark.

The earliest known remains of fish are from the Trenton rocks of Colorado. In the Devonian fish remains are abundant, and of the types above mentioned.

In the Carboniferous Amphibian remains appear, not those of the more modern Batrachian type of the toads and tailed salamanders, but of a separate order, Stegocephala; and the species were often of large size, and in some cases protected by scales or plates over part of the body.

The modern type of Amphibia are not known earlier than the Cretaceous.

The modern type of fish, the Teleosts, did not appear till the middle of the Mesozoic, and their chief expansion is in the Tertiary. Of the 45 recorded families of Teleostei, only 16 are reported from below the Tertiary, and only 2—the *Hoplopleuridae* and the *Clupeidae*—below the Cretaceous. Species of these two families appear in the Triassic.

The reptiles and birds (paleontological evidences requiring their association in one great class—the Sauropsida) formed their great expansion in the Mesozoic, which on that account has been called by Agassiz the age of Reptiles. A few true reptiles were seen in the Carboniferous, and though a few traces of true birds have appeared in Cretaceous rocks, the birds and the mammals were very insignificant among the faunas previous to the Tertiary.

In the following table the range of the grander divisions of the reptiles and birds is given:

GEOLOGICAL RANGE OF THE ORDERS OF REPTILES AND BIRDS.	Paleozoic					Mesozoic				Cenozoic
	C	O	S	D	Car.	T	J	K	Ty. Rec.	
REPTILES	Ichthyosauria						—	—	—	—
	Sauropterygia						—	—	—	—
	Testudinata (Turtles)						—	—	—	—
	Theromorpha					—	—	—	—	—
	Rhynchocephalia					—	—	—	—	—
	Lepidosauria						—	—	—	—
	Lacertilla (Lizards)						—	—	—	—
	Pythonomorpha							—	—	—
	Ophidia (Serpents)							—	—	—
	Crocodylia					—	—	—	—	—
	Dinosauria					—	—	—	—	—
	Pterosauria					—	—	—	—	—
BIRDS	Saururæ						—	—	—	—
	Ratite							—	—	—
	Carinatae							—	—	—

From the table it appears that the gigantic sea-lizards (Ichthyosauria, Sauropterygia) called Enaliosauria, and the sea-serpents, which were equally gigantic, of 70 feet or more in length (the Pythonomorpha), the peculiar type of Theromorpha, the gigantic and truly marvelous land reptiles, the Dinosauria, 25 to 30 feet long, and exceeding in bulk the elephants and rhinoceros of the present time, and the flying reptiles, with long teeth and bat-like wings—Pterosauria—were the dominant races of Mesozoic time, but have all become extinct. The modern reptiles are the turtles, the serpents, the rare Hatteria, and the lizards, all of

size inferior to the mammals, and the Crocodilians which preserve somewhat of the importance of the ancient reptilian type.

The Saururæ, tailed, feathered, toothed, and winged animals, combine the characters of birds and reptiles, and have not been discovered later than the Jurassic. The Hesperornis of the Cretaceous, however, is a true bird (Ratite) with teeth in its beak, thus showing the intimate genetic relationship between these two great divisions of the animal kingdom, the reptiles and birds, suggesting to Huxley their inclusion in a single class, the Sauropsida.

The study of the fossil mammals reveals some of the most interesting facts of paleontology. See VERTEBRATES, FOSSIL.

With the exception of a few small representatives of the marsupials (Microlestes, Dromatherium, and other related forms from the Triassic and Jurassic), which are interpreted by Marsh as probably insectivorous, and allied with what are now marsupials, the mammals did not appear lower than the Eocene—the base of the Tertiary.

This is perhaps the most remarkable fact exhibited in the paleontological history of organisms—i. e. that the evolution of the highest, now by all means the dominant and most important class of the organisms on the globe, was evolved in all of its most characteristic differences of structure and organization since the beginning of the Eocene. The length of the life history of not only all the species but the genera, families, and orders of mammals is little longer (perhaps twice as long at the greatest) than the average length of life of the majority of the species of Invertebrates now living in the ocean.

The above review of the chief facts of paleontology will suffice to point out the nature of the problems which this comparatively new science reveals. To paleontology we must look for the demonstration of the laws of organic evolution.

HENRY S. WILLIAMS.

Paleozoic Era [Gr. *παλαιός*, ancient + *ζῶον*, animal]: one of the greater divisions of geologic time. It is preceded by the Proterozoic era and followed by the Mesozoic and Cenozoic, and it includes the Cambrian, Silurian, Devonian, and Carboniferous periods. See PALEONTOLOGY.

Paleozoic System: See PALEONTOLOGY.

Paler'mo [Ital. < Lat. *Panor'mus*, the ancient name = Gr. *Πάνορμος*, liter., always fit for landing; *πᾶς*, *πᾶν*, all + *ἄρμος*, harbor]: city of Sicily; situated on the north coast; in lat. 38° 6' 44" N., lon. 13° 20' E. (see map of Italy, ref. 9-E). It lies on a bay formed by a deep and spacious inland sweep of the sea, between Cape Zafferano on the E. and Monte Pellegrino on the W. This bay has received the name of the *Conca d'Oro*, the Golden Shell, a name also applied to the city and to the plain which extends from the sea to the mountains in the rear—a region favored in its climate, soil, and landscape beauty. The city walls, $\frac{1}{4}$ miles in circumference, form a square, the four angles corresponding very nearly to the four cardinal points of the compass, and the town is entered by sixteen gates. The harbor lies to the N. of the town, and is sheltered by a huge mole. The Oreto, which, with its many small tributaries, waters the adjoining plain, flows into the sea near the east angle. Two fine streets, the Macqueda or Strada Nuova, and the Vittorio Emanuele, formerly Toledo, intersect each other at right angles near the center of the city, thus dividing it into four sections. Among the public squares are the Villena or Vigliena, decorated with fountains and statues in the Renaissance style, and the public garden on the left of the Porta Felice, abounding in almost tropic vegetation. The favorite promenade is the Marina, running along the shore on the line of the old fortifications.

Notable Buildings.—Palermo is an archbishopric, and has about 300 churches and chapels. The cathedral, built in the twelfth century by an Englishman, Archbishop Walter, contains curious mediæval monuments. San Domenico is the largest church in the city, and will hold 12,000 persons; the Olivella is the most gorgeous church. The royal palace is in part the work of the Arabs, for whom it served as a fortified castle, but it was transformed by the Normans. The chapel and the Sala di Ruggiero are richly incrustured with old mosaics. Of other buildings there is the university (founded in 1447) with (1891) 65 teachers and 1,253 students, the town library with 141,000 volumes and 2,640 MSS., and the national library with 110,000 volumes and 12,000 MSS. Some of the private edifices are remarkable for their antiquity, others for their architecture. The environs of Palermo abound in objects of interest—the great



Note. The word *Lebanon* is applied to the whole of the *Libanus* or *Libanus* range, which extends from the *Libanus* to the *Libanus* range, and is not to be confused with the *Libanus* range, which is a range of hills in the *Libanus* range.

PALESTINE

Scale of Miles

cathedral of Monreale (see MONREALE); the Castello della Zisa; the Castello della Cuba; and Monte Pellegrino, in which is the grotto of Santa Rosalia, the patroness of the city.

Trade and Industry.—These are active, though not growing. There are manufactures of gloves, essences, and machinery. The number of vessels annually entering the port is about 3,500, with a tonnage of 1,200,000; exports, fruits, wines, silks, gloves, etc.—in 1890 were valued at \$6,383,044, of which the U. S. took more than one-half; the imports were valued at (1890) \$4,019,604. There is also a coasting trade; imports over \$15,000,000, exports about \$5,000,000. Pop. (1892) 273,000.

History.—Palermo is probably of Phœnician origin, and is first known in history as a Carthaginian dependency. During the Punic wars it fell into the hands of the Romans and became a great naval station. In the fifth century A. D. it was taken by the Vandals, and was ceded by them to the Goths, who were driven out by Belisarius. In 830 it was conquered by the Saracens, who made it the capital of their Sicilian dominions. In 1071 the Normans, under Count Roger, took Palermo, and it continued the capital of the Sicilian kingdom through the Norman and Swabian dynasties. Charles of Anjou removed his court to Naples (1269), since which time Palermo has never been a permanent royal residence. (For further historical details, see SICILY and SICILIAN VESPEERS.) From 1820 the revolutionary failures of Naples were repeated in Palermo until the landing of Garibaldi at Marsala (1860) caused an uprising here, which put to flight 30,000 Bourbon troops, backed by a strong fleet; and by an enthusiastic *pièbiscite* the city became a part of the new kingdom of Italy. Revised by R. A. ROBERTS.

Pa'les: in Roman mythology, a divinity of flocks and shepherds, corresponding in some respects to the Greek Pan. This divinity was probably of early origin, but is seldom mentioned, and played in historical times only a subordinate part in the religion of the Romans. It was conceived of sometimes as male and sometimes as female, although the rites of the festival Palilia considered Pales only as female. This festival was celebrated on Apr. 21, and was considered the birthday of Rome. In this festival Pales was invoked to grant protection and increase to flocks and herds. The name Pales is thought to be connected with Palatium. Revised by G. L. HENDRICKSON.

Pal'estine [from Lat. *Palæstina* = Gr. *Παλαιστίνη*, by analogy of *πάλας*, anciently, ancient from Heb. *P'elsheth*, Philistia, liter., Land of Wandering, and *P'elishthim*, Philistines, derivs. of *pelesh*, wander]: a name designating originally only the country of the Philistines, but in the later Greek and Roman period applied, as we now apply it, to the whole country of the Israelites on both sides of the Jordan. Josephus uses the name in both of these senses. The oldest name was the Land of Canaan, or sometimes simply Canaan, lowland, by which was meant, however, only the country W. of the Jordan, which is all that was promised to Abraham. Other Scripture names are Judæa, the Land of Israel, the Land of Promise, and the Holy Land. The last name has for several centuries been more current than any other.

Boundaries and Extent.—The boundaries of Palestine can not be determined exactly. Approximately, they were as follows: On the W. the Mediterranean; on the N. a line beginning near the *Promontorium Album*, S. of Tyre, in lat. 33° 10', trending northward till, near the southern base of Hermon, it strikes lat. 33° 16', and then runs straight on to the desert; on the E. the Arabian desert; and on the S. the parallel of lat. 31°, a little S. of Beersheba (31° 15'), curving to take in Kadesh. Within these boundaries, as recently determined, there are, on the west side of the Jordan, about 6,600 square miles, and on the east side, including ancient Moab, S. of the Arnon, more than 5,000, perhaps nearly 6,000, square miles. The length of this territory is about 150 miles; its average breadth W. of the Jordan more than 40, and E. of the Jordan about 40 miles.

Physical Features.—The country is made up of four long parallel strips of territory, lowland and highland alternating. Along the Mediterranean coast is a strip of lowland, in the northern or Phœnician section of it, about 20 miles long and from 4 to 6 broad; in the middle, Sharon section of it, S. of Carmel, more than 30 miles long and about 10 miles broad; and in its southern, Philistine section, 40 miles long and from 10 to 20 broad. This strip of lowland is interrupted by the ridge of Carmel, which branches off from the mountains of Samaria, runs northwestward for 18 miles, rises at one point to the height of 1,810 feet, and thrusts out into the

sea a promontory 556 feet high. On all this coast there is not one good harbor. Next comes the highland strip, some 25 or 30 miles broad, which springs from the roots of Lebanon, swells into the hills of Galilee, is interrupted by the plain of Esdraelon, as the lowland strip is interrupted by the ridge of Carmel, swells again into the hills of Samaria, reaches its greatest average height in Judæa, and then sinks away into the desert S. of Beersheba. This broad, high central strip of West Jordanic territory has been compared to a ship's longboat turned upside down. Among its highest points in Galilee are Safed (perhaps the "city set on a hill" of Matt. v. 14), 2,749 feet above the sea, and Jebel Jermûk, near by, nearly 4,000 feet above the sea. In Samaria the highest points are Ebal, 3,077, and Gerizim, 2,849, feet above the sea. In Judæa the highest point of Jerusalem is 2,593, Mount of Olives 2,693, Hebron 3,040, and Beersheba 788, feet above the sea. The Jordan valley, at some points quite narrow and at others from 5 to 10 or 12 miles broad, is one of the wonders of the world. The Jordan itself, in going from its Hasbeiya source to the Dead Sea (115 or 120 miles), plunges down a descent of more than 2,300 feet, from 1,080 feet above to 1,292 feet below the level of the Mediterranean. The fourth parallel strip, E. of the Jordan, is (most of it) high table-land, some of it 3,000 feet above the sea, sinking away eastward into the Arabian desert. As seen from the west side of the Jordan it looks like a purple wall.

Lakes, Rivers, and Springs.—Of the four lakes of Palestine, the northernmost is Phiala, 5 miles E. of Banias, nearly round, about a mile in diameter, and of unknown depth, occupying apparently the crater of an extinct volcano. It is some 3,300 feet above the sea, is not, as was anciently supposed, one of the sources of the Jordan, has neither inlet nor outlet, and abounds in frogs and leeches. Merom (now *Huleh*), 10 miles S. of Banias, in the midst of an extensive papyrus marsh, 7 feet above the sea, is a triangular lake, with its apex pointing southward, about 5 miles long, nearly 4 miles across its base, and 15 feet deep. Ten miles farther down is Geunsesaret, 12½ miles in length, 6½ miles in its greatest breadth (at Magdala), 165 feet deep, and 682½ feet below the level of the Mediterranean. The Dead Sea, which is situated at a distance of some 65 miles farther S., is 40 miles long, nearly 10 miles broad, more than 1,300 feet below the level of the Mediterranean, and 1,292 feet deep. No fish live in it. Of rivers, the most important is the Jordan, which has two tributaries emptying into it from the E. (the Yarmuk and the Zerka), and two from the W. (the Jalûd and the Fârah). Many of the so-called rivers of Palestine are merely winter torrents, which run dry in summer. Of the eight permanent rivers emptying into the Mediterranean Sea, the most important are the Belus (now *Nahr Na'man*, near Acre), celebrated for the accidental discovery of the art of making glass; the Kishon, "that ancient river" (now *Nahr el-Mukatta*, river of slaughter), which drains the plain of Esdraelon; the Zerka, just N. of Casarea; and the Aujeh (not mentioned in Scripture), a few miles N. of Jaffa, which drains the mountains of Samaria, and is, next to the Jordan, the longest permanent river in Palestine. Three permanent streams empty into the Dead Sea from the E. These are the Zerka Ma'in (not mentioned in Scripture), near which are the four hot springs of Callirrhœ; the Arnon (now *Mojib*), the northern boundary of the Moabites and the southern boundary of the Israelites, about half-way down the sea; and the Zered (now *el-Ahsy*), at the southeast corner of the sea. The springs of Palestine constitute one of its most characteristic features. First in importance are the three sources of the Jordan. Of these, that at Hasbeiya (not mentioned in the Bible) contributes one-seventh, that at Casarea Philippi (now *Banias*) two-sevenths, and that at Dan (now *Tell el-Kady*) four-sevenths, of the whole volume of the river. As an indication of the very great multitude of springs in Palestine, Robinson enumerates thirty in a circuit of 8 or 10 miles around Jerusalem.

Geology.—The backbone of the country, on both sides of the Jordan, is hard Jura limestone, full of grottoes and caverns, with sandstone, basalt, and other volcanic rocks also on both sides of the river, but these last more especially on the east side. There are many signs of violent volcanic action in the past, and earthquakes are still occasionally felt, the most severe in modern times being that which occurred in 1837, which partially destroyed both Safed and Tiberias.

Climate and Rainfall.—The climate, on the whole, is mild, inclining, however, toward the extreme of heat rather than toward the extreme of cold. There are only two seasons, summer and winter—the former, from April to Novem-

ber, rainless or nearly so; the latter, from November to April, rainy; but between the middle of December and the middle of February there is generally a kind of intermission, separating "the former and the latter rain." The rainfall at Jerusalem varies from 12 to 42 inches, both extremes being exceptional; 25 inches are considered necessary to insure good crops, and if less than 18 inches fall the harvest is poor and suffering ensues. During the rainy season of 1892-93 the rainfall was 38.4 inches. The average rainfall appears to be less than 25 inches, while on the Atlantic seaboard of the U. S. it is 45, and in California, whose climate is much like that of Palestine, it is only 20. Along the Mediterranean lowlands, and still more in the Jordan valley, the heat of summer is always great, and sometimes exceedingly oppressive, but not so on the higher levels, except during sirocco weather. At Jerusalem, from June, 1851, to Jan., 1855, according to Dr. Barclay's register, the mean temperature was 66.5°, the highest temperature 92°, and the lowest, on one occasion just before sunrise, 28°. In some years the mean is 62° and the highest 86°. Observations made by Dr. Chaplin, for the eight years preceding 1872, show a mean temperature of 62.8°. In May, and also in September, the temperature sometimes rises to 100°; on June 24, 1869, it reached 103.5°, and on Aug. 28 and 30, 1881, it remained for some hours at 112°. Mt. Hermon, nearly 10,000 feet high, and looking down upon the whole of Palestine, is never entirely clear of snow, though late in autumn only slender threads of it are left, as the Arabs say, "like the straggling silver locks on an old man's head." During the winter ice seldom forms, and the ground is seldom, if ever, frozen in any part of the country. With abundant rains, which may generally be counted upon, Palestine was once very fertile, and might be so again; but in order to this, trees must be planted, cisterns built and kept in repair, and the hills terraced, as of old. The products of the soil still range from peas, beans, wheat, and barley to grapes, figs, olives, apricots, lemons, oranges, and dates.

Botany.—The botany of Palestine, unlike that of Egypt, is richly varied. Upward of 3,000 species have been reported, chiefly by the labors and observations of Dr. George E. Post, of Beyrout. For mile on mile, in the proper season, the ground is fairly covered with flowers of all the colors of the rainbow. Everywhere one sees the scarlet anemone, which is thought by some to be our Lord's "lily of the field." The ranunculus and the pheasant's eye (*Adonis palestina*) are also very brilliant. The narcissus, the crocus, and the mallow are all candidates for the honor of being considered "the rose of Sharon." Of shrubs, the most abundant and most beautiful is the oleander. The whole country was once well timbered, and still there are groves, and even forests, of pine and oak beyond the Jordan. On the west side of the river, from Beersheba all the way up to Lebanon, there are very few trees, except on Tabor and Carmel. Since the time of the crusades the pine forest then standing between Jerusalem and Bethlehem has wholly disappeared. Repeated wars and conquests, and dreary centuries of bad government, have gradually reduced the country to its present naked, burnt, and desolate appearance. The tree now most common is the oak, of which Dr. Post enumerates eight different species, the most abundant being the prickly evergreen oak (*Quercus pseudo-coccifera*). The "oaks of Mamre" were not oaks, but terebinths, the most famous specimen of which is the so-called Abraham's Oak, near Hebron, 23 feet in circumference.

Animals and Birds.—The wild animals of the country are much the same as in ancient times, except that the lion has disappeared and the leopard is practically extinct. There are wolves, jackals, hyenas, wild boars, gazelles, the ibex or wild goat of the Bible, the lynx, otters, badgers, the coney, hares, ichneumons, hedgehogs, wild cats, chetahs. Bears are occasionally seen on Mt. Hermon. Of domesticated animals, the horse is less used than the ass, the mule, and the camel. The buffalo, introduced probably by the Persians, has in some sections taken the place of the ox, and the neat cattle of the country in general are neither so numerous nor so well cared for as in ancient times. Sheep and goats are abundant, but swine are scarcely ever seen. The dogs are nearly all of one breed (the shepherd), and are outcasts and scavengers, making night hideous, as the jackals do, by their howling. Of the 360 species of birds which have been observed may be mentioned, as most common, eagles, vultures, hawks, owls, storks, pelicans, ravens, doves, pigeons, partridges, quails, sparrows, and nightingales. Fish still abound, as of old, in the Lake of Galilee, but the natives employ

rudimentary methods in taking them; forty-three species of freshwater fishes have been recorded from Palestine, and of this number thirty belong exclusively to the Jordan system and its lakes. The "great fish" of Jonah i. 17, which swallowed the truant prophet, was not a "whale," as the *κῆτος* of Matt. xii. 40 is unwarrantably rendered in our version, but may have been a specimen of the great white shark (*Canis carcharias*), still found in the Mediterranean, and sometimes 25 or 30 feet long. There are many species of reptiles, upward of thirty species of snakes, and upward of forty species of lizards having been found. The crocodile still occurs occasionally in the marshes of the Zerka. Frogs (three species) are abundant, and two species of toads are known.

History.—The original, prehistoric occupants of Palestine appear to have been a Semitic population, including the Rephaim, Zuzim, Emim, and Horim, E. of the Jordan, and the Anakim and Avim, W. of the river; but the immediate predecessors of the Hebrews were descended from Canaan, the fourth son of Ham. The date of their migration can not be determined. In the original grant to Abraham (Gen. xv. 19-21) ten tribes are named, two of which (the Kenites and the Kenizzites) were probably S. of Palestine, toward Egypt, one of them (the Kadmonites) on the east side of the Jordan, and the remaining seven (the Hittites, Girgashites, Amorites, Canaanites, Perizzites, Hivites, and Jebusites) on the west side. In the time of Moses and Joshua the Ammon-Moab people were on the east side of the river, but had been crowded far south by the Amorites, who held the whole territory from Mt. Hermon to the Arnon. Reuben, Gad, and Half-Manasseh took this territory E. of the Jordan. The remaining nine and a half tribes crossed over and occupied the west side. The Hebrew commonwealth reached the summit of its prosperity and power under David and Solomon. Visible decay began (about 975 B. C.) with the secession of the ten tribes. Assyria crushed the northern kingdom of Israel about 720 B. C., and Babylon crushed the southern kingdom of Judah about 587 B. C. Since then Palestine has been under foreign domination, with hardly more than the shadow of independence at any time. Persians, Greeks, and Romans succeeded one another in the mastery. In the time of Christ, under the Romans, there were four provinces—Galilee, Samaria, and Judaea, on the west side of the river, and Peraea on the east side. Since 637, when Palestine was conquered by the Saracens, it has, with little interruption, been under Mohammedan power. The Seljukian Turks seized the country in 1073, and by their barbarous treatment of Christian pilgrims provoked the crusades. The Latin kingdom, with its nine successive sovereigns, established in 1099, held Jerusalem till 1187, and stayed in Acre till 1291. In 1517 the Ottomans came in, and made the country a part of the Turkish empire. It was snatched from the sultan by Mohammed Ali in 1832, but Europe intervened, and in 1841 it was given back again.

Population.—As no census is ever taken, the population of Palestine can not be exactly determined, but is supposed to be well on toward 400,000, which is less than a tenth of what it probably was in the time of Solomon. Of this number the Jews form a considerable portion, the most recent and reliable estimates placing them at 43,000. In round numbers 27,000 of these are in Jerusalem, 1,200 in Hebron, 6,000 in Safed, 3,000 in Tiberias, the rest being divided between Jaffa, Ramleh, Acre, Haifa, Nablus, and a few colonies. Attempts to colonize Palestine with Jews have not been very successful. The little remnant of the Samaritans at Nablus numbers only about 150. The bulk of the inhabitants are a mixed race, descendants of the ancient Syrians and their Arab conquerors.

Pilgrimages and Explorations.—Pilgrimages to the Holy Land began with Helena, the mother of Constantine, in 326, and have continued ever since. What was then known of the country may be found in the *Onomasticon* of Eusebius and Jerome. During the Middle Ages the principal topographers of Palestine were ignorant, superstitious, and careless monks, whose identifications of sacred places were largely of the legendary and childish sort. It is only within a comparatively recent period that the true critical method has been pursued. Seetzen was there from 1805 to 1807; Burckhardt in 1810; Irby and Mangles in 1817-18; but no one man has ever done so much for the geography of the Holy Land as Dr. Edward Robinson. He was the first to adopt and adhere persistently to the rule of looking for ancient Hebrew names under the disguise of modern Arabic names. Next in rank with respect to the amount and quality of service rendered is Dr. William M. Thomson, of Beyrout,

a native of the U. S., for more than forty years a missionary in Syria and the Holy Land, whose book appeared in 1858. In 1848 the lower Jordan and the Dead Sea were for the first time thoroughly explored and surveyed by Lieut. Lynch, of the U. S. navy. In 1859 Johann Gottfried Wetzstein, Prussian consul at Damascus, explored the northern section of the country E. of the Jordan. In 1866 the marsh and lake of Huleh and the upper Jordan were explored by John MacGregor, of Scotland, and in the same year the Lake of Galilee was accurately surveyed by Capt. Wilson, of the Royal Engineers. This last piece of work was done under the direction of the Palestine Exploration Fund, a society organized in 1865 for the purpose of making an exhaustive exploration and an exact survey of the Holy Land. From 1867 to 1870 Capt. Warren, under the direction of the same society, was making excavations in and around Jerusalem. In 1870 the American Palestine Exploration Society was organized to work on the east side of the Jordan. In the autumn of 1871 the triangulation of Western Palestine was begun by Capt. Stewart, whose health soon broke down, and was completed in 1877 by Lieut. Conder and Lieut. Kitchener. Of 622 biblical sites in Western Palestine they claim to have identified 172 out of the total of 434 which are now considered to have been identified with tolerable certainty. Their large map in twenty-six sheets, on the scale of an inch to the mile, was published in 1880. Seven quarto volumes accompany it—three of memoirs, one of name-lists, one of special papers, one on the Jerusalem work, and one on the flora and fauna of Palestine. The reduced map (on the scale of three-eighths of an inch to a mile) is in four forms—the Old Testament ancient, the New Testament ancient, the modern, and the water-basins. In 1873 the American society sent out its first expedition, under command of Lieut. Edgar Z. Steever, of the U. S. army, detailed for that service by the Secretary of War. A base-line was measured in the desert E. of the Jordan, over against Jericho; the work was carried on through the hottest months of the summer and more than 500 sq. miles were triangulated. Prof. John A. Paine, archaeologist and botanist of the expedition, discovered several new species of plants, and examined with great care Mt. Nebo and the adjacent region. In 1875 a second expedition was sent out under command of Col. James C. Lane, who remained in the country but a short time, and the work was put in charge of the archaeologist, Dr. Selah Merrill, who made several important expeditions to every part of that interesting country. A reconnaissance survey of the whole Trans-Jordanic region was made (the survey work being done chiefly by Rudolph Meyer), important sites, such as Ramoth-Gilead, Succoth, and others, were identified, and in all about 230 names appeared for the first time in Meyer's map (not published). Dr. Merrill reckons about 240 biblical names E. of the Jordan, besides fourteen mentioned in the Maccabees. Nearly 100 of these he thinks have been identified. At this point the work of triangulation was surrendered to the English society, which entered the field in 1881, surveyed about 500 sq. miles, and was then compelled by the disturbed condition of the country to withdraw. The American society published four *Statements* (1871, 1873, 1875, 1877), and holds in reserve Dr. Merrill's *Notes upon the Meyer map*. Dr. Merrill's finding of a section of the "second wall" outside of which our Lord was crucified was one of the most important discoveries of recent years. This was in 1885. Other discoveries are the finding of the church built by Eudocia (A. D. 460) on the site of the Martyrdom of St. Stephen, and near it the tomb in which she was buried; the finding in the year 1891 of the "monument of Herod," mentioned by Josephus (*Wars*, v., 12, 2); and the unearthing by F. J. Bliss in the ruins of Lachish of a cuneiform tablet belonging to 1400 B. C., when prehistoric Palestine was subject to Egypt.

The event, however, which has attracted most attention was the completion of the Jaffa and Jerusalem railway, the first to be opened in either Palestine or Syria. After two years' labor by a French company the railway was opened for traffic on Sept. 26, 1892, and since then trains have run regularly between these two ancient cities. The road is 54 miles long, and cost not far from \$2,000,000.

LITERATURE.—The literature of the subject is of immense extent. Tobler, in his *Bibliotheca Geographica Palestina* (1867), enumerates more than 1,000 writers on this one topic. To mention only a few of the most important: The *Onomasticon* of Eusebius (c. 330), translated into Latin, with additions, by Jerome (388), edited by Larsow and Parthey (Berlin, 1862); *Descriptiones Terræ Sanctæ*, by writers of

the eighth, ninth, twelfth, and fifteenth centuries, edited by Tobler (Leipzig, 1874); *Early Travels in Palestine*, edited by Wright (London, 1848); the *Historica Theologica, et Moralis Terræ Sanctæ Elucidatio* of Quaresmius (Antwerp, 1639), valuable for the traditions; Maundrell's *Journey from Aleppo to Jerusalem at Easter*, 1696, (Oxford, 1796); Reland's *Palestina Illustrata* (Utrecht, 1714), a classic; Hasselquist's *Voyages and Travels in the Levant in the Years 1749, '50, '51, '52*, edited by Linnaeus (London, 1766), valuable for the natural history; Burckhardt's *Travels in Syria and the Holy Land* (London, 1822); *Travels in Egypt and Nubia, Syria and Asia Minor, during the Years 1817 and 1818*, by Irby and Mangles, printed but not published (London, 1822); Robinson's *Biblical Researches* (3 vols., Boston, London, and Berlin, 1841); *Later Researches* (5 vols., and *Physical Geography of the Holy Land* (published posthumously, 1865); Williams's *Holy City* (1845; 2d ed. 1849), defending the traditional sites; Lynch's *Expedition to the Dead Sea and the Jordan* (1849); Stanley's *Sinai and Palestine* (1857), highly graphic; Barclay's *City of the Great King* (1858), valuable for the meteorology; Thomson's *The Land and the Book* (1859; 2d ed. 3 vols., 1880-85); Tobler's *Bethlehem* (1849), *Jerusalem* (1854), and *Nazareth* (1868); MacGregor's *The Rob Roy on the Jordan* (1870); Tristram's *Land of Israel* (1865; new ed. 1876), *Natural History of the Bible* (1867), and *Land of Moab* (1873); Nutt's *Samaritan Targum and History* (1874); Ritter's *Geography of Palestine*, translated by Gage (4 vols., 1866); Porter's *Damascus* (1855), *Giant Cities of Bashan* (1865), *Handbook of Syria and Palestine* (revised ed. 1875); the new edition of the *Handbook for Syria and Palestine* (1892), by Haskett Smith, is very unsatisfactory and faulty in many respects; Palmer's *The Inscript of the Eschabas* (1872); Conder's *Tent Work in Palestine* (1878); Merrill's *East of the Jordan* (1881; new ed. 1883) and *Galilee in the Time of Christ* (1881); Dawson, *Egypt and Syria* (1885), and *Modern Science in Bible Lands* (1888); also see the many publications of the Palestine Fund. The German Palestine Society has published a journal since 1878. The best maps are those of van de Velde (1866), of Kiepert (1875), and of the English Exploration Fund (1880-83). The best atlases are those of Menke (1868) and of Clark (1868). For further information see special articles, such as ESDRAELON, HAMATH, JERUSALEM, JEWS, and JORDAN.

Revised by SELAH MERRILL.

Palestine: city; capital of Anderson co., Tex. (for location, see map of Texas, ref. 3-J); on the International and Great Northern Railroad; 10 miles E. of Trinity river. It is in an agricultural, fruit-growing, iron ore, and timber region; contains the headquarters of the railway company, 3 banks, and a semi-weekly and 2 weekly newspapers; and has water and electric-light systems, and numerous manufacturing. Pop. (1880) 2,997; (1890) 5,838; (1894) estimated, 8,500.

EDITOR OF "SOME WEEKLY TIMES."

Palestrina, paa-les-tree'naa (anc. *Præneste*): town; in the province of Rome, Italy; situated on a spur of the Apennines, about 1,600 feet above the sea; 18 miles N. E. of Albano, 22 miles E. S. E. of Rome (see map of Italy, ref. 6-E). It covers only a portion of old Præneste, whose strong citadel crowned the height now occupied by the mediæval castle San Pietro. The Church of Santa Rosalia is richly adorned with marbles and alabaster. The Palazzo Barberini, occupying a part of the site of the vast old Temple of Fortuna, was erected in the fifteenth century, and with the garden contains many statues, bas-reliefs, mosaics, and inscriptions, etc., from the ancient city. Præneste was a member of the Latin League until in 499 B. C. it joined Rome; it took part, however, in the Latin war against Rome. In 82 B. C. Sulla inflicted upon it the most cruel punishment for harboring the younger Marius, by putting to death more than 12,000 of its citizens; but the town recovered itself, and under the emperors it was a favorite resort of the Roman aristocracy. On the fall of the Western empire it became a part of the papal dominions; but the Colonna family afterward claimed it as their fief, and held it for more than two centuries. In 1297 Boniface VIII. utterly destroyed the town, with the exception of the cathedral. From this time the Colonna never ceased to struggle with the popes for its possession until 1630, when it passed by sale to the Barberini. The modern town is in itself of no interest except as the seat of one of the six suburban bishoprics. Pop. 5,855.

Palestrina, GIOVANNI PIER LUIGI, an Italian composer, born Italy about 1528; went to Rome about 1540 to study music

with Goudimel, a Flemish composer, then celebrated. Palestrina published his first works (five masses dedicated to Pope Julius III.) in 1554. This led to his appointment to the pontifical chapel, and for a number of years he filled the part of chapelmaster or conductor at the Lateran and also at Santa Maria Maggiore. The church music of that day had become degraded to an extent difficult for us now to understand. Secular and profane melodies, often of an utterly ribald nature, had been introduced into the service of the Mass, the actual improper text being frequently and unblushingly sung by many of the singers, excepting a relatively small number standing in front who sung the sacred text. So scandalous became this condition of things that the Council of Trent passed a unanimous resolution in favor of reform, which resolution nearly amounted to a decree silencing all music in the churches. In this juncture Pius IV. appointed a commission of eight cardinals (1563) to carry out the wishes of the council. This led to Palestrina's being engaged to write a mass which should serve as a model of what religious music should be, both from the standpoint of the council's strictures and also illustrating the best science of the day. Instead of one he wrote three, the first two winning ample praise, the third creating unbounded enthusiasm. The delighted pope (Pius IV.) declared—"some such music it must have been that St. John heard sung by the heavenly hosts in the vision of the New Jerusalem." From this time Palestrina's position was fixed and his name renowned. During the remaining years of his life both the quality and quantity of his works continued remarkable. D. in Rome, Feb. 2, 1594. His published compositions consist of thirteen books of masses, six books of motets, one book of lamentations, one of hymns, one of litanies, one of sacred madrigals, three of secular madrigals, and a *Stabat Mater*. In Palestrina the ancient musical system found its highest development, thus leading the world up to the logical necessity of a new revelation—viz., a new doctrine of tonality and the birth of harmony in our modern sense. D. B.

Paley. FREDERICK APTHORP: grandson of William Paley; classical scholar; b. at Easingwold, near York, England, in 1816; graduated at Cambridge 1838; became a Roman Catholic in 1840; Professor of Classical Literature at Kensington 1874. D. at Bournemouth, Dec. 11, 1888. Edited *Æschylus*, Euripides, Hesiod, Homer, and other classic authors; translated *Æschylus* (1864) and *Pindar* (1875) into English. Author of a *Manual of Gothic Mouldings* (1845) and a *Manual of Gothic Architecture* (1846).

Revised by A. GUDEMAN.

Paley, WILLIAM, D. D.: theologian; b. at Peterborough, England, in July, 1743; graduated at Christ's College, Cambridge (1763), where he became fellow (1766), a tutor and lecturer upon moral philosophy and divinity (1768); took orders in the Church of England; rector of Musgrove 1775; vicar of Dalston 1776; prebendary of Carlisle 1780; archdeacon of Carlisle 1782; and chancellor 1785; prebendary of St. Paul's, London, 1793; sub-dean of Lincoln and rector of Bishop Wearmouth 1795. Published *Principles of Moral and Political Philosophy* (London, 1785); *Horæ Pauline* (1790); *View of the Evidence of Christianity* (1794); and *Natural Theology* (1802). These works have been repeatedly edited and republished, but are now superseded. Their merit was their simple style and lucid illustrations; their defects, their lack of spirituality and their utilitarian morals. D. at Bishop Wearmouth, May 25, 1805. See his *Life*, by W. Meadley, 1809, and in his complete works 1819; n. e. 1834; principal works 1877.

Revised by S. M. JACKSON.

Palfrey, JOHN GORHAM, D. D., LL. D.: author; b. in Boston, Mass., May 2, 1796; was educated at Phillips Exeter Academy and Harvard College 1815; studied theology; succeeded Edward Everett as minister of Brattle Square church in Boston 1818; succeeded Andrews Norton as Professor of Sacred Literature in the Cambridge Divinity School 1831; retired in 1839. From 1842-43 he was member of the House of Representatives, and 1844-47 was secretary of State in Massachusetts. In 1847 he represented the anti-slavery Whigs in Congress; was a leading Republican, one of the creators of the Republican party, a prominent writer and speaker on the anti-slavery side, an able ally of Sumner and Adams; lost his seat in Congress after a fiercely contested struggle against the "compromise" Whigs; ran for Governor of Massachusetts, but was defeated, in 1851; was postmaster of Boston 1861-67, and then retired from public life and devoted himself to literature. Dr. Palfrey was a diligent author. His books are *Evidences of Christianity*

(Boston, 2 vols., 1843); *Jewish Scriptures and Antiquities* (4 vols., 1838-52); *History of New England* (Boston, 4 vols., 1858-75); *The Slave Power* (1 vol., 1847), etc. He was editor of *The North American Review* from 1835 to 1842, and in 1851 was one of the editors of *The Commonwealth Newspaper*. D. in Cambridge, Mass., Apr. 26, 1881.

Revised by S. M. JACKSON.

Palgrave, WILLIAM GIFFORD: traveler and author; son of Sir Francis Palgrave; b. at Westminster, England, Jan. 24, 1826. He graduated with honors at Oxford 1846; was an officer of the native infantry in Bombay 1847-53; subsequently studied theology at the Jesuit Seminary at Laval, France; entered the Roman Catholic priesthood, and was employed as a missionary in Southern India, Palestine, and Syria. In 1862, commissioned by Napoleon III., he made a daring journey through the Wahabite kingdoms of Central Arabia, disguised as a physician. His intimate acquaintance with the Arabic language and customs enabled him to carry out this exploration in safety. In 1864 he severed his connection with the Jesuit order, and in 1865 he was sent to Abyssinia by the British Government to negotiate with King Theodore for the release of English prisoners. Thereafter he held various British consular positions, and from 1884 was minister to Uruguay. His publications include *Central and Eastern Arabia* (2 vols., 1865); *Essays on Eastern Questions* (1872); *Dutch Guiana* (1876); and *Alkamah's Cave, a Story of Nejd* (1875). D. at Montevideo, Uruguay, Oct. 1, 1888.

HERBERT H. SMITH.

Palikao, pāā'lēē'kaā'ō, COUSIN-MONTAUBAN, Count de: soldier and statesman; b. in Paris, France, June 24, 1796; served in Spain, and for twenty years in Africa; rose to be general 1851. In the expedition to China (1860) he commanded the French troops, gaining the victory of Pa-li-k'iao (or Eight-mile Bridge), carried the forts of Taku, and marching to Peking enforced the conditions of peace submitted by the allied powers. He received for these services the cross of the Legion of Honor; was raised to the rank of senator with the title of count. In Aug., 1870, he succeeded M. Ollivier as premier of the French ministry, and acted as Minister of War. He published in 1871 an account of the events of his ministry. D. in Paris, Jan. 8, 1878.

Pāli (paa'lēē) Language: the language in which the Buddhist scriptures are written. The word Pāli means text, as distinguished from commentary, and is used by Buddhists as the current name for Māgadhi, the dialect of Magadha, in which they think their sacred books are written. Magadha was the name of the district round Patna on the Ganges at the time when those scriptures were composed—from about 500-250 B. C. Some modern scholars think that the Buddhists are mistaken in identifying Pāli with Māgadhi. Ernst Kuhn would rather identify it with the dialect of Ujjen (*Beiträge zur Pali Grammatik*, p. 7), and Eduard Müller (*Pali Grammar*, p. iii.) with that of Kalinga. Whichever view should turn out to be correct, Pāli is one of the Prākṛit dialects into which the old spoken Sanskrit, the Sanskrit of the Vedas, was gradually broken down during the centuries from 1000-600 B. C. while the Sanskrit-speaking Aryan tribes were gradually forcing their way from the Punjab down into the Ganges valley. It is the only one of those spoken dialects of which we have full and such early records, and it bears about the same relation to Vedic Sanskrit that Italian does to Latin.

We have records of other Prākṛit dialects from about the sixth century A. D., and the Jaina Prākṛit, in which the sacred books of the Jains were composed still later, is closely allied to it; but the inscriptions of Asoka, the celebrated King of Magadha, in the middle of the third century B. C., come the nearest to Pāli of all the existing linguistic documents of ancient India.

Down to the fifth century A. D. the texts were handed down in Ceylon in Pāli, and the commentaries in Sinhalese, the local dialect of Ceylon. During that century the commentaries also were translated into Pāli, and now exist only in that language. The Pāli of these early commentators differs from that of the texts in the same way as the Latin of Augustine differs from the Latin of Vergil and Cicero.

From the twelfth century A. D. onward there have been a number of works composed from time to time in Ceylon, Burma, and Siam in a Pāli which differs from the two previous stages in much the same way as the Latin of the mediæval theologians and chroniclers differs from the Latin of Augustine and of Cicero. In this third and last stage of

Pāli a large number of words are introduced which are merely retranslations of Sanskrit, Burmese, Siamese, or Sinhalese expressions; and the idiomatic phraseology of the sentences is not seldom a reproduction of the idiom in which the author was accustomed to speak in everyday life.

Of these three stages the pure Pāli, or language of the texts, though considerably older in time than the majority of the books written in so-called classical Sanskrit, is considerably younger in form. The changes shown in it as compared with Sanskrit are allied to the changes which have produced the modern languages of Western Europe out of Latin, and may be summarized as follows:

1. Every word has to end either in a vowel or in a vowel followed by a nasalization (pronounced probably like the English *ng* in *sing*).

2. The groups of consonants which are so characteristic of Sanskrit are softened down by assimilation, elision, or crasis, or are avoided by the insertion of vowels.

3. The vowels *ri*, *rī*, *li*, and *lī* have completely disappeared, the diphthongs *ai* and *au* are replaced by the vowels *e* and *o*; and the three different sorts of *s*'s are all represented by the simple dental *s*.

4. The rules of Sandhi—that is, of the union of adjacent words—are much simplified, so that the words retain very much of their previous form, and Sandhi becomes in Pāli very little more than a set of rules for the elision of vowels in a simple, natural way.

5. The rules for the declension of nouns and the conjugation of verbs are much simplified, not only by the action of the foregoing principles, but also by the loss of the dual number, and by other and similar alterations.

In consequence of these new guiding factors Pāli, like Italian, has become a language at once flowing, melodious, and sonorous; and an examination of its grammar and vocabulary reveals all the distinctive characteristics of a vigorous, spoken, and growing vernacular, as distinguished from the formal hardness of a dead language. There are, as in Sanskrit, a few imported words, such as *chāṭī* and *chumbata*, adopted from Dravidian or other native sources. With these few exceptions the whole of the word-forms in Pāli are derived directly, like the classical Sanskrit, from the older Sanskrit as spoken by the Aryan conquerors of India, before it became a dead language. In about a score of instances Pāli has preserved word-forms peculiar to the ancient Vedic and lost in the classical Sanskrit, and it has preserved the Vedic palatal *ḷ*. In a few cases it has even distinct traces of the still older language of which Sanskrit and all other Aryan languages are the common children. A few instances will make its relation to Sanskrit more clear.

In giving these instances it should be borne in mind that the Pāli books are preserved, in the three countries where it is still studied and used, in the local alphabets—all of them, like the various alphabets in which Sanskrit is written, being derived from the old Pāli alphabet of the inscriptions, now fallen out of use. In transliterating Pāli words into English the vowels have the sound of Italian vowels; double consonants (as in Italian) are pronounced double; and the consonants have their English sounds. The *g* is always hard, as in *gate*, the *ṇ* is pronounced as *ng*, and *m* is *ng*, as in *sing*.

About two-fifths of the words in Pāli are identical with their Sanskrit equivalents, these latter being so little complicated in structure that they conform to the principles of Pāli simplicity. Such words as *nāga*, snake, elephant; *gochara*, realm; *āha*, he said; and *ayaṃ*, this, are examples of this sort of word.

There is another class, comprising two-fifths of the Pāli language, in which the change is so slight as to be easily recognizable. Thus *mukta*, free, becomes *mutta*; *kṛṣṇa*, sin, becomes *kilesa*; *sthāna*, place, becomes *thāna*; *umbā*, mother, becomes *ammā*; *agni*, fire, becomes *aggi*; *aupamya*, metaphor, becomes *opamma*.

The third class, which looms largest in the works on Pāli philology, but is really very small in comparison with the other two, contains those words in which the change is not so evident—*milakkha*, foreigner, for *mleccha*, in Sanskrit; *upadāṭṭhā*, ant, for *upadīkṣā*; *dāsa*, clear, for *janāśāsa*; *samparanka*, friend, for *sampariyanka*; *gaddūhana*, small space, for *dadrūghna*; *vutta*, sown, for *upla*; *janṭagga*, for *jantragriha*, bathroom. Some words, certainly identical, are still more unlike in appearance even than these, and the reasons which have brought about changes so considerable are not as yet fully worked out. This unsolved department

of Pāli, or rather of Indian linguistics (for it deals with the whole history of speech in India), is full of interest to the trained philologist.

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Pāli Literature: a literature consisting of the Buddhist sacred texts, and of other works by Buddhist authors—histories, poems, legends, commentaries, books on ethics, and controversial volumes on the rules of the Buddhist order. Its extent is constantly being increased, for the Pāli language has become the *lingua franca* of the Buddhists in Ceylon, Burma, and Siam, and is still used by authors who wish to be read not only in their native land, but by the Buddhists in all these countries.

The Pāli books containing the sacred texts are divided into three collections called the *Pitakas* or Baskets—that is to say, the vessels in which the truth is handed on from teacher to scholar. The most important of these for the right understanding of the ethical and philosophical standpoint of Gotama himself and of the early Buddhists is a collection of dialogues in which usually the Buddha himself, but occasionally also one of his principal disciples, is represented as setting forth to an outsider or a disciple some fundamental point of his theory of life. These dialogues are arranged in two books containing respectively the longer and the shorter dialogues (called in Pāli the *Dīgha* and the *Majjhima Nikāyas*). They occupy in the history of Indian thought a position equivalent to that occupied in the history of Greek thought by the *Dialogues* of Plato. As compared with these, while by no means without a peculiar eloquence of their own, they are deficient in the graces of style; but the thought is more original, especially as being free from the ancient soul-theory. They are also much more systematized and worked out, and less charged with logomachies. The two collections were evidently put together at the same time—probably in the fifth century B. C.—and by the same hands; they form, in reality, but one book.

Next in historical importance to these *Dialogues of the Buddha* are the rules of the Buddhist order of mendicants. The whole of this body of canon law (in Pāli the *Vinaya*) was edited in Pāli, by Prof. Oldenberg, of Kiel, in 1879-83 (5 vols.), and an English translation by him and by the present writer of the most important parts of it has appeared under the title of *Vinaya Texts* in three volumes of the Sacred Books of the East (Oxford, 1881-85).

In the *Dialogues* the essential points of what we call Buddhism are all discussed; but each single dialogue deals for the most part with some particular point only, and allied points occur, perhaps, in other dialogues widely separated in the collection. The student has often to piece these various dialogues together before he can arrive at a full understanding of a particular question. This task was already done in a rather loose way by the early Buddhists. They brought together in one collection, called the *Samyutta Nikāya*, the various utterances ascribed to the Buddha, grouped according to particular subjects or particular persons addressed. Then again it is a distinctive characteristic of the Buddhist mode of thought that they arranged their ideas in groups consisting of one, two, three, four, and so on up to twenty or thirty detailed particulars. There is a collection, made by the early Buddhists and included in the *Pitakas* (called the *Anguttara Nikāya*), which takes each of these groups in order—Book I. dealing with the ones, Book II. with the pairs, Book III. with the triplets, and so on. Whether these two great collections add anything to the materials contained in the *Dialogues* of Gotama, or whether (as is at present generally supposed) they are only a rearrangement of the same matter, they are of the utmost value to the student.

A fifth collection (the *Khuddaka Nikāya*) consists of a number of shorter books of various dates and of various contents. They are: 1. The *Khuddaka Pāṭha*, selected short poems of great beauty. 2. The *Dhamma-pada*, a selection of 423 verses, most of them extracted from the earlier books of the *Pitakas*. 3. The *Udāna*, eighty short lyrics pur-

porting to be uttered by Gotama under circumstances of strong emotion which are explained in short prose introductions. Many of them are of great beauty and subtlety. 4. The *Iti Vuttaka*, 110 short lyrics of a similar character. A good many of the lyrics in both these tracts have been already traced elsewhere in the Pitakas. 5. The *Sutta Nipāta*, a very valuable collection of some of the most ancient lyrics produced by the early Buddhists. 6 and 7. *Vimāna* and *Peta Vatthu*, short poems on celestial mansions and on disembodied spirits. 8 and 9. The *Thera* and *Therī Gāthā*, poems by the members of the order, men and women respectively. Many of the verses in both collections are to be found in other parts of the Pitakas. 10. The *Jātaka* stories, the most ancient, the most complete, and the most valuable collection of folk-lore extant; edited by Prof. Fausbøll, of Copenhagen (first 5 vols., London, 1877-91). A translation was undertaken by the writer (1st vol., *Buddhist Birth Stories*, London, 1881), but is being continued by a syndicate of English scholars under the editorship of Prof. Cowell (1st vol., by Robert Chalmers, Cambridge, 1894). 11. *Niddesa*, a work ascribed to Sāriputta, one of the personal disciples of Gotama, and containing accounts of the principal leaders, whether men or women, in the Buddhist reformation. 12. *Patissambhidā*, a longish treatise on the various mental powers resulting from the Buddhist system of self-culture. 13. The *Apadāna*, stories about Buddhist saints. 14. *Buddha Vansa*, short lines in verse, altogether 1,068 stanzas, of the twenty-five Buddhas. 15. The *Cariyā Piṭaka*, short poetical versions of 334 of the *Jātaka* stories.

All of the above fifteen books deal in one way or another with the life of ethical and intellectual self-culture which was the *summum bonum* of the early Buddhists. This was necessarily based on a view of psychology, one of the most interesting contributions of the Buddhists to human thought, which is constantly referred to and frequently discussed in scattered passages of these books. These passages have been collected and systematized in a series of works which form the third and last of the three great divisions of the *Pitakas*—the division called *Abhidhamma*. This word has been usually rendered by the misleading translation “metaphysics,” but, as the soul theory of life is ignored by the Buddhists, they had of course nothing corresponding to what we understand by metaphysics. Looking at the contents of the *Abhidhamma*, the best translation of the word is psychology. There are seven books dealing with this subject, which is as full of difficulty and obscurity as of interest and value. These are as follows:

1. The *Dhamma Sangani* (Concatenation of Qualities), which treats of the way in which a particular state of mind involves or connotes the coexistence of other states. It consists for the most part of long lists with constant repetition, and it is difficult to find the clue which binds these lists together. It presupposes in the reader (or rather in the user, for it was never intended to be read) a knowledge of the general system of Buddhist psychology—very little understood at present in the West. 2. *Vibhanga*, of which the contents are unknown. 3. The *Kathā Vatthu*, a discussion, by an author of the time of Asoka, of 219 points then at issue between different schools of Buddhists. The writer has published a full analysis of this treatise, so very valuable for historical purposes, in the *Journal of the Royal Asiatic Society* for 1892. 4. The *Puggala Paññatti*, a short tract on different sorts of individuals from the ethical point of view. 5. The *Dhātu Kathā*, a shorter work than, but similar in character to, the *Dhamma Sangani*. 6 and 7. *Yamaka* and *Paṭṭhāna*, The Pairs and The Book of Origins, of which the contents are unknown.

Most of the above works have been edited for the Pāli Text Society of London, and some translations have appeared either for that society or in the Sacred Books of the East. Of works outside the Pitakas, the society has published a Pāli treatise called the *Gandha Vansa* (Account of the Books), giving a very short account of all the Pāli books written down to the fifteenth century. Of these there are accessible to Western students at present only the *Mahā Vansa*, a history of Ceylon; the *Dipa Vansa*, another history of Ceylon; the *Milinda*, published by Dr. Trenkner (London, 1880); and a number of smaller works, mostly poetry, issued from time to time in the *Journal of the Pāli Text Society*. The *Milinda*, in many respects one of the most interesting of Eastern works known to the West, is a series of controversial conversations between Menander, the Greek King of Baktria, and Nāga sena, a member of the Buddhist order. It has been translated in full, with introductions, by

the present writer for the Sacred Books of the East (Oxford, 1890 and 1894). Mention should also be made here of the very complete analysis, published in the Pāli Text Society's *Journal* for 1893, of the *Visuddhi Magga* (Path of Purity), a systematic handbook of Buddhism drawn up by the distinguished scholar Buddhaghosa in the fifth century A. D. See PĀLI LANGUAGE.

T. W. RHYS DAVIDS.

Palimpsest [from Lat. *palimpsestum* = Gr. *παλινψηστον*, liter., neutr. of *παλινψηστος*, scraped or rubbed out again; *πάλιν*, again + *ψάειν*, *ψήν*, rub, rub away]: a term used either absolutely, or as an adjective with the word manuscript, to indicate an ancient writing of which the original ink has been washed or scraped away to enable a scribe to use the material again. Both the Greeks and the Latins were familiar with the process. Thus the phrases *ῥωπερ παλινψηστα* and *ῥωπερ βιβλίον παλινψηστον* occur in Plutarch, and both Catullus and Cicero speak of *palimpsesta*. Ulpian calls this second-hand writing material *charta deleticia*. It was probably used for little else than memoranda and rough drafts, and it is likely that only writings of an ephemeral and trivial nature were allowed to pass under the scraping-knife of the vellum-seller; but, with the decline of the commerce of the Mediterranean and the dwindling of the supply of papyrus, parchment or vellum—always dear, and by no means universally plentiful—soon became enhanced in value; and the large styles of uncial and capital writing then in vogue assisted this dearth by reason of the large amount of writing surface required. Hence naturally, in the last centuries of Rome and in the early Middle Ages, the use of the palimpsest was considerably extended. A Greek synod of 691 found it necessary to forbid the destruction in this way of copies of the Bible and of the Church Fathers; and when, in the West, the condensed and legible minuscule which we still use took the place of the cumbersome uncial and national scripts, the temptation must have been great to mutilate the old quartos with their growingly unfamiliar characters, their lavish pages, and their easily erasable ink. Nearly all our valuable Latin palimpsests come from this period between the seventh century and the ninth. Palaeographers no longer credit, however, the charge that the monkish scribes indulged in wholesale destruction of earlier books. As Tischendorf has pointed out, no complete work has yet been found in a palimpsest, and it is improbable that any but worn or damaged books were often sacrificed.

Time brings back to the erased ink something of its color, and at length the manuscripts which had been subjected to the process of obliteration fell under the notice of modern scholars. At first the imperfect knowledge of a means of restoring the faded inks rendered the results unsatisfactory; but in the eighteenth century Knittel, a German theologian, carefully went through the palimpsests at Wolfenbüttel, and was so fortunate as to identify fragments of the Gothic Bible. P. J. Brunns discovered several palimpsests at Rome in the library ceded by Christina of Sweden to the Vatican, among them Cicero's *pro Roscio*, over which had been written a Latin version of the Scriptures. Niebuhr discovered in the same manuscript another oration of Cicero, that *pro M. Fonteio*, and was able to recover the *Institutes* of Gaius almost entire from a palimpsest at Verona. Angelo Mai made himself celebrated in deciphering texts of palimpsests, discovering Cicero's *de Republica* under Augustine's commentary on the Psalms and the *Letters* of Fronto under the acts of the Council of Chalcedon. Many curious morsels of antiquity have since been thus patiently rescued from oblivion, among them some of the most ancient manuscripts of the Christian Scriptures. Double palimpsests—those whose writing has twice been erased—are found. In the restoration of the earlier writing various chemical reagents have been used—an infusion of nutgalls, Gioberti's tincture, the hydrosulphuret of ammonia; but, unfortunately, all with great risk to the manuscript. So high an authority as Wattenbach declares that “more precious manuscripts, in proportion to the existing supply, have been destroyed by the learned experiments of our own time than by the much-abused old monks.” One great palaeographer (Sickel) points out how much may be gained by simply laying the manuscript in clear water, from which it takes no harm if it be afterward thoroughly dried.

The leading monograph on palimpsests is Mone's *De libris palimpsestis* (Carlsruhe, 1855), but the best discussion of the subject is that of Wattenbach, in his *Schriftwesen im Mittelalter*. For other authorities see MANUSCRIPT and PALEOGRAPHY. W. D. BIRCH. Revised by GEORGE L. BURR.

Palinurus (now *Capo Palinuro*): a promontory on the coast of Lucania, in the Tyrrhenian Sea, between Vella and Buxentum. It received its name from Palinurus, the pilot of Æneas, who, according to tradition, was buried here. Some remains of old buildings still bear the name of the tomb of Palinurus. The place was twice the scene of great disasters, two large Roman fleets being wrecked on the rocky shores, one in 253 B. C., the other in 36 B. C.

Palisades: See FORTIFICATION.

Palisades: a line of cliffs bordering the lower portion of the Hudson, opposite New York city. They have a length of about 20 miles, and a general height of 300 feet. They are formed by the outcrop of an inclined sheet of trap-rock (diabase) which dips westward and was intruded in a molten condition between layers of sandstone and shale belonging to the Newark system, a division of the Jura-Trias. The same trap-sheet forms Bergen Hill to the S. and the Hook Mountains to the N. of the Palisades, and has been left in relief owing to the removal by erosion of the softer beds inclosing it. The trap is columnar, and at the Palisades breaks off so as to form vertical cliffs. The cutting away of the base of the cliffs by the Hudson is now progressing but slowly owing to the protection afforded by talus slopes. See also WATCHUNG MOUNTAINS. ISRAEL C. RUSSELL.

Palissot de Montenois, *pāl-lē-sō de-mōn-te-nwā'*, CHARLES: author; b. at Nancy, France, Jan. 3, 1730. A precocious student, he entered the congregation of the Oratory, but soon left the order and tried literature. After some unsuccessful tragedies and comedies he found notoriety by bitter attacks on the philosophers. *Le Cercle* (comedy, 1755) satirized Rousseau, and *Peuples lettrés contre des grands philosophes* (1756) Diderot. His best-known work is the comedy *Les Philosophes* (1760), written with the same purpose. His *Œuvres* were published in 6 volumes (Paris, 1809). D. June 15, 1814. A. G. CANFIELD.

Palissy (Fr. pron. *pāl-lē'see'*), BERNARD: potter and author; b. at Capelle Biron, in the department of Lot-et-Garonne, France, about 1510; was apprenticed to a potter, and afterward, on account of his knowledge of geometry, engaged for some time as a land-surveyor, but pursued also the arts of pottery, enameling, glass-painting, etc. He married about 1538 and settled at Saintes, but in 1564 removed to Paris. He was a Protestant, and although exempted from the massacre of St. Bartholomew by special order from the queen, in whose service he stood, he was twice imprisoned as a heretic—in 1557, when he was liberated by the intercession of the constable of Montmorency, and in 1558, when he was thrown into the Bastille and kept there to his death in 1589. The most remarkable of his glass-paintings is a representation of the *Myth of Psyche*, after Raffaello. Of his pottery, vases, ewers, jugs, salvers, etc., generally small in size but highly finished, collections are formed in several of the Paris museums; and these articles are much valued on account of the unique character of their design. His best-known pieces are those decorated with lizards, snakes, etc., in high relief, probably moulded from the actual creatures, and colored in close imitation of nature. None of his work can be compared for beauty with the finest Italian pottery. His writings, containing many new and true observations on the formation of springs, on the fertilizing power of marl, on the best means of purifying water, etc., and on the true origin and nature of fossil remains, were published in 1777 by Faujas de Saint-Fond and Gobet, and in 1844 by A. Cap. As an artist Palissy was well appreciated during his lifetime, but it was not until the time of Buffon and Réaumur that the truth of Palissy's scientific views was understood and recognized. The slighting remarks of Voltaire are simply the result of ignorance. Palissy's writings, published 1557-80, were edited by M. France and republished at Paris in 1880. His *Life* was written by H. Morley (2 vols., London, 1852), and in French by J. Salles (Nîmes, 1855), Audiat (1868), and Berty (1886). See Delange, *Monographie de l'œuvre de B. Palissy* (1862).

Palladio, *pāl-lā-dē-ō*, ANDREA: architect; b. at Vicenza, Italy, in 1518. Little is known of his family or of his early years. A wealthy patron of Vicenza enabled the youth to travel over Italy and in France wherever Roman remains existed. Vitruvius and Leon Battista Alberti were the authors he studied, and it would seem that Giovanni Fontana, the architect of the castle of Udine, was for a time his master. In 1541 he modernized the palace of Trissino at Cricoli. He competed in 1546 with Giovanni Fontana, and again in

1549 with Giulio Romano, for the renovation of the Sala della Ragione (Palace of Reason) at Vicenza, an ancient monument of Gothic architecture, and won the competition, after which he went to Rome, where he made the façade of the palace of the Grand Duke of Tuscany. His genius was henceforth recognized, and his great learning and culture attracted the friendship and consideration of all the great men of his day. He settled at Vicenza, which, together with the neighboring country, is full of palaces and monuments designed by him. In 1556 he began the restoration of the Palace of Reason in his native city, a labor which lasted all his life. About the year 1560 Sansovino, being then eighty, recommended the Venetian republic to accept Palladio as his successor. His first work in Venice was the monastery Della Carità. Other important works here included the churches of San Giorgio Maggiore and Il Santissimo Redemptore, the façade of San Francesco della Vigna, and some palaces.

When Henry III. of France passed through Venice, the republic, wishing to astonish him by the splendor of the city, commissioned Palladio to decorate it. War prevented him from carrying out his engagement to renovate the cathedral at Brescia, which he had intended to transform into a masterpiece of his art. He commented on and illustrated with drawings Polybius, and also the *Commentaries* of Caesar, in a manner which showed careful study of the military tactics of the ancient Romans. His knowledge of hydraulics was also considerable. At Bassano he built a wooden bridge, in which he combined solidity with elegance of design, and this resisted the inundations of the river Brenta till the end of the seventeenth century, when its restoration by Ferracina spoiled its original beauty. Palladio took part in the competition of the greatest architects of his time for the design of a stone bridge to replace the wooden Rialto bridge at Venice, and his project was preferred to all, although Antonio da Ponte's was finally chosen as more within the means the republic had to dispose of. He planned the royal park in Piedmont for Duke Emmanuel Philibert of Savoy, to whom he dedicated his *Treatise on Architecture*, published in Venice in 1570, which has since been reprinted and translated in all languages. Palladio died at Vicenza in 1580. W. J. STILLMAN.

Palladium: a silver-white to steel-gray metal of the platinum group, discovered by Wollaston in 1803 in the mixture of platinum metals (polyxene) from South America. It has nearly the hardness of platinum, but is less ductile; specific gravity, 11.3 to 11.8; when hammered, 12. It does not fuse in ordinary furnaces, but melts in the oxyhydrogen flame and volatilizes. It can be welded like iron or platinum. It does not oxidize readily, but dissolves in hot nitric acid and in aqua regia, and may be combined with sulphur by heat and can be alloyed with various metals, particularly platinum, gold, silver, and copper. Four parts of copper and one of palladium form a white ductile alloy, so, also, with gold. The *oro pudre* or impure gold from Porep, South America, contains 9.85 per cent. of palladium and 4.17 per cent. of silver. Similarly the *oro prelo* (black gold) from Minas Geraes, Brazil, contains from 7.7 to 11.1 per cent. of palladium, according to assays made at the Rio de Janeiro mint. Six parts of gold and one of palladium formed the alloy used at the suggestion of Dr. Wollaston for the graduated part of the mural circle at Greenwich Observatory. Being very white and inalterable in the air, and not tarnishing like silver in sulphurous gases, it has been much used for such purposes. Some of its alloys have been used for the points of pencils, lancets, and as a substitute for gold in dental work. Palladium has the property of occluding hydrogen to an extraordinary degree. This was discovered by Graham, and he regarded hydrogenized palladium as a true alloy containing the hydrogen in the form of the metal hydrogenium, the compound corresponding to the formula Pd_2H_2 . This property of the metal was well illustrated at Paris in 1878 by a disk of palladium 100 mm. in diameter and 2 mm. thick, in which nearly 1,000 times its bulk of hydrogen had been occluded. By the absorption of the gas its diameter was increased to 102.5 mm. and its thickness to 2.2 mm. It increased in weight, and became concave.

Brazil appears to be the chief source of this metal; it not only occurs in alloy with gold, as above shown, but separately in mixture with gold and platinum in alluvial sands. A small quantity occurs at Port Orford, on the coast of California, with platinum and iridium. It is reported to

have been found upon the south coast of the Black Sea, in the vicinity of Batum, in auriferous sands, and is associated with platinum in the Ural Mountains. WILLIAM P. BLAKE.

Palladium [= Lat. = Gr. Παλλάδιον, statue of Pallas, liter., dimin. of Παλλάς, Παλλᾶδος, Pallas]; a wooden image (ξᾶνον) of Pallas let fall from heaven by Zeus in answer to the prayer of Ilus, in token of his approval of the founding of Ilium. There are other stories of its origin. It was 3 cubits high, with legs stiff and closely pressed together, an uplifted spear in the right hand, and a distaff and spindle or a spear in the left hand. The image represented the protecting goddess, who would not allow the city to be taken as long as the image remained inside its walls. Odysseus and Diomedes crept into Troy by night and stole it. According to one story, Demophoon captured it from Diomedes as he was landing in Attica and placed it on the Athenian Acropolis, but according to another story Diomedes brought it to Argos. According to still another story, the Trojans, fearing that it might be stolen, made an imitation Palladium, which was the one stolen by Odysseus and Diomedes, and concealed the genuine one, which was carried by Æneas to Italy, and for centuries was preserved in the temple of Vesta in Rome, until Heliogabalus placed it in his temple of the Sun. The theft of the Palladium by Odysseus and Diomedes was a favorite motive with the ancient artists. See the article *Palladium* in Baumeister's *Denkmäler*. J. R. S. STERRETT.

Palla'dius: the name of several distinguished men. (1) RUTILIUS TAURUS ÆMILIANUS, a Roman author, probably from the fourth century; wrote a work on agriculture, *De re Rustica*, in fourteen books, which was much used during the Middle Ages. Edited by J. G. Schneider in his *Scriptores Rei Rusticæ Veteres Latini* (Leipzig, 1795); translated into English by Thomas Owen (London, 1803). Book xiv., a poem in elegiacs on grafting (*De Incitione*) has been separately edited by J. C. Schmidt (Münnerstadt, 1877), and book i., by the same editor (Würzburg, 1876).—(2) A Christian Father; b. in Galatia in 367 A. D.; Bishop of Helenopolis in Bithynia in 400, and of Aspona in Galatia in 420; d. in 430. He wrote the *Historia Lausiaca*, a collection of biographies of hermits, dedicated to Lausus, governor of Cappadocia, published by Meursius (Leyden, 1616) and by Fronto Ducaeus in his *Auctarium* (Paris, 1624).—(3) A Greek author on medicine; lived probably in Alexandria in the seventh century, and wrote commentaries on the works of Hippocrates, and a book on fevers, edited by Bernard (Leyden, 1745). M. WARREN.

Pallah [from the native (South African) name]: the *Æpyceros melampus*, a fine dark-red antelope of South Africa (called in Dutch *roode bok*, red antelope). It has a white belly, a black mark upon the croup, and black tufts on the back part of each foot. It has long, handsome horns, somewhat lyrate and ringed. Its flesh is good, though dry. It is very swift, but when surprised has the habit of trying to steal away undiscovers. It is found in considerable herds in bushy places.

Pal'las (in Gr. ἡ Παλλὰς and δ Πάλλας): 1. A daughter of Triton and a youthful companion of Athene. Once when they were engaged in warlike sport they became angry, and Zeus, seeing that Pallas was about to strike Athene, interposed his ægis, and Pallas fell at the feet of Athene, who made an image in her honor and placed upon its breast the death-dealing ægis. This statue was the Palladium cast down from heaven by Zeus in answer to the prayer of Ilus for a sign of heaven's approval. 2. A Titan. 3. Father of Selene. 4. A giant. 5. The grandfather of Evander, after whom the city built by Evander on the Palatine Hill was named. 6. Son of Pandion, of Athens. 7. Freedman of Antonia, mother of Claudius; he played a prominent rôle under Claudius, and was put to death by Nero for the sake of his money. J. R. S. STERRETT.

Pallas, PETER SIMON: traveler and naturalist; b. in Berlin, Germany, Sept. 22, 1741; studied medicine and natural science; visited England and Holland; published in 1766 his *Elenchus Zoophytorum* and *Miscellanea Zoologica*, still of value; was invited by Catherine II. in 1768 to Russia as Professor of Natural Science at the Academy of St. Petersburg; made from 1768 to 1774 a journey of exploration through Southern Siberia to the frontier of China; resided for many years in the Crimea, where the empress gave him extensive estates, and partook with great activity in all scientific undertakings in Russia, but returned at last to

Berlin, where he died Sept. 8, 1811. Those of his numerous works best known and still of interest are *Travels through the Southern Provinces of the Russian Empire* (Leipzig, 1799–1801; Eng. trans. 1812); *Flora Rossica* (2 vols., 1784–88, not completed); and *Sammlungen historischer Nachrichten über die mongolischen Völkerschaften* (2 vols., St. Petersburg, 1776–1802).

Pallas Athene (in Gr. Παλλὰς Ἀθήνη, Ἀθηναίη, Ἀθηναῖα): See ATHENA.

Pallavicino, SFORZA, Cardinal: theologian and scholar; b. in Rome, Italy, Nov. 28, 1607. After studying jurisprudence there he turned to theology, receiving his baccalaureate in 1628. In 1630 he determined to become an ecclesiastic, and was at once given important charges by Pope Urban VIII. In 1637 he became a Jesuit, and for the rest of his life he was one of the most important members of the Society of Jesus, having in charge particularly the direction of its educational policy and work. In 1659 he was made cardinal by Alexander VII., who had long been his intimate friend. He is chiefly famous for his theological works, of which the most important is his *Istoria del Concilio di Trento*, etc. (Rome, 1656–57), written to combat the similar history by the Venetian Paolo Sarpi. In the preparation of this he had access to documents closed to all others; but the violence of his partisanship prevented him from giving scientific exactness to his treatment. To the same field belong (besides his Latin treatises, *Vindicationes Soc. Jesus*, *Assertio theologicarum libri*, etc.) his *Arte della perfezione cristiana* (Rome, 1665) and his admirable *Della vita di Alessandro VII. libri cinque* (Prato, 1839–40). Besides being a theologian, Pallavicino was a scholar and poet. He belonged to the Roman academy called Gli Umoristi, and later to the Florentine della Crusca. He wrote a tragedy, *Ermenegildo* (1644); *Del Bene* (dialogues, 1644); *Considerazioni sopra l'arte dello stile del dialogo* (1646); *Avvertimenti grammaticali a chi scrive in italiano* (1661); and a sacred poem, *Fasti sacri*, of which only fragments are preserved. D. in Rome, June 5, 1667. For his life and works, see *Opere edite ed inedite di Sforza Pallavicino* (5 vols., Rome, 1844–48). A. R. MARSH.

Palliser, SIR WILLIAM, C. B.: soldier and inventor; b. in Dublin, Ireland, June 18, 1830; was educated at Rugby, Trinity College, Dublin, Trinity Hall, Cambridge, and Sandhurst College; became ensign in the Rifle Brigade 1855, and joined the Eighteenth Hussars in 1858; became captain 1859, major, unattached, 1864, and retired from the service in 1871. He was the inventor of the Palliser projectiles, designed for piercing armor-plated ships; he also invented an improved method of rifling iron wrought cannon for use both in ships and on fortifications, and of converting smooth-bore cast-iron ordnance into rifled guns. He was knighted by Queen Victoria Jan. 21, 1873. D. Feb. 4, 1882.

Pal'lum [= Lat., liter., cloak, mantle, pall]: in the Roman Catholic Church, a band of white lamb's wool, embroidered with purple crosses, worn upon the neck by the pope and all ecclesiastics of archiepiscopal rank, including metropolitans and patriarchs. It was once made of linen, embroidered with purple, and was worn by all bishops. The pallium has two pendants, one hanging down the back and one down the breast of the wearer. It is the chief badge of the archbishop's authority, is granted by the pope in person, and is worn only upon very solemn occasions. The pope, however, wears it continually. It is always buried with the wearer, and can never be transferred to another person.

Palm: See PALM FAMILY, PALM OIL, and PALM WINE.

Palm, JOHANN PHILIPP: bookseller; b. at Schorndorf, Bavaria, in 1768; succeeded his father-in-law, Stein, as publisher in Nuremberg, where, in 1806, his firm issued a pamphlet entitled *Deutschland in seiner tiefen Erniedrigung* (Germany in her Deep Humiliation), which censured Napoleon and condemned the occupation of Bavaria by the French troops. The book fell into the hands of the French officials and the matter was brought to the notice of Napoleon, who, it is said, gave orders for the arrest, conviction, and speedy execution of the offender, that his death might serve as a warning to others. Palm was seized, hurried before an extraordinary military commission at Braunau, and, though he professed ignorance of the contents of the pamphlet, was condemned to death Aug. 25, 1806. He was shot at Braunau on the following day. Like the execution of the Duc d'Enghien, this act caused general indignation throughout

Europe, and in Germany the hatred of Napoleon was intensified. Some writers have tried to lay the blame of this jehoid murder upon Marshal Berthier instead of Napoleon. A bronze statue of Palm was erected at Braunau in 1766. See Schultheiss, *Johann Philipp Palm* (Nuremberg, 1860).

Palma: town of Spain; capital of the province of Balears, on the southwestern coast of the island of Majorca (see map of Spain, ref. 16-L). It is surrounded with walls and fortified with thirteen bastions, and has a fine harbor with a mole 500 yards long, and lined on both sides with dockyards, in which ship-building is carried on. The city is well built, and contains many elegant buildings, both private and public, among which the most remarkable are the cathedral (1232-1601) in the Gothic style, the Church of St. Francis, containing the tomb of LULL (*q. v.*), the exchange, dating from the fifteenth century, and the governor's palace. It has many good educational institutions and manufactures of silks and woollens, jewelry, soap, brandy, and glass. Pop. (1887) 60,514.

Palma: one of the CANARY ISLANDS (*q. v.*). Area, 330 sq. miles, with 39,622 inhabitants. It contains the interesting, now extinct, volcanoes Caldera and Barranco, often referred to as exceptionally well-preserved types of volcanic forms. The island produces good timber, and has two fine towns, St. Cruz and Los Llanos.

Palma, JACOPO, called IL VECCHIO (the elder), or PALMA VECCHIO: painter; b. at Serina, near Bergamo, about 1480; d. in Venice in 1528. He went to Venice while still very young and followed Giorgione's method of coloring. His altar picture at San Cassiano is one of his early works, and one of his finest is *Santa Barbara* at Santa Maria Formosa. He soon received orders for altar pieces for the churches in Venice, the surrounding country, and for Serinalta. His picture of *The Epiphany*, now in the Brera at Milan, shows that he had originality. He painted in competition with Gian Bellini and Mansueti in the school of St. Mark the story of the ship bringing St. Mark's body to Venice in a terrible storm. Vasari bestows the highest praise on this work, as also on a portrait of himself which Palma painted for him. The Venetian academy possesses a fine *Assumption* by this master. The Louvre has four pictures by him, and the museum of Brussels one. W. J. S.

Palma, JACOPO, called IL GIOVANE (the younger), or PALMA GIOVANE: painter; date of birth unknown. He was a nephew of Palma Vecchio. His father was his first instructor in painting, but he imitated Titian, and before he was fifteen years of age he became the *protégé* of the Duke of Urbino, who first took him to his capital and then sent him to Rome to study. He returned to Venice in 1570, where his work did not seem much in request until Vittoria, the architect and favorite sculptor of the republic, gave him commissions which enabled him to compete with Tintoretto and Veronese. He painted a *Last Judgment* in the Sala dello Scrutinio, and a picture representing the pope permitting Otho to be reconciled to his father in the Sala del Maggior Consiglio, both in the ducal palace; also Alexis and the crusaders assaulting Constantinople, besides the naval fight on the Po, and the taking of Cremona, which is perhaps his masterpiece. After the death of Tintoretto and Veronese he contented himself with producing mere sketches. He painted innumerable altar-pieces for Venice, and examples of his art are to be found at Cremona, Pesaro, Urbino, and Bologna. D. at Venice in 1628. W. J. S.

Palma, RICARDO: author; b. at Lima, Peru, Feb. 7, 1833. In his younger days he was engaged in a revolt, and in 1860 was exiled to Chili for a short time. After his return he was secretary to President Balta, senator, and finally assistant in the National Library until it was sacked by the Chilians in 1881. In 1884 he undertook its restoration. About 8,000 books, a mere fragment of the original collection, were recovered, and these were supplemented by gifts, principally from foreign governments. The library was reopened under his directorship July 28, 1884. Señor Palma is called the Nestor of Peruvian literature. He has published several romances, sketches of country life, two volumes of poems, and a historical work, *Anales de la Inquisición de Lima* (1863), but he is best known for his volumes on the historical traditions and legends of Peru which have appeared since 1870. HERBERT H. SMITH.

Palma di Montechiaro: city of Italy; in the province of Girgenti, Sicily; 14 miles S. E. of the city of Girgenti (see map of Italy, ref. 10-F). Though at some distance in-

land it has a port with a considerable coasting trade. Soda, sulphur, wine, and dried fruits are exported. Pop. 11,702.

Palmas, Cape: See CAPE PALMAS.

Palmblad, paalm'blät, WILHELM FREDRIK: writer; b. in Liljestad, Sweden, 1788. At the age of twenty he founded with ATTERBOM (*q. v.*) the phosphoric society Auroraförbundet, and both as critic and creative writer he contributed largely to the advancement of the new literary movement. In this his success was the greater because of the comparative conservatism of his views. During the latter part of his life he was a professor at the University of Upsala. His earliest serious efforts consisted of a number of tales, *Amala*, *Holmen i sjön Dall* (The Island in Lake Dall), and others of considerable merit; but his two novels—*Familjen Falkensvärd* and *Aurora Königsmark*—are decidedly inferior, as are also his translations of Æschylus and Sophocles. His principal work, and the best on that subject in the Swedish language, is *Handbok i fysiska och politiska, äldre och nyare geografin* (Manual of Physical and Political Geography, Ancient and Modern, 5 vols.), which, however, was not completed. D. at Upsala, 1852. D. K. DODGE.

Palm-crab: See CRAB.

Palmer: town; Hampden co., Mass.; on the Chicopee, Swift, and Ware rivers, and the Boston and Albany and the Cent. Vt. railways; 15 miles E. of Springfield, 39 miles W. S. W. of Worcester (for location, see map of Massachusetts, ref. 3-E). It comprises several villages, and is noted for its manufactures, which include carpets, woolen dress-goods, cotton goods, wire, wire nails, and foundry and machine-shop products. There are two libraries (Y. M. C. A. and State Primary School), a high school, a national bank with capital of \$100,000, a savings-bank with deposits of nearly \$1,000,000, and a weekly newspaper. Pop. (1880) 5,504; (1890) 6,520; (1895) 6,858.

Palmer: in mediæval times, a pilgrim returned or returning from the Holy Sepulcher, so called from the fact that he bore branches of palm gathered near Jericho, which were placed upon the church altar after the pilgrim's return. The palmer also employed the consecrated scrip (a leathern wallet) and staff; and it was further customary for him to visit the holy places of other lands during his return. Thus after his visit to the shrine of St. James the Less at Compostella, he wore the scallop-shell (*Pecten Jacobæus*), the cognizance of the great apostle.

Palmer, BENJAMIN MORGAN, D. D., LL. D.: clergyman; b. in Charleston, S. C., Jan. 25, 1818; was educated at the University of Georgia and the Theological Seminary at Columbia, S. C.; was pastor of the First Presbyterian church, Savannah, Ga., 1841-43; of the First Presbyterian church, Columbia, S. C., 1843-56; and since 1856 of the First Presbyterian church, New Orleans, La. Dr. Palmer was Professor of Church History and Polity in the Theological Seminary, Columbia, S. C., 1853-56; moderator of the first southern assembly, Augusta, Ga., 1861; and has been commissioner to ten general assemblies. Since 1847 he has been one of the editors of *The Southern Presbyterian Review*, of which he was a founder. He is the author of *The Life and Letters of J. H. Thornwell, D. D., LL. D.* (Richmond, 1875); *Sermons* (2 vols., New Orleans, 1875-76); *The Family in its Civil and Churchly Aspects* (New York, 1876); *Formation of Character* (1889); *The Broken Heart* (1890); and *Theology of Prayer* (Richmond, 1894). C. K. HORT.

Palmer, EDWARD HENRY: Orientalist; b. at Cambridge, England, Aug. 7, 1840; graduated at the university of that city 1867; was a member of the Sinai surveying expedition of 1868-69, and the survey of Moab in behalf of the Palestine Exploration Society 1869-70; acquired a practical knowledge of Oriental languages, and became Professor of Arabic at Cambridge 1871. Author of *The Negeb, or South Country of Scripture* (1871); *The Desert of the Exodus* (1871); *Arabic Grammar* (1874); of several translations from and into the Persian language, of a *Persian-English and English-Persian Dictionary* (1876-83); and of the *Qur'an* (1880); *Song of the Reed* (1876); *Poems of Behâ ed Din Zoheir* (1876-77). In 1882, during the British military operations in Egypt, he was commissioned to dissuade the Bedouins E. of the Red Sea from allying themselves with Arabi Pasha, but while on a journey from Suez was murdered, with his two companions, by Bedouins Aug. 11. See the *Life* by Walter Besant (1883).

Palmer, ERASTUS DOW: sculptor; b. at Pompey, N. Y., Apr. 2, 1817; was for some years a carpenter at Utica; be-

gan in 1846 to cut cameos; achieved great success; removed to Albany; began a new career as a sculptor 1852; has produced above 100 works in marble, including several portrait-busts of eminent men; has executed various groups, including one representing the landing of the Pilgrims, intended for the Capitol at Washington.

Palmer, JOHN McCauley: soldier; b. at Eagle Creek, Ky., Sept. 13, 1817; removed to Illinois 1831; settled at Carlinville; was admitted to the bar 1839; took an active part in politics; State Senator 1852-55; was prominent in the organization of the Republican party 1856; delegate to the peace convention at Washington, D. C., Feb., 1861; appointed colonel Fourteenth Illinois Volunteers in May; accompanied Gen. Fremont in his expedition to Springfield, Mo.; appointed brigadier-general of volunteers 1861; participated in battles of New Madrid, Island No. 10, Corinth, and Murfreesboro; and was made major-general of volunteers Nov. 29, 1862; was in command of the Fourteenth Corps Oct., 1863, to Aug., 1864; was in Sherman's Atlanta campaign and subsequently in command of department of Kentucky; was mustered out Sept., 1866; Governor of Illinois 1869-73; U. S. Senator 1891.

Revised by JAMES MERCUR.

Palmer, JOHN WILLIAMSON, M. D.: author; b. at Baltimore, Md., Apr. 4, 1825; graduated at the University of Maryland 1847; studied medicine in Philadelphia; was city physician of San Francisco, Cal., in 1849; went in 1852 to China; served 1852-53 as surgeon of the East India Company's war-steamer *Phlegathon* in the Burmese campaign; was active on the Confederate side during the civil war in the U. S.; became afterward an editor in Baltimore, removing to New York city in 1870. Author of *The Golden Dragon* (1853); *The Queen's Heart*, a successful comedy (1858); *The New and the Old* (1859); and *After his Kind*, a novel (1886); has translated Michelet's *L'Amour* and other works from the French; compiled *Folk-songs* (1860) and several other volumes of selected poetry; is widely known for his admirable papers on East Indian life. His poem, *Stonewall Jackson's Way*, was a popular Confederate ballad during the civil war.—His wife, HENRIETTA (Lee) PALMER, b. at Baltimore in 1834 and married in 1855, is the author of *The Heroines of Shakspeare* (1858); *The Stratford Gallery*; *Home Life in the Bible*; of translations from the French, etc.

Revised by H. A. BEERS.

Palmer, RAY, D. D.: clergyman and hymn-writer; b. at Little Compton, R. I., Nov. 12, 1808; graduated at Yale College 1830; studied theology at New Haven; was pastor of Congregational churches at Bath, Me., 1835-50, and at Albany, N. Y., 1850-66; and secretary of the American Congregational Union at New York 1866-78. He was author of many literary contributions to reviews, some doctrinal works, and several volumes of religious poems, among which is the favorite hymn, *My Faith looks up to Thee*. A collection of his poetical works was issued in 1875. D. at Newark, N. J., Mar. 29, 1887.

Palmer, ROUNDELL, Earl of Selborne, D. C. L.: b. at Mixbury, Oxfordshire, England, Nov. 27, 1812; was educated at Rugby and Winchester schools, and at Trinity College, Oxford, and graduated with high honors 1834, obtaining a fellowship at Magdalen College and the Eldon law scholarship; was called to the bar 1837; entered Parliament 1847; became queen's counsel 1849; knighted and appointed solicitor-general 1861; was attorney-general 1863-66; was counsel of the British Government before the Geneva court of arbitration on the Alabama claims 1871; became Lord Chancellor with the title of Baron Selborne of Selborne, Hampshire, Oct., 1872, retiring from that office Feb., 1874; became Lord Chancellor again in 1880, and Earl of Selborne in 1882. He was author of *The Book of Praise*, from the *Best English Hymn-writers* (1862), and was well known from his advocacy of the establishment of a law university in London. D. at Petersfield, England, May 4, 1895.

Palmerston, HENRY JOHN TEMPLE, Viscount, and Baron Temple: statesman; b. at Broadlands, Hampshire, England, Oct. 20, 1784; a son of an Irish peer of the family of Sir William Temple; succeeded in 1802 to the title; was educated at Harrow and St. John's College, Cambridge, where he graduated in 1803; declined the election to the House of Lords as a representative peer for Ireland; entered Parliament for Bletchingley 1806; represented Newport in Parliament 1807-11, and Cambridge University 1811-31, and after that represented Bletchingley, South Hants, and Tiver-

ton; became a Junior Lord of the Admiralty 1807; was Secretary of War 1809-28, under five administrations, having abandoned high Tory principles for moderate Liberalism; was Secretary of State for Foreign Affairs 1830-34, 1835-41, and 1846-52, attaining great distinction as a diplomatist. He appears to have sympathized with Napoleon's *coup d'état* of 1851, and his avowal of his views resulted in his withdrawal from the cabinet. He was Secretary of State for Home Affairs 1852-55, and again sided with Napoleon on the outbreak of the Crimean war, favoring an alliance with France against Russia. When the war spirit in Great Britain flagged, he resigned from the cabinet, but returned to office upon receiving pledges of a warlike policy. He was Premier and First Lord of the Treasury 1855-58 and 1859-65. His premiership is distinguished by the warlike spirit shown by the Government in dealing with foreign affairs. He saw the Crimean war to a close, refused to mediate between France and Austria in the Italian war, standing firmly for the expulsion of the latter power from Italy, and on the eve of the Danish war, in conjunction with Napoleon III., he warned Prussia and Austria against any interference with the independence of Denmark; but when Napoleon drew back he looked about for allies with whom to defend Danish rights, but, finding none, left Denmark to her fate. In 1861 he was appointed lord warden of the Cinque Ports, and in 1863 was elected rector of Glasgow University. D. at Brockett Hall, Hertfordshire, Oct. 18, 1865, and was buried in Westminster Abbey. See his *Life*, by Lord Dalling (1870, incomplete).

Palmetto [from Span. *palmito*, dimin. of *palma*, palm, palm-tree]: properly, a small palm-tree of Southern Europe (*Chamaerops humilis*); also any one of certain other small palms. Of these the U. S. has the following: (1) *Sabal palmetto*, the cabbage palmetto, found as far N. as the Cape Fear river, in sandy soil near the coast. Its timber is useful in constructing piers, since it is durable and not subject to the attack of the teredo. The tree sometimes reaches the height of 50 feet. The leaves are largely used in making hats, and the "cabbage," or crown of young leaves, is very palatable when boiled. The root is highly astringent. (2) *Serenoa serrulata*, the saw-palmetto, has a creeping stem from 5 to 8 or more ft. 6 in. in diameter, with thick clusters of fan-shaped leaves, the abode of many rattlesnakes. (3) *Sabal adansonii*, the dwarf palmetto, is stemless and has leaves 2 or 3 feet high. It covers dense patches of ground in low coast regions. (4) *Rhapidophyllum hystrix*, the blue palmetto, is a low palm with long-stemmed fan-like leaves, in the axils of which are sharp needle-like thorns. The roots of the palmettos are in some soils so numerous and strong as to make the plowing of land very difficult and expensive. Much of the palmetto-leaf of commerce is derived from the Palmyra palm. Revised by L. H. BAILEY.

Palm Family [*palm* is from Lat. *palma*, possibly so named from the resemblance of the leaf to the palm of the hand, or possibly

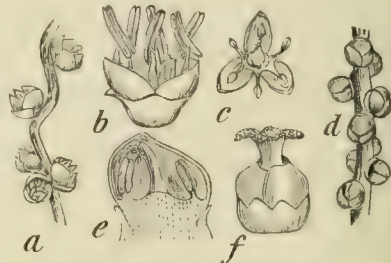


FIG. 1. Flowers of various palms.

three sepals and three petals, usually six stamens, and a compound three-celled pistil (Fig. 1) or three simple pistils. Each cell of the ovary contains a single erect, ascending, or even pendulous inverted ovule, but in fruiting, as a rule, but one seed is developed. The embryo is small, conical or cylindrical, and lies imbedded in a large endosperm.

The stems of palms are mostly unbranched, cylindrical, or nearly so, and are covered with the decaying bases of the leaves. The crown of leaves always clothes the summit of the stem, and rises with its elongation, new leaves forming above, while the older ones die away below. The leaves are simple or palmately or pinnately compound, and are often many feet long and broad. (Fig. 3.)

Palms vary greatly in size, some scarcely rising above the ground, while others are 100 feet or more in height. In

their growth they first attain very nearly their full diameter, and then shoot up their cylindrical stems, which subsequently increase in size little or not at all. Some species, especially of the genus *Calamus* and its allies, are long, slender, prickly, climbing shrubs, often attaining a length of 300 feet or more.

It would be impossible in a short article to enumerate the many uses which palms serve for the world at large, and especially for the inhabitants of tropical regions. The grasses

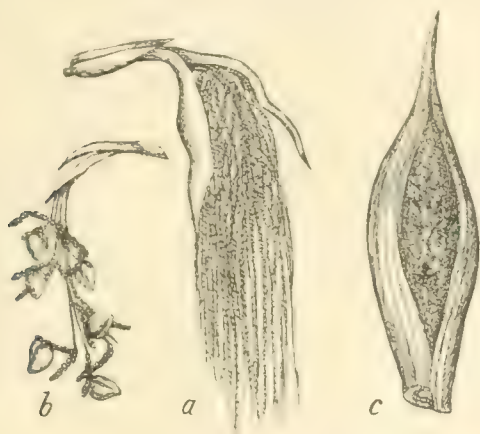


FIG. 2.—Inflorescences of palms

possibly excepted, no other family of plants excels the palms in economic importance in relation to mankind. Food, clothing, shelter, furniture, utensils, tools, weapons, ornaments, medicines, and intoxicating drinks are sometimes all supplied by one or more species.

The family has been separated into five sub-families by Dr. Oscar Drude, as follows:

Sub-family I. *Corypheae* (Fig. 1, *a b c*; Fig. 3, *a b c*), with inflorescence diffusely branched; flowers with three free

sometimes 12 feet in diameter. (Fig. 3, *b*.) The palmetto (*Sabal palmetto*) is a short-stemmed species common in the Southern U. S. The wax-palm (*Copernicia cerifera*) of Brazil is notable for the waxy coating on its young leaves, which is collected for making candles. (Fig. 3, *a*.) Nine other species in this sub-family are natives of the U. S.

Sub-family II. *Borassineae* (Fig. 2, *b*), with inflorescence of simple or little branched, thickened axes; flowers with three united carpels; fruit, a drupe; leaves, palmate. The Doum palm (*Hyphæne thebaica*) of the upper Nile region is remarkable for its branching habit. Its large fruits have the flavor of gingerbread, whence the name gingerbread-palm which is often applied to it. (Fig. 2, *b*.) The Palmyra palm (*Borassus flabelliformis*) of tropical Africa and Asia is a stately tree 20 to 100 feet in height, yielding "Palmyra wood." Wine, toddy, and sugar are made from its juice. The double cocoanut (*Lodoicea sechellarum*) of the Seychelles islands is 100 feet high, with a trunk $1\frac{1}{2}$ to 2 feet in diameter. The large fruits weigh 30 to 40 lb. each, and grow in bunches of nine or ten. They take ten years to ripen.

Sub-family III. *Lepidocaryineae* (Fig. 3, *d e*), with branched inflorescence; flowers with three united carpels; fruit, covered with scales; leaves, palmate or pinnate, generally spiny. The sago-palms (*Metroxylon rumphii* and *M. levee*) of the East Indian Archipelago yield sago, which is obtained by splitting their trunks and extracting the soft pithy central portions, whose cells are filled with starch. The rattan palms (*Calamus rotang*, *C. rudentum*, *C. royleanus*, *C. seipionum*, etc.) of India are much used for making walking-sticks, matting, chairs, etc.

Sub-family IV. *Coccothrinaceae* (Fig. 1, *d e f*; Fig. 2, *c*; Fig. 3, *f g*), with simple or branched inflorescence; flowers with three united carpels; fruit, a smooth berry or drupe; leaves, pinnate.

The toddy palm (*Caryota urens*) of India attains a height of 50 to 60 feet, and furnishes great quantities of toddy. (Fig. 2, *a*.) The Gomuti palm (*Arenga saccharifera*) of the Indian Archipelago yields fiber, toddy, sugar, sago, casks, utensils, etc. (Fig. 3, *f*.) See GOMUTI PALM.

The Piassaba palm (*Attalea funifera*) of Brazil yields "Coquilla nuts," and a valuable fiber much used in the manufacture of cordage, mats, brooms, etc. The cocoanut-palm (*Cocos nucifera*), a native of the tropical parts of the Old World, now cultivated in all hot countries, yields the well-known cocoanuts of commerce. See COCOANUT.

Two genera of this sub-family, *Pseudophoenix* and *Oreodoxa*, are represented in the Southern and Southwestern U. S. The species of *Chamadorea* of South America are slender stemmed climbers, and are used in the construction of rude suspension bridges. (Fig. 1, *d e f*.)

Sub-family V. *Phytelephantineae*, with spicate or capitate inflorescence; flowers with three or four united or free carpels; leaves, pinnate.

The ivory-nut palms (*Phytelephas macrocarpa* and *P. microcarpa*) produce very hard nuts, whose endosperm resembles ivory, for which it is used as a substitute.

LITERATURE.—*Popular History of Palms and their Allies*, by Berthold Seeman (London, 1856); *The Illustrated Dictionary of Gardening*, 4 vols., by George Nicholson (London, 1885-89); Bentham and Hooker's *Genera Plantarum* (vol. iii., London, 1883); Engler and Prantl's *Die natürlichen Pflanzenfamilien* (vol. ii.); *Palmae*, by Oscar Drude (Leipzig, 1887).

CHARLES E. BESSEY.

Palмира, pāl-mee'ra: a town of the department of Cauca, Colombia; 7 miles E. of the river Cauca and 86 miles N. N. E. of Popayan; on a plain called the Llanos de Malagana, about 3,200 feet above the sea (see map of South America, ref. 2-B). Until 1860 it was a small village; since then it has become the most important place in the department, after Popayan, and the center of a rich agricultural and grazing district. It is especially noted for its excellent tobacco. The climate is somewhat insalubrious. Pop. (1892) about 10,000.

HERBERT H. SMITH.

Palmistry: See CHEIROMANCY.

Palmitic Acid: a fatty acid universally distributed in the fats of the animal and vegetable kingdoms. It is a colorless solid, lighter than water, crystallizes in small shining scales, and is without odor; insoluble in water, but freely so in hot alcohol and ether. Combined with glycerin, it occurs abundantly in palm oil, the fat of certain palms, in Chinese tallow, in Japanese wax, and the wax of *Myrica cerifera*. In the animal kingdom it is found in butter, in beeswax, in spermaceti, in human fat, etc. It is easily pre-

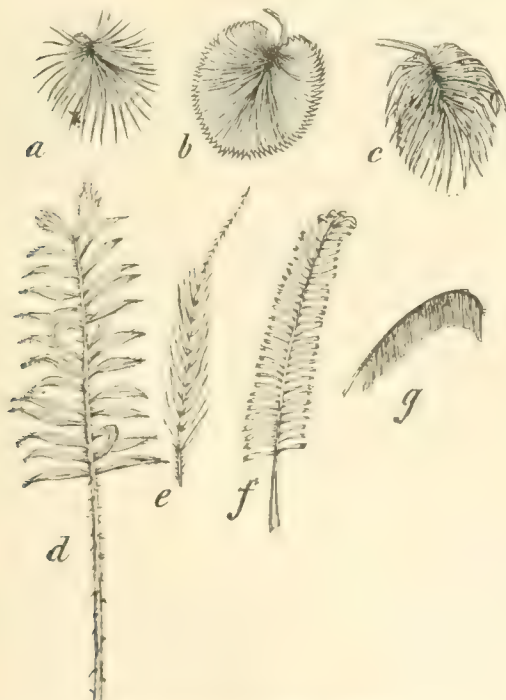


FIG. 3.—Forms of palm leaves.

carpels; fruit, a berry; leaves, pinnate in *Phoenix*, palmate in all others. Important members of this sub-family are the following: The date palm (*Phoenix dactylifera*) of Western Asia, Northern Africa and Southern Europe, bears large bunches of the well-known fruits. The talipot-palm (*Corypha umbraculifera*) of Ceylon and Malabar is remarkable for its gigantic leaves, the circular blades of which are

pared from palm oil by saponification with caustic potash, decomposing the soap with sulphuric acid, and recrystallizing the fatty acid several times from hot alcohol till it gives a steady melting-point.

The solutions of palmitic acid are acid, and if concentrated solidify on cooling, or if dilute yield tufts of slender needles with an acid reaction. This acid may be distilled unchanged, and, gently heated, evaporates without residue from an open dish. It burns like other fats with a light smoky flame. It forms with the alkali metals acid-salts analogous to the acid-acetates, and it forms normal or neutral salts with other metals according to their equivalence. The potassium and sodium palmitates are soluble in water and alcohol; the rest are insoluble.

Palmitic acid is made commercially for candle-making by fusing oleic acid with a large excess of caustic potash. The products formed are potassium palmitate, potassium acetate, and hydrogen. The potassium palmitate is washed, decomposed with sulphuric acid, the acid thus obtained washed and distilled.

Palmitins or *glyceryl palmitates* are ethers known as *mono-, di-, and tri-palmitin*, all crystalline fats which are artificially formed, of which the last is natural palmitin from palm oil and other fats. Revised by IRA REMSEN.

Palm Oil: the thick oil obtained from the fleshy pericarps of the fruit of *Elais guineensis* and *melanococca*, a palm-tree of Africa, and to some extent from other palms. It is extensively imported and made into soap, candles, and glycerin, and used for lubricating purposes. It is bleached and then pressed, and thus the palmitine is extracted for candle-making, while the elaine is used for lubricating, etc. The fresh oil is of a deep orange red, and has a pleasant smell as of violets. It may be used like butter. The oil palm is now naturalized in South America.

Palm Sunday: the Sunday before Easter, celebrated in the Greek and Roman Catholic and Lutheran Churches in commemoration of the triumphal entry of the Lord into Jerusalem (John xii.), on which occasion the multitude cast branches of trees before him. These branches are represented by sprays of palm, or, in countries where the palm does not grow, by those of other trees, as of the yew, willow, box, and fir. These branches are blessed by a priest and distributed to the congregation, who wear them for the rest of the day. The custom prevails, at least locally, of gathering and preserving the "palms," which are afterward burned, the ashes serving for use upon Ash Wednesday, the ashes of consecrated wood and of the old altar linen being also employed. It was another ancient custom that palmers returning from the Holy Land should bring with them leaves of the palm for service on Palm Sunday.

Palm-tree: See PALM FAMILY.

Palm Wine, or Toddy: an alcoholic beverage prepared from the saccharine sap of various species of palm. It yields by distillation a stronger drink called arrack. Palm wine is much used in India and other parts of Asia; it is made in Chili, and is almost the only fermented liquor made in Africa. See Johnston's *Chemistry of Common Life*.

Palmy'ra [Mod. Lat., named from the city of *Palmyra*, in Syria]: one of the noblest of the palm-trees, the *Borassus flabelliformis* of India and Ceylon. Its fruit is a valuable food, its timber is excellent, and it furnishes thatch, cordage, material for hats, fans, umbrellas; its leaves are used for writing tablets; sugar and arrack it produces abundantly. The young shoots are boiled and eaten, the seeds are edible, and the fruit yields a useful oil. This most useful tree is from 20 to 100 feet high and very beautiful, and its leaves are generally about 4 feet long, with stalks of about the same length. Each leaf has from seventy to eighty rays, and the stalks are spiny at the edges. The fruit is somewhat triangular, about the size of a child's head. It has a thick, fibrous, and rather succulent yellowish-brown or glossy-black rind, containing three seeds, each as large as a goose-egg, which are jelly-like and very palatable when young. As the palmyra is of slow growth, the wood near the circumference of the stem in old trees is very hard, black, heavy, durable, susceptible of a high polish, easily divided in a longitudinal direction, but very difficult to cut across. Palmyra-wood is the commercial name of this and of various other palms. In the north of Ceylon multitudes of people almost entirely depend on this tree for the supply of most of their wants, and in the palmyra regions of Southern Dekkan vast numbers of the inhabitants subsist chiefly on the

fruit of this palm. The deleb-palm, so important to the inhabitants of Central Africa, is believed to be nearly allied to the palmyra-palm. Revised by L. H. BAILEY.

Palmyra: an ancient city of Upper Syria, situated in an oasis, 150 miles N. E. of Damascus; was founded or enlarged by Solomon (2 Chron. viii. 4), and formed at that time a bulwark against the Bedouin hordes of the desert. It is called in Scripture Tadmor (a name which in the Authorized Version appears in Kings ix. 18, where the Hebrew text and the Revised Version read *Tamar*), of which Palmyra, i. e. the city of palms, is the Greek and Latin equivalent. Under the wars between the Romans and the Parthians it acquired great importance, developed a vast commercial activity, and became a splendid city. In the second century A. D. it was the commercial metropolis of Northern Arabia. In the third century of our era, Odenathus, a native of Palmyra, established an independent Palmyrene kingdom, which was further extended, comprising the whole of Syria, and parts of Mesopotamia, and brought to great prosperity by his widow, Queen Zenobia; but when the queen refused to acknowledge the authority of the Roman emperor, Aurelian defeated her army, dissolved her empire, and captured her capital in 272. A revolt, during which the Roman garrison was slain, occasioned its destruction shortly after, and it never recovered, though in 527 Justinian rebuilt its fortifications and endeavored to restore it. In 633 it was devastated by the Saracens, and again in 744. In 1400 Tamerlane completely destroyed it, and at present it is only a vast field of ruins. A small village, Thadmor, inhabited by a few Syrian shepherds, is situated close by. The ruins, among which some tombs with inscriptions in the old Palmyrene language and characters, and a temple of Baal, are very remarkable, were first visited by English merchants in 1691, and explored by Robert Wood and Dawkins in 1751, who published their researches (London, 1753). See Saint-Mart, *Histoire de Palmyre* (Paris, 1823); Vogüé, *Syrie Centrale* (Paris, 1869); J. Seiff, *Reisen in der asiatischen Türkei* (Leipzig, 1875); also W. Wright, *An Account of Palmyra and Zenobia* (London, 1894). Revised by S. M. JACKSON.

Palmyra: city; capital of Marion co., Mo.; on the Chi., Burl. and Quincy Railroad; 15 miles N. W. of Hannibal, 15 miles S. W. of Quincy (for location, see map of Missouri, ref. 2-H). It is in an agricultural region, and contains water-works, electric lights, several manufactories, a national bank with capital of \$60,000, a State bank with capital of \$50,000, and two weekly newspapers. The educational institutions include the Centenary High School (Methodist Episcopal South, opened in 1884), St. Paul's College (Protestant Episcopal, opened as the Ingleside Female College in 1848), and St. Joseph's College (Roman Catholic, opened in 1879). Pop. (1880) 2,479; (1890) 2,515.

Palmyra: village; Wayne co., N. Y.; on the Erie Canal, and the N. Y. Cent. and Hud. Riv. and the W. Shore railways; 13½ miles W. of Lyons, 23 miles E. S. E. of Rochester (for location, see map of New York, ref. 4-E). It is in an agricultural region, has important manufactures, and contains the Palmyra Classical Union School, a national bank with capital of \$1,000,000, a private bank, and 3 weekly and 2 monthly periodicals. Pop. (1880) 2,308; (1890) 2,131.

Palo Alto: town; Santa Clara co., Cal. (for location of county, see map of California, ref. 8-C); on the Coast Division of the Southern Pacific Railroad; 16 miles N. W. of San José, the county-seat, 34 miles S. by E. of San Francisco. It comprises a tract of over 8,400 acres, containing the costly mansion built by Leland Stanford and an extensive arboretum filled with a great variety of shrubs and trees, and is one of the three estates which Mr. and Mrs. Stanford deeded to the trustees of the LELAND STANFORD JUNIOR UNIVERSITY (q. v.) for university purposes. The beauty and healthfulness of this estate caused it to be chosen as the site for the university buildings. It has a State bank with capital of \$20,000, and a weekly newspaper. Pop. (1894) estimated, 1,500.

Palpitation of the Heart [*palpitation* is from Lat. *palpita'tio*, deriv. of *palpita're*, throb, beat, intensive of *palpa're*, feel, stroke, whence Eng. *palpable*]: the forcible pulsations of the heart which make themselves felt or produce unpleasant sensations. Palpitation may be due to organic disease of the heart, but in perhaps a majority of all cases the heart itself will be found normal and the cause of the palpitation will be discovered elsewhere. The most direct and immediate extraneous cause of purely functional or non-organic

palpitation is pressure upon the heart by some pleural effusion, some tumor-mass, or a flatulent and distended stomach. Diseases of the stomach, however, act in a double way, not only by the pressure in cases of flatulence, but also through the nervous system by reflex action. The latter cause also applies to diseases of the ovaries or uterus and other organs. Reflex excitability is furthered by causes increasing the general nervous instability of the patient. Among these is the overuse of stimulants, such as tea, coffee, tobacco, and alcohol. Anæmic and hysterical or otherwise neurotic subjects are for a similar reason prone to palpitations; and in exophthalmic goiter, a form of nervous disease, cardiac palpitation is the most important symptom. Finally, there are the cases of palpitation due to diseases of the heart itself—such as hypertrophy, valvular disease, fatty heart, etc. See HEART DISEASE.

Palpitation is a paroxysmal affection, attacks coming on with greater or less frequency, lasting a short time or perhaps a day and then subsiding. The pulse is generally rapid, from 100 to 150 per minute; but there are persons with all the subjective sensations of extreme palpitation in whom the pulse-rate is actually less than normal. On the other hand, there are cases in which the most excessive rapidity, as much as 300 per minute, may occasion no subjective sensations, or very little. These cases are designated *tachycardia*. Constant or frequently repeated palpitation leads to hypertrophy of the heart from over-exercise, as in exophthalmic goiter, athletes, etc.

The treatment of palpitation varies with the cause. In nervous cases or in palpitation from fright, excitement, and the like, sedatives, such as bromide of potassium, valerian, or camphor are called for. When the heart is weakened by organic disease and palpitates from inefficient power of the individual contractions, digitalis and other stimulants are needed. Finally, local treatment directed to the stomach, ovaries, or uterus, or constitutional remedies to improve the condition of the blood, or the simple correction of dietetic errors may suffice to control long-standing tendency to palpitation.

WILLIAM PEPPER.

Palpus (pl. PALPI): See ENTOMOLOGY.

Palsy: another term for PARALYSIS (*q. v.*).

Paludan-Müller, paa'loo-daan-mü'ler, CASPAR PETER, Ph. D.: historian; b. in Kjerteminde, Denmark, 1805; studied theology, but became a teacher; in 1840 rector of a Latin school; in 1872 Professor of History at the University of Copenhagen. His principal works are *Grevens Feide* (The Counts' Feud, 2 vols., 1853-54) and *De første Konger af den Oldenborgske stægt* (The Earliest Kings of the Oldenburg Line, 1874). D. in 1882.

D. K. D.

Paludan-Müller, FREDERIK: poet; b. at Kjerteminde, in the island of Fünen, Denmark, Feb. 7, 1809; studied law, but never practiced; visited Germany, Holland, France, Switzerland, and Italy 1838-40. His principal work, *Adam Homo* (3 vols., 1841-48), is a novel written in verse, in the strophe of Byron's *Don Juan*. In its contents the book is national and original; in its form it is an imitation of Byron. It is a satire upon the spirit of worldliness and compromise of our time as represented in the person of the hero. Among his other novels and tales, *Dandserinden* (1833) is the best known. Of his dramas some treat mythological subjects, *Amor og Psyche*, *Dryadens Bryllup*, etc.; others romantic, *Alf og Rose*, *Prinds og Page*, etc.; and others biblical, *Adam og Eva*. Prominent among his works are *Kalanus*, an Indian tragedy (1861), and *Adonis*, a romance written in verse (1874). D. Dec. 27, 1876. His *Poetiske Skrifter* were published at Copenhagen (8 vols., 1878-79).

Revised by D. K. DODGE.

Paludico'læ [Lat. pl. of *paludicola*, a marsh-dweller; *palus*, marsh + *colere*, inhabit]: an order, or sub-order, of birds containing the cranes, rails, and their allies; synonymous with ALECTORIDES (*q. v.*).

Paludism: See MALARIA.

Pamir Dialects: the Iranian dialects spoken in the central Asiatic table-land, the plateau of Pamir. Most important of these is the Munji or Munjāni, spoken in the region of Mungān, near Kāfiristān; this tongue presents interesting resemblances to the ancient language of the AVESTA (*q. v.*). Other dialects are the Sanglichi, Ishkāshāmi, Wakhī, Shighini, and the Yaghnoobi, or speech of the Galchas near the source of the Zarafshān. (See IRANIAN LANGUAGES AND LITERATURE.) Consult Tomaschek, *Centralasiatische Studien*, vol. ii., *Die Pamir-Dialekte* (Vienna, 1880), and W. Geiger,

Die Pamir-Gebiete in Penck's *Geographische Abhandlungen*, vol. ii., 1 (Vienna, 1887).

A. V. WILLIAMS JACKSON.

Pamirs: the geographical designation of the elevated region in Central Asia between lat. 36° and 39° N. and lon. 70° to 76° E. Politically it is divided between Chinese and Russian Turkestan, Bokhara, Afghanistan, and a number of petty states and independent tribes N. of the Punjaub. It extends from the Trans-Alai Mountains on the N. to the Hindu Kush on the S., and from the plains of Kashgar to the upper tributaries of the Oxus. It is a complex of mountains, valleys, and limited plains, all at elevations above 12,000 feet, and the mountains sometimes reaching 20,000 and 25,000 feet. It is divided into several individual isolated plains, as, from S. to N., the Little Pamir, the Great Pamir, Pamir Alichur, Pamir Rang-Kul, Pamir Sariz, Pamir Khartosh. The Pamir region is sometimes referred to as the "Roof of the World." It is traditionally the birth-place of the Aryan race, and some of the names of places still in use there present curious similarity to corresponding ones found in Genesis. The Anglo-Russian rectification of the Afghan boundary omitted the consideration of the Pamirs, as the region was little known and considered impassable. This omission attracted Russian and then British attention to it very strongly, and its resulting strategic importance has led to many explorations from both N. and S. since 1870. See Morgan, *The Pamir*, *Scot. Geog. Mag.*, viii., 1892, and Immanuel, *Die Pamirfrage*, *Petermanns Mitteilungen*, xxxviii., 1892—each article with a map. M. W. H.

Pamlico (or **Pamplico**) Sound: the largest of the sounds of North Carolina; fenced by long low islands from the open sea, with which it communicates by Ocracoke, Hatteras, Loggerhead, New, and other inlets. It is about 20 feet in average depth, with great areas of shoal water. It communicates with Albemarle Sound on the N. Its shores are low and often marshy. The fisheries are important. The Neuse and Pamlico are its largest tributaries.

Pampa, La: an ill-defined territory of the Argentine Republic, W. of Buenos Ayres and N. of the river Colorado; variously estimated to contain from 58,000 to 91,342 sq. miles. It lies partly in the region of the pampas, but there are also extensive tracts of woodland and hills of considerable size, especially toward the N.; in the open lands are numerous lagoons, often surrounded by *medanos*, or shifting sand-dunes. Since 1879, when the hostile Indian tribes were exterminated or driven beyond the Rio Negro, the land has been rapidly taken up by colonists. Sheep and cattle breeding are almost the sole industries. Pop. (1893) about 50,000. Acha, or General Acha, the capital, has about 2,500 inhabitants.

HERBERT H. SMITH.

Pam'pas [plur. of *pampa*, probably Peruv. *bamba*, a plain]: in the southern and western parts of South America, any large open plains or rolling lands; hence the word is synonymous, or nearly so, with the terms llanos, savannas, prairies, etc., used in other parts of America. In a special geographical sense, the vast grassy plains which occupy a portion of the Argentine Republic. Roughly defined, they comprise an area of over 300,000 sq. miles, between the Paraná and the Atlantic on the E., the hills of Córdoba, San Luis, and Los Andes on the W., the Rio Salado on the N., and the Rio Negro on the S. The Gran Chaco and the eastern part of Patagonia are plains continuous with the pampas, but they are sufficiently distinguished by their vegetation and geological structure. To the eye the pampas are perfectly level; there is, however, a gentle slope southeastward, from 1,300 feet above sea-level, near Córdoba, to 50 or 60 feet by the Atlantic, S. of the Rio de la Plata. Slight depressions are occupied by shallow lakes and swamps; many streams are lost in these, and others have excavated deep ravines or *barrancas*; the western side of the Paraná presents a long line of clay cliffs, the cut edges of the plains. The soil is somewhat impregnated with salt; there are extensive salines, and in the northern and western districts many of the lakes and even the streams are brackish. The vegetation consists entirely of grasses and herbs, more luxuriant and perennially green in the depressions; in other parts they dry up in July and August, leaving the ground bare. The soil in the depressions is often well suited for agriculture, and good crops of grain and vegetables are raised; but the pampas are above all adapted for grazing, and they are famous for the immense herds of cattle and flocks of sheep which are pastured on them. The half-wild *gauchos*, or herdsmen of mixed race, who were formerly the only inhabitants, are gradually

giving place to European immigrants, who have introduced better methods of planting and herding. The clays composing the pampas are of late Tertiary and Quaternary age, and contain the bones of many species of extinct mammalia, including the *Megatherium*, *Scelidotherium*, and *Myiodon*. See **PLAIN** and **ARGENTINE REPUBLIC**.

AUTHORITIES.—Darwin's *Voyage of a Naturalist*; Napp, *The Argentine Republic* (1876); Raimon Lista, *Exploración de la Pampa* (1885). **HERBERT H. SMITH.**

Pampas del Sacramen'to: an extensive tract of more or less open land in Northern Peru, between the rivers Huallaga and Ucayali, similar in character to the Brazilian plateau. They were discovered by Simon Zara, a Jesuit missionary, in 1732, and until 1767 supported important missions, but are now nearly deserted. The area is at least 20,000 sq. miles. **H. H. S.**

Pampas Grass: the *Ciguieria argenteum*, a reed-like grass from the temperate regions of South America, much cultivated for ornament. The recurved slender leaves are clustered thickly at the ground. From the middle of the tuft the flowering stems rise 6 to 12 feet high, and bear an ample silvery panicle. The staminate and pistillate flowers are borne by different plants; the flower-clusters of the female plant are distinguished by their larger size and greater spread; it is therefore the most ornamental.

Pam'philus: martyr; b. at Berytus in Phœnicia about 240 A. D.; embraced Christianity; became a friend and associate of Eusebius; founded a library at Cæsarea in Palestine, which he bequeathed to the Christian church there, and suffered martyrdom in 309. He wrote an apology for Origen, of which only the Latin translation by Rufinus of the first book has come down to us.

Pamphyl'ia (in Gr. *Παμφυλία*): an ancient district of Asia Minor, extending along the Mediterranean from Cilicia on the E. to Lycia on the W. With the exception of the plain of Perge-Aspendus, it is mountainous, being covered with ramifications of the Taurus Mountains, which formed its northern boundary. The inhabitants were a mixed race, composed of Greek colonists and aboriginal tribes, and their language and institutions exhibited a similar mixed character, half Greek and half barbarian. The country belonged to the Persian empire, and after its fall to the Macedonians. When Alexander died it fell to Syria, and became subsequently a Roman province. Its chief cities were Olbia, Attalia, Perge, Aspendus, Sylleum, and Cibyra. Its chief rivers were the Cestrus and the Eurymedon. See the monumental work of Niemann and Petersen, *Städte Pamphyliens und Pisidiens* (Vienna, 1890), vol. i., *Pamphylien*; Ramsay, *Historical Geography of Asia Minor* (London, 1890, p. 415 ff.). **J. R. S. STERRETT.**

Pampl'o'na, or **Pampeluna** (anc. *Pompeopolis*): capital of the province of Navarre, Spain; situated on the Arga, a tributary of the Ebro (see map of Spain, ref. 12-H). It is fortified and defended with a strong citadel (modeled on that of Antwerp), and has a Gothic cathedral (1397), a natural history collection, a bull-ring (accommodating 8,000 spectators), a magnificent aqueduct on ninety-seven arches, manufactures of silk, leather, pottery, and a trade in wine. Originally a town of the Vascones, it was rebuilt by Pompey, from whom it derived its name. It was the capital of Navarre after 907. In the fourteenth century it was greatly strengthened by Charles III. It was taken by the French in 1808 and held until 1813, when it was freed by Wellington. In 1873-76 it was a point of attack by the Carlists, but never taken. Pop. (1887), 26,663.

Pamplona: a town of the department of Santander, Colombia; 84 miles N. E. of Socorro; in a mountain valley, 7,000 feet above the sea (see map of South America, ref. 2-C). It was founded by Pedro de Ursua in 1549, and soon after rich gold mines were discovered in the vicinity; these are now abandoned, and the town has lost much of its ancient importance. It is the seat of a bishopric and contains many old convents, etc. The climate is healthful, but the frequent thick mists make it disagreeable. Pop. about 9,000. **H. H. S.**

Pamun'key River: a stream formed in Virginia by the confluence of the North and South Anna rivers. It flows S. E. and at West Point joins the Mattaponi to form the York river. Navigation by vessels of considerable draught once extended to Hanover Court-house, more than 60 miles, but the river is now shallow and full of sand-bars, and navigable only some 12 miles to White House.

Pan (in Gr. *Πάν*): a son of Hermes by a daughter of Dryops (or of Zeus by Callisto). He was a genuine Greek god, and was originally a light-god (*φάω*), though in poetry and art he was the patron of flocks and pasturage (*πᾶν = pasco*). The Greek conception of Pan is given beautifully in *Hom. Hymn.*, xix. (cf. *Theocritus*, i., 16 ff.). Pan had goat's legs, horns, beard, tail, ears, and face; he was so ugly that his mother was terrified when she first saw him. He was the inventor of the syrinx and of pastoral music; had a loud voice by which he frightened the wayfarer and even put armies to flight, wherefore such sudden flight is called *panic* (*πανικός φόβος*). He must not be confounded with the Satyrs, Sileni, or Roman Fauns. For Pan in art, see the article *Pan* in Baumeister's *Denkmäler*.

J. R. S. STERRETT.

Pana: city; Christian co., Ill. (for location, see map of Illinois, ref. 7-E); on the Balt. and Ohio S. West., the Cleve., Cin., Chi. and St. L., and the Ill. Cent. railways; 35 miles S. by W. of Decatur, 42 miles S. E. of Springfield. It is in a coal-mining region, and has considerable trade, a national bank with capital of \$50,000, a private bank, and a daily and two weekly newspapers. Pop. (1880) 3,009; (1890) 5,077.

Panætius (in Gr. *Παναίτιος*): Stoic philosopher of the second century B. C.; friend of Lælius and Scipio Africanus; author of a lost work *On Duty* (*περί του καθήκοντος*), which forms the basis of Cicero's *De officiis*. See H. N. Fowler, *Panaetii fragmenta* (1885). **B. L. G.**

Panama': a department of Colombia, including the Isthmus of Panama to the confines of Costa Rica; area, 32,380 sq. miles. About half the territory, principally in the middle and western parts, is settled; the remainder is peopled only by a few roving Indians. The grazing industry has attained some importance in the western districts; agriculture is everywhere backward, and the manufactures are insignificant. Gold is mined in small quantities, and coal and other minerals are reported. The forests are rich in cabinet woods. The pearl-fisheries of the Pacific coast have existed since the conquest, and are still important. Panama was the first region in continental America settled by Europeans (see **DARIEN**), and since 1535 it has had a special importance owing to the trade across the isthmus. In 1698-1700 an unsuccessful attempt was made to plant a Scotch colony on San Blas Bay. The isthmus was incorporated with the viceroyalty of New Granada in 1718. It was independent from 1857 to 1860. Pop. (1885) 315,000. See **PANAMA**, **ISTHMUS OF**. **H. H. S.**

Panama: capital and largest city of the department of the same name; on the southern or Pacific side of the isthmus, at the head of the Bay of Panama; terminus of the Panama Railway, which connects it with Aspinwall (see map of Central America, ref. 9-N). It is the oldest city of European origin in continental America, having been founded by Pedro Arias Davila in 1519. The old city, 6 miles S. E. of the present one, was burned by the buccaneer Henry Morgan in 1670, and is now marked only by ruins. Panama was long the most important port on the Pacific side of Spanish America; the trade of Peru, Chili, Central America, and a portion of that of the East Indies, centered here; and there was a regular commerce with Spain through the Caribbean ports of Nombre de Dios and Portobello. With the development of the route around Cape Horn, and the transference of much of the Peruvian trade to the land route through New Granada, Panama declined in importance. The completion of the isthmian railway in 1855 gave it a new impetus; but it has suffered greatly from revolutions and from destructive fires. The modern city is built on a rocky peninsula. There is no proper harbor for large vessels; the anchorage, 11 miles from the city, is partly protected by reefs and islands, but during the prevalence of north winds it is inconvenient and sometimes dangerous. Owing to the force of the tides, which rise from 12 to 22 feet, landings can be effected with safety only at certain hours; small steamers and lighters are used to transfer passengers and freight. The port is free, and besides the commerce in transit there is a considerable trade with Central America and the Pacific ports of Colombia. Among the interesting old buildings are the cathedral (one of the largest in America), convents, the palace of the Audiencia, and the ancient walls and fortifications, which were of great strength. The climate is warm and damp, but more healthful than that of other parts of the isthmus. Pop. (1892) about 25,000. **HERBERT H. SMITH.**

Panama, Isthmus of: a neck of land connecting North America with South America, and separating the Caribbean Sea from the Pacific Ocean. Broadly speaking, the isthmal portion of the continent includes all of Central America and Southern Mexico; but the name is generally restricted to the narrow portion extending from the Bay of Chiriqui to the river Atrato, lying entirely in Colombia and including the department of Panama, with a small portion of Cauca. It extends from W. to E., forming a double curve. The length is nearly 470 miles, and the average width is nearly 70 miles. The bays of Panama and San Miguel on the S., and of Chiriqui and Urabá on the N., form three minor constrictions which bear distinctive names. Beginning at the W., the Isthmus of Chiriqui, opposite the bay of that name, has a minimum width of about 45 miles. Beyond this the neck is broadened to 118 miles by the Azuero Peninsula on the S. The Bay of Panama reduces it to 31 miles opposite the Bay of San Blas, or about 35 miles between Panama and Aspinwall; this is known as the Isthmus of Panama proper, or of San Blas. The Isthmus of Darien (a name sometimes applied to the whole neck) is properly the portion between the Gulfs of Urabá and San Miguel, 35 miles in minimum width. An irregular mountain chain, the Cordillera de Baudó, runs the whole length of the isthmus, generally near the northern coast; westward it has volcanic peaks said to be over 7,000 feet high; but eastward it subsides to a range of hills, with passes less than 400 feet above sea-level. Humboldt's theory that this range formed a continuation of the Andes has not been confirmed by later explorations. It is separated from the Andes by the valley of the river Atrato, which forms the true limit of the South American continent; the head of the Atrato is separated from the Pacific only by low hills, and the region between the river and the ocean may be regarded as a part of the isthmus. The coasts of the isthmus are generally low, swampy, hot, and often very insalubrious; there are numerous fringing islets and larger outlying islands, especially on the Pacific side. Many small rivers descend to both coasts. On the southern slopes of the Cordillera there are considerable tracts of natural grassland; all the rest of the surface, where uncleared, is covered with matted forest. Rains are very abundant during nine months of the year, with frequent violent thunder-storms. The dry months are February, March, and April; from August to October the heat is very great, except in the mountains. Balboa, who first established the existence of the isthmus in 1513, crossed it in the part known as the Isthmus of Darien. The difficulties of this route, and of that opposite the Bay of Chiriqui, early led to their abandonment in favor of the easier road from Panama, by the valley of the river Chagres. This has continued to be the ordinary route across the isthmus, and it attained a new importance during the early rush for the California gold-fields. Here the Panama Railway (opened in 1855) crosses by a pass only 263 feet above tide-water; and it was the route chosen for the Panama ship-canal. See SHIP-CANALS. HERBERT H. SMITH.

Panama Ship-canal: See SHIP-CANALS.

Pan-American Congress: a conference of representatives of the U. S. and the republics of Mexico, Central and South America, Haiti, San Domingo, and the empire of Brazil, held at Washington for the purpose of discussing and recommending measures to regulate and improve the international relations, business intercourse, and means of direct communication between these countries. It was summoned in accordance with the provisions of an act of the U. S. Congress of May 24, 1888, and met at Washington Oct. 2, 1889, but in consequence of the invitation of the U. S. Government to the delegates of the congress to visit different parts of the U. S. before entering upon their labors, it adjourned to Nov. 18, 1889, when it began its regular sittings. The idea of such a congress was not new. Henry Clay's scheme for a Panama congress comprised several features of the later plan, but was never carried out. To James G. Blaine more than to any one else was due the assembling of such a body. Among the subjects discussed by the congress, without definite results, were the establishment of an international bank, the protection of copyrights and patent rights, the granting of subsidies to steamship companies, and the adoption of an extradition treaty. Among the measures which the congress voted to recommend to the various governments for adoption were a uniform system of weights and measures, a uniform commercial coinage, and a common method of legalizing documents.

Another important recommendation of the congress was that reciprocity treaties be adopted between the represented states. It adjourned Apr. 19, 1890.

Panard, pañ'naar', CHARLES FRANÇOIS: song-writer; b. at Courville, near Chartres, France, Nov. 4, 1694; went early to Paris, where he became a Government clerk. Possessed of a great facility in rhyming, he composed more than eight hundred songs and vaudevilles. These were mainly improvised, written only on odd scraps of paper if written at all, and sung at a tavern for the delight of his companions. They are gay, light, and seldom coarse pictures of the manners of the time in a vein of good-humored satire, and are masterpieces of their kind. Only part of them were collected in *Théâtre et Œuvres diverses* (4 vols., Paris, 1764) and *Œuvres choisies de Panard*, published by A. Gouffé (3 vols., Paris, 1803). D. June 13, 1765. A. G. CANFIELD.

Panas, PHOTINOS, M. D.: ophthalmologist; b. in Cephalonia, one of the Ionian islands, Jan. 30, 1832; graduated M. D. at the School of Medicine in Paris in 1860; settled in Paris and was naturalized as a citizen; in 1863 was made an associate professor and surgeon to the Central Bureau; was appointed ophthalmic surgeon to the Bicêtre Hospital in 1864, to the Lourcine and the Midi hospitals in 1865, to the St. Antoine and St. Louis hospitals in 1868, to the Lariboisière Hospital in 1872, and to the Hôtel Dieu in 1879; in 1879 he was appointed professor of ophthalmology. He has published many papers on subjects connected with his specialty in medical journals, and he is the author of a number of works, among the most important of which are: *Leçons sur le strabisme, les paralysies oculaires, etc.* (Paris, 1873); *Leçons sur les kératites, etc.* (1876); *Leçons sur les affections de l'appareil lacrymal, etc.* (1877); *Leçons sur les rétinites* (1878). S. T. ARMSTRONG.

Panchatantra [Sanskrit, having five books or sections]: an ancient Sanskrit collection of fables and tales, of ethico-didactic purpose. The form of the teaching bears much resemblance to that of the Buddhists, as exemplified in the Jātaka. The substance of the work is neither specifically Brahmanic nor Buddhistic, but rather, in general, Indic. The date of the extant form of the work is uncertain. The *Panchatantra*, or perhaps rather the earlier but now lost original thereof, has had a most remarkable history, and been transmitted through translations and translations of translations, sometimes under the name of the *Fables of Pilpay*, to almost all the peoples of Europe. The first known translation was the one into Pahlavi, about 550 A. D. Among the most notable are the Syriac version, Kalilag and Damnag (570 A. D.), text and translation by Bickell (Leipzig, 1876); the Arabic, edited by Silvestre de Sacy (Paris, 1816); Duke Eberhard's *Buch der Beispielen*, of marvelous popularity between 1483 and 1592; and Doni's *La moral filosofia* (Venice, 1552); of special interest as the immediate source of the first English version, that by Sir Thomas North (London, 1570). The last has been reprinted by Joseph Jacobs (London, 1888), under the title *The Fables of Bidpai*, with an introduction. Text edition by Kielhorn and Bühler (Bombay, 1885, 1891). Translations into German by Benfey, with famous introduction (Leipzig, 1859), and by Fritze (Leipzig, 1884); into French by Lancereau (Paris, 1871). For an account of the history of the work, see Lanman, *Sanskrit Reader*, pp. 311-316, or Jacobs's introduction. C. R. LANMAN.

Pancoast, JOSEPH, M. D.: surgeon; b. in Burlington co., N. J., Nov. 23, 1805; took his medical degree at the University of Pennsylvania in 1828; became, in 1831, an instructor in anatomy and surgery; surgeon to the Philadelphia Hospital 1838-45; Professor of Surgery 1838, and of Anatomy 1861-74, in the Jefferson Medical College, Philadelphia. He invented a number of new surgical operations; published *Operative Surgery, Essays and Lectures*, and other works; edited various reprints and translations of European works, and was author of many professional papers; and member of various learned societies. D. in Philadelphia, Mar. 7, 1882. Revised by S. T. ARMSTRONG.

Pancreas, or Sweetbread [*pancreas* is from Gr. *πᾶν* *pân*, sweetbread; *κρέας*, *kreas*, all + *kreas*, flesh]: a gland which in the human being is found behind the stomach, extending across the abdominal cavity. It weighs from 2 to 6 oz., though it seldom exceeds 5. A small posterior part (lesser pancreas) is sometimes detached. The right extremity is called the head, the left the tail, and the rest the body. In the octopus, a mollusc, the pancreas is a long,

convoluted, single cæcum. In other mollusks it is either absent or rudimentary. Some insects have analogous organs. (*Siebold*.) The pancreas of the cod is a cluster of cæcal follicles; in the higher cartilaginous fishes a number of such clusters are bound together into a glandular mass, with several distinct excretory ducts. In the higher vertebrates there is sometimes but one duct (the canal of Wirsung), but there are very often two even in man. In the human subject the larger canal usually unites with the common choledic duct. The minute structure and general aspect of the pancreas resemble those of the salivary glands. The secretion of the gland (called the pancreatic juice) is normally alkaline, viscid, and coagulable by heat. It is secreted in abundance only during digestion. Its specific gravity, according to Bernard (who derived his specimens generally from the dog by artificial fistulæ), is 1.040. It contains the principle PANCREATIN (*q. v.*), with other organic matters, and from 6 to 10 parts in 1,000 of ash. It is probable that it does not normally acidify the fats of the food, although it does so in the test-tube.

Revised by W. PEPPER.

Pancreatin: an extract derived from the pancreas. It should contain the four pancreatic ferments: trypsin, which digests proteids; steapsin, which splits up and emulsifies fat; amylopsin, which converts starch into sugar; and a milk-curdling ferment. It is by far the most important and most useful of the digestive ferments, either when administered by the physician or when acting in the secretion of the pancreas of the individual, and is used for the purpose of peptonizing foods. See PEPTONIZED FOOD. H. A. H.

Panda: See AILURUS.

Pandects: See ROMAN LAW.

Pando'ra [= Lat. = Gr. Πανδώρα, liter., all-gifted; πᾶς, all + δῶρον, gift]: in the old Greek legend, the first woman on earth, sent by Zeus to mankind in vengeance for Prometheus's theft of the heavenly fire. Aphrodite gave her beauty, Hermes cunning, and each of the gods bestowed on her some fatal gift for the punishment of mankind (*Hesiod, Works and Days*, 42-104). Again, it is said that the gods gave her a box full of blessings for mankind, but, prompted by curiosity, she opened the box, and all the blessings flew away except hope.

Revised by J. R. S. STERRETT.

Panæas: See CÆSAREA PHILIPPI.

Pangenesis [Mod. Lat.; Gr. πᾶς, πᾶν, all + γένεσις, production]: a theory of reproduction propounded by Darwin in his *Animals and Plants under Domestication*, and best given in his own words: "It is universally admitted that the cells or units of the body increase by self-division or proliferation, retaining the same nature, and that they ultimately become converted into the various tissues and substances of the body. But besides this means of increase I assume that the units throw off minute granules which are dispersed throughout the whole system; that these, when supplied with proper nutriment, multiply by self-division, and are ultimately developed into units like those from which they were originally derived. These granules may be called gemmules. They are collected from all parts of the system to constitute the sexual elements, and their development in the next generation forms a new being; but they are likewise capable of transmission in a dormant state to future generations, and may then be developed. Their development depends on their union with other partially developed or nascent cells which precede them in the regular course of growth. . . . Gemmules are supposed to be thrown off by every unit, not only during the adult state, but during each stage of development of every organism; but not necessarily during the continued existence of the same unit. Lastly I assume that the gemmules in their dormant state have a mutual affinity for each other, leading to their aggregation into buds or into the sexual elements. Hence it is not the reproductive organs or buds which generate new organisms, but the units of which each individual is composed."

F. A. LUCAS.

Pan'golin [from Malay *pangūlang*]: a common name synonymous with Manis, for any member of the MANIDIDÆ (*q. v.*).

Panicle, pāa-nēe-kaa'lā, MASOLINO, da: painter; b. at Valdesa, Italy, in 1378. He was a pupil of Lorenzo Ghiberti, and in early youth was an excellent goldsmith and engraver. At nineteen he gave himself up to painting and studied under Starnina for a while, then went to Rome, where he painted a room for the Orsini family. On his re-

turn to Florence he painted at the Carmine a figure of St. Peter beside the Chapel of the Crucifix. This work was so much praised that the Brancacci chapel was intrusted to him to adorn with subjects from the life of St. Peter. He is reported to have died in Hungary in 1415.

Panic, Commercial: See COMMERCIAL CRISES.

Pāṇini: the greatest of Sanskrit grammarians. His date is uncertain, but is probably to be set several centuries before Christ. He is believed to have been born in the extreme N. W. of India, at Čalātura, near Attock on the Indus. He had doubtless many predecessors, but his own work attained an authority which made it powerful in shaping the language of the later Sanskrit literature. It is composed in a style of enigmatical brevity, and its point of view is wholly different from ours. The principal Occidental work upon Pāṇini is by Böhlingk (2 vols., Leipzig, 1886-87), with text, translation, explanations, indices, etc.

C. R. LANMAN.

Paniz'zi, Sir ANTONIO, K. C. B.: librarian; b. at Brescello, in the duchy of Modena, Sept. 16, 1797; took his university degree at Parma in 1818; was implicated in the revolutionary plot of 1821 and obliged to flee; after spending some years on the Continent and in England was offered the professorship of Italian in University College, London; in 1831 became an assistant in the British Museum; in 1837 was appointed keeper of printed books, and in 1856 succeeded Sir Henry Ellis as principal librarian. He reorganized the library, planned the catalogue, and designed the new library building. His most important literary works are critical editions of *Orlando Innamorato* and *Orlando Furioso* (London, 1830-34) and *Sonetti e Canzoni* (London, 1835). D. in London, Apr. 8, 1879.

Panjab: See PUNJAUB.

Panmixia: See EVOLUTION.

Panno'nia: province of the Roman empire; lying between the Danube and the Alps; bounded N. and E. by the Danube, which separated it from Germania and Dacia, S. by the Save, which separated it from Illyria, and W. by the mountains of Noricum. It was conquered and made a Roman province in the reign of Augustus, and 100 years later was divided into Upper and Lower Pannonia. Frequent rebellions compelled the Romans to build a large number of fortresses in the country, of which Vindobona, the present Vienna, was the most remarkable, and to keep large garrisons in the cities. During the decline of the Roman empire, Pannonia fell into the hands of the Huns, and from them it passed successively to the Ostrogoths, Longobards, and Slavs, till, in the ninth century, the Magyars settled on it and kept it.

Pannus: See GRANULAR LIDS.

Panopolis (Egypt. *Khemmis*; now *Ekhmīm*, or *Akhmīm*): one of the most ancient cities of Egypt; on the east side of the Nile (26° 36' N. lat.). It contained one of the principal sanctuaries for the priapian worship of Min (whom the Greeks identified with Pan). The local ruins are disappointing and are falling into rapid decay. A necropolis, discovered by Maspero in 1884, furnished many mummies and other antiquities, some of them going back to the sixth dynasty. It is now a thriving town containing 10,000 inhabitants.

CHARLES R. GILLET.

Panormita'nus: the common surname of the great canonist Nicholas de Tudeschis; b. at Catania, in Sicily, in 1386; entered the Benedictine order in 1400; studied canon law at Bologna, and afterward taught it with eminent success at Siena, Parma, and Bologna. In 1425 he was made auditor of the Rota and *referendarius apostolicus* by Martin V., who also gave him the abbey of Maviacum, in the diocese of Messina. In 1427, however, he entered the service of King Alfonso of Sicily, whom he represented at the Council of Basel. In 1440 he was made a cardinal by Felix V. D. at Palermo in 1445. His commentaries on the decretals of Gregory X. and on the Clementines, as well as his *Questiones, Consilia*, and other treatises on canon law, were considered authoritative by his contemporaries and nearest successors, and were quoted as such even by Melancthon. They appeared in a collected edition at Venice (9 vols., 1617). See Schulte's *Geschichte der Quellen des canonischen Rechts* (2 vols., 1877).

Panormus: See PALERMO.

Panorpa'ta (*Panorpa*, a generic name): an order of insects frequently called Mecaptera (see ENTOMOLOGY), in

which there is a complete metamorphosis, jaws fitted for biting placed at the end of a beak-like prolongation of the head, and two similar membranous wings with few cross veins. These forms were formerly included in the Neuroptera, but their larvae are more like those of the Lepidoptera, being caterpillar-like, the abdomen being furnished with eight pairs of fleshy legs. The scorpion-flies (*Panorpa*) are the most abundant members of the order. They derive the common name from the fact that the end of the abdomen of the male bears some resemblance to that of the scorpion, but in reality it is furnished not with a sting, but with a pair of clasping organs. *Boreus* contains the snowflies, brown or blackish forms found on the snow in the entire winter. All of the *Panorpa*, so far as known, are carnivorous. J. S. KINGSLEY.

Pan-Presbyterian Council: See PRESBYTERIAN CHURCH and ALLIANCE OF THE REFORMED CHURCHES.

Pansy: See VIOLET.

Pantellaria, pân-tel-lă-ree'ă: a small island between Africa and Sicily, in the Strait of Sicily; included in the Italian province of Trapani. Area, 58 sq. miles. The soil is volcanic and well suited to the vine, the caper-plant, and to cotton, all of which are cultivated. The mineral springs have some reputation. The principal town, of the same name, is on the northwest coast. The island, anciently called *Cosyra*, was used by Roman emperors as a place of banishment for offenders. Pop. 8,000.

Revised by C. C. ADAMS.

Pan'theism: a word first used by Toland at the beginning of the eighteenth century to designate absolute monism; the identification of the totality of being with God. See the article GOD.

Pan'theon, or Panthe'on. The [= Lat. = Gr. *πάνθειον* (sc. *ἱερόν*, temple), temple dedicated to all the gods, liter., neut. of *πάνθεος*, of or belonging to all the gods, *pās*, all + *θεός*, god]: the most perfectly preserved and one of the most admired structures of ancient Rome; situated in the Campus Martius (Piazza della Rotonda), and now used as a Christian church, St. Maria Rotonda. The building proper consists of a cylinder 142½ feet in interior diameter, surmounted by a hemispherical dome of same height above the floor. The walls of the structure are of concrete faced with brick, and are about 20 feet thick. In these there are alternating semicircular and square niches, seven in number, in addition to the opening for the door. The recess opposite the door contained originally a statue of Caesar, flanked on either hand by statues of Mars and Venus. The remaining niches contained statues of gods, but their names have not been preserved. The building is lighted by a single opening in the center of the dome nearly 30 feet in diameter. Before the entrance opening there is a pronaos or portico 52 feet deep and 114 feet in width, which is faced by eight columns bearing an architrave with the inscription, *M. Agrippa L. f. cos. tertium fecit* (constructed by Marcus Agrippa, son of Lucius, in his third consulship, i. e. 27 B. C.). Another inscription in the building attests that it was restored by Severus and Caracalla in 202 A. D. It was transformed into a Christian church in 607 A. D.

There is no building at Rome which presents so many perplexing and baffling problems of an historical as well as an architectural character, and it has appropriately been called the Sphinx of the Campus Martius. Even the purpose for which it was originally intended has been a matter of dispute, many archaeologists contending that it was originally designed for a warm bath (*calidarium*) in connection with the adjacent baths of Agrippa, and that its use as a temple was an afterthought, occasioning the addition of the pronaos. This was argued partly from the form of the main structure and partly from the fact that the pronaos does not either in design or execution fit the edifice behind it. Later discoveries, however, have thrown much light on these problems. That the whole edifice dated from the Augustan period, in accordance with the evidence of the inscription on the architrave, was almost universally believed up to the winter of 1891-92, when some necessary repairs of the dome gave an opportunity for more thorough investigation than had been possible since the restoration of 1747. At this time a French architect, Chedanne, found that all of the bricks, made visible by the repairs in progress, bore the stamp of brick-makers from the time of Hadrian. Other portions of the building were then examined, and it was established beyond question that the whole struc-

ture, with perhaps the exception of the pronaos, dates from the reign of Hadrian and probably from the years 120-124 A. D. Further investigation in the floor revealed two pavements below the present surface, the lower one doubtless being the floor of the original Pantheon of Agrippa, the intermediate one belonging probably to the restoration of Domitian. Excavations beneath the floor of the portico revealed at a level corresponding to the lower floor within the edifice foundations for a larger portico, with places for ten instead of eight columns. These facts would seem to indicate that the present portico belonged originally to a building of different character (perhaps rectangular, as Lanciani suggests), and, having escaped the destruction which befell the original Pantheon of Agrippa, was removed from its site and with some alterations, placed back upon the present level by Hadrian.

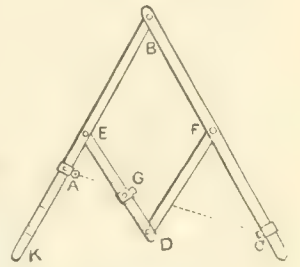
LITERATURE.—R. Lanciani, *New Facts concerning the Pantheon* (in *Atlantic Monthly*, June, 1893); E. Guillaume, *Le Pantheon d'Agrippa* (in *Revue des Deux Mondes*, Aug., 1892); A. Michaelis, *Das Pantheon* (*Preussische Jahrbücher*, 1893), pp. 208-224; and especially Ch. Hülsen's review of the investigations in vol. viii. (1893), fasc. 4, pp. 305-318, of the *Mittheilungen des k. deutschen Archäologischen Instituts*. G. L. HENDRICKSON.

Panther [from O. Fr. *panthère* < Lat. *panthēra*, from Gr. *πάνθηρ*]: a name originally applied to the Old World leopard (*Felis pardus*; L.), but in the U. S. used for the puma (*Felis concolor*).

Pantograph [Gr. *pās*, *παντός*, all, every + *γράφειν*, write]: an instrument used in copying maps and other drawings, either on the same or on some other scale.

The principle of the pantograph may be illustrated by the engraving, which shows the essential parts of the instrument in common use. It consists essentially of four brass bars with hinge-joints at B F D and E, forming a rhombus B F D E in every position. The sides B F and B E are extended so that F C and E K shall each be equal to one side of the rhombus. The parts E K and E D are graduated and numbered so that a line A G through two corresponding divisions shall always pass through C. This requires the graduation to be such that E A : E G :: B A : B C. The whole apparatus is supported by delicately formed castors. Three boxes, each fitted to hold either a pencil or a metallic tracing-point, are fitted to the beams, the one at C being fixed, and those at A and G capable of sliding along the beams, so that they may be set at corresponding points of the bars E K and E D. From the description already given, it is obvious that the three points A G and C will always remain in the same straight line, and that we shall always have A G : A C : G C :: A E : A B : E B; hence if either of these points is taken as a center of motion, the other two will trace out similar figures, whose homologous lines bear to each other a fixed ratio.

To use the instrument, the boxes A and G are clamped to the bars, so that A G and G C shall have the proper ratio, both being at corresponding points of the graduated scales. A metallic tracing-point is then clamped in the box C, which is taken as the center of motion; a second tracing-point is clamped in the box corresponding to the drawing to be copied; and a pencil is clamped in the remaining box; the tracing-points and the pencil are all arranged so as to press with proper firmness against the plane of the paper. When thus adjusted, the movable tracing-point is carried along the lines to be copied, and the pencil traces out a similar figure. If the movable tracing-point is at G, the copy is larger than the original; if at A, the copy is smaller than the original. If G is taken as the center of motion, the movable tracing-point and the pencil being at A and C, the copy will be reversed. In this manner the engraver is enabled to transfer the outlines of a drawing to the surface of the block or plate to be engraved, and either enlarge or diminish it in any given ratio. If the box A is at K and the box G at D, the copy will be of the same size as the original, but reversed. By copying the reversed drawing with the same relation of parts, a result will be obtained equal in all respects to the original.



The pantograph just explained was invented in 1603 by Christopher Scheiner, and was described by him in a pamphlet published in 1623. A more perfect instrument for accomplishing the same object was invented by Prof. Wallace, of Edinburgh; but as enlargements and reductions can now be made with more exactness and ease by photography, there is not so much use for the pantograph as formerly.

Pan'tomime [viâ Fr. and Lat. from Gr. *παντόμιμος*, pantomimic actor, liter., all-imitating; *πᾶς*, *πᾶν*, all + *μιμῶσθαι*, imitate, mimic]: the art of representing thought, sentiment, will, and action by mimicry only, by attitude, gesture, and movement. It is a Roman invention (though the name is Greek), and originated in the time of Augustus. The Romans, who had more practical acuteness than imagination, had also more sense for virtuosity than for art. They seized on each single element of the representation and enjoyed it separately, the declamation through an elocutionist, the mimical expression through a pantomimist, the dance as a ballet, and the music as a concert. Of the old Roman *atellane*, a sort of improvised comedy performed at the festivals of the nobles by their own sons and for the sake of amusement only, the mimical imitation of what was awkward and ridiculous and the display of bodily adroitness and skill formed the principal part. In the last years of the republic these *atellane* received an artistic form through the *mimes* of Decimus Laberius and Publius Syrus. The *mime* was an imitation of everyday life, in the same manner as the modern comedy; but although the speech was written down and often elaborated with the greatest care, the acting or the mimical representation was still considered a most essential element. In general, mimical expression and imitation were highly appreciated by the Romans. Cicero and Roscius vied with each other as to who could express a certain state of mind best, the one with his eloquence, the other with his mimicry; and under Augustus the pantomime became the reigning fashion. Pylades and Hylas were celebrated pantomimists in the tragical line, Bathyllus in the comical; and of the rivalry between the first two, who danced *Agamemnon* and *Edipus*, Macrobius tells some very amusing stories. Not only in public life, however, in the theater, but also in private life, at the dinner-party, the pantomime played a very conspicuous part during the time of the first Roman emperors. The social position of the pantomimist was nevertheless very low. Hylas was flogged publicly, at the prætor's request, on account of some blunder he had made on the stage. Augustus forbade such interference of the prætor with the actors, but under Tiberius it became a law that a senator who visited the dwelling of a pantomimist or was seen in his company in the streets should lose his senatorship. The reason for thus throwing contempt on a class of artists who happened to be very fashionable was not the old Roman prejudice against actors and acting, but the character of the art itself. The obscenity and indecency which these pantomimes displayed exceeded all description; that the female pantomimist often danced entirely naked on the stage was not the worst feature. At the fall of the Roman empire this, like all the other arts, decayed and lost its former prestige. It did not perish, however; and we have reason to believe that during the whole mediæval period pantomimists continued to exist, though mingled with the motley crowd of singers, jesters, acrobats, and other popular entertainers so vehemently denounced by the Church writers. Later they were now and then employed at the performance of the mysteries, and later still, by associating themselves with the *commedia dell' arte*, their representations assumed the form under which we now know them. They borrowed the masks Harlequin, Perrot, Columbine, and Pantalone from the *commedia dell' arte*, formed a loose plot, mostly of comical elements, and filled out the scheme in a manner half acrobatic, half ballet. In that form, however, they have continued to exercise a great charm over the mind. In all capitals of Europe, and at certain seasons in all the larger towns, there are found theaters which are exclusively devoted to the representation of pantomimes. See E. Munk, *De fabulis Atellanis* (Breslau, 1840); A. d'Ancona, *Origini del Teatro in Italia* (2d ed. 2 vols., 1893); E. du Ménil, *Les Origines latines du Théâtre moderne* (1849); E. du Ménil, *Histoire de la Comédie* (1864-69); Maurice Sand, *Masques et Bouffons*; Magnin, *Histoire des Marionnettes*.

Revised by A. R. MARSH.

Panwe: See FANS.

Panyas'sis, or **Pany'asis** (in Gr. *Πανύασσις*), of HALICARNASSUS: Greek poet of the fifth century B. C.; has been

called the regenerator of the epos. A kinsman of HERODOTUS (q. v.), and, like him, involved in a struggle for freedom, he was put to death by Lygdamis, the tyrant of Halicarnassus, about the time that Herodotus withdrew from his native city. See Krausse, *De Panyasside* (1891). B. L. G.

Paola: city; capital of Miami co., Kan.; on Peoria creek, and the Kan. City, Ft. Scott and Mem., the Mo., Kan. and Tex., and the Mo. Pac. railways; 22 miles E. by S. of Ottawa, 34 miles S. S. E. of Lawrence (for location, see map of Kansas, ref. 6-K). It is in an agricultural, oil, coal, lime, and natural-gas region, and contains 3 national banks with combined capital of \$200,000, 2 libraries (Normal School, founded 1879, and Free City, founded 1880) containing nearly 10,000 volumes, and 3 weekly newspapers. Pop. (1880) 2,312; (1890) 2,943; (1895) 3,009.

Paoli, PASQUALE: revolutionist; b. near Morosaglia, Corsica, in 1726; was educated at Naples, where his father had taken refuge, after being exiled from the island in 1739 for participation in the revolt against Genoa; returned to Corsica in 1755; became the leader of the party which strove to expel the Genoese; defeated their army and even their fleet in several engagements, and deprived them of nearly all their strongholds in the island, at the same time introducing important reforms, improving the laws, and bringing the agriculture, commerce, and industry of the country to a flourishing state by his wise and energetic administration. His success was almost complete, and excited great sympathy in Europe; but in 1768 the Genoese sold their claims on Corsica to France, and in 1769 Paoli was driven from the island by a French army of 22,000 men. He fled to England, where he was held in general esteem, and received from the Government a large pension. After the outbreak of the Revolution in France he was appointed chief both of the civil and military administration in Corsica; but the anarchical state of the Government soon occasioned collisions. He again placed himself at the head of a revolution; but despairing of winning independence without foreign aid, he appealed to Great Britain, and proclaimed George III. King of Corsica, but he was not appointed viceroy, as he had expected, and he again went to England, where he died, near London, Feb. 5, 1807. See Boswell, *Account of Corsica* (Glasgow, 1768), and *Biographies* by Arrighi (Paris, 1843), Klose (Brunswick, 1853), and Bartoli (Ajaccio, 1867).

Paolo, Fra: See SARPI, PIETRO.

Paolo Veronese: See VERONESE, PAOLO.

Papacy: See PAPAL STATES and POPE.

Papal States, or STATES OF THE CHURCH [*papal* is from Lat. *pa'pa*, papa, bishop, (later) pope]: that portion of Central Italy which, before the unification of the kingdom, was under the temporal government of the holy see. They extended, though with a very irregular shape, from the Adriatic to the Mediterranean; bounded S. by Naples, and on the W. and N. by Tuscany, Modena, and the Austrian possessions, and comprised an area of about 16,000 sq. miles, with 3,124,668 inhabitants, had Rome for their capital, and yielded (in 1859) a revenue of 14,453,325 scudi. The pope possessed temporal authority over a part of this region from the time of Constantine the Great, who is said to have endowed the episcopal see of Rome with large landed possessions. The spiritual supremacy of the holy see gave to it an impressiveness and dignity that facilitated the extension of its temporal power. In the centuries after the fall of the Roman empire, when the barbarians pushed forward to Rome and the Byzantine emperors showed themselves unable to defend their possessions in Italy, the so-called exarchate, it was quite natural that the people of Rome should look on the pope not only as their head, but as their leader. The strongest of the barbarous tribes, the Franks, had become orthodox Christians, and their kings supported the popes against their enemies. Charles Martel was about to enter Italy and defend the Roman see against the Lombards when he died, but his son, Pepin le Bref, fulfilled his promise. He defeated Aistolf, the king of the Lombards, and compelled him to yield up to the pope, Stephen III., the exarchate of Ravenna, comprising, besides the so-called Pentapolis or the five cities of Rimini, Pesaro, Fano, Sinigaglia, and Ancona, seventeen other cities, mostly situated on the coast of the Adriatic, and thus the foundation of the papal states was laid. Pepin's son, Charlemagne, confirmed and enlarged the donation, but in the ninth and tenth centuries much of the papal territory was lost, and in the first

half of the eleventh century the temporal jurisdiction of the pope was not recognized beyond Rome and its immediate vicinity. In 1053 the pope obtained the city of Benevento, and in 1114 the Countess Matilda of Tuscany left all her fiefs, consisting of Parma, Modena, Mantua, and Tuscany, to the pope, who secured the possession of them, though only after a long strife with the German emperors. The chief difficulty attending the establishment of the temporal sovereignty of the pope lay in the vague and undefined relation in which he stood to the German emperor. Pope Leo III. had crowned Charlemagne emperor of the Romans, and the emperor had given Leo III. the exarchate of Ravenna, Rome, and other Italian possessions. The title of Roman emperor was inherited by the German successors of Charlemagne, and they evidently meant to transform the title into a real authority. Hence the severe struggles between Gregory VII. and Henry IV. and between Innocent III., Henry VI., and Otto IV., and it was not until 1278 that Pope Nicholas III. succeeded in compelling the German emperor, Rudolf I. of Hapsburg, to acknowledge him as a free sovereign, thereby establishing the papal states as an independent empire. The Great Schism and the removal of the popes to Avignon brought confusion and misgovernment to the papal domains in the fourteenth century. The strife between the Guelphs and the Ghibellines kept Rome in constant turmoil, and in 1347 the popular leader Rienzi became the chief magistrate of a short-lived republic. The pontificates of Alexander VI. (1492-1503) and of his successor, the warlike Julius II. (1503-13), were marked by the consolidation and extension of the papal territory. It underwent some changes during the wars of Napoleon, being at one time entirely incorporated with France, but in 1814 it was restored to the pope with nearly its former boundaries. The administration, however, of the papal government, especially during the reign of Gregory XVI., caused a great fermentation in the population. Revolutions broke out in 1831 at Bologna and other places, and Gregory XVI. depended entirely on Austrian troops for the maintenance of his sovereignty. Pius IX. made some attempts at reform, but failed. In 1848 the revolution broke out in Rome, and the pope fled in disguise to Gaëta. He was restored by French soldiers, who held the city of Rome from 1849 to 1870. In the meanwhile, after the Italian war of 1859, the Legations voted for annexation to Sardinia, and the troops of Victor Emmanuel entered Umbria and the Marches and defeated the papal forces at Castelfidardo. Rome and the patrimony of St. Peter were all that was left to the pope. The French garrison evacuated the city Aug. 2, 1870, and on Sept. 20 King Victor Emmanuel took possession of Rome, declaring it the capital of Italy, and thereby abolishing the temporal power of the pope, who was nevertheless guaranteed the possession of the Vatican and Lateran palaces, and continued to enjoy the honors and immunities of a sovereign. See **ROME**.

Revised by F. M. COLBY.

Papaveraceæ: See **POPPY FAMILY**.

Papaw' [from Span. *papaya* (whence Mod. Lat.), from the native West Indian name]: (1) the fruit of a small tropical American tree (*Carica papaya*) of the family *Passifloraceæ*. This fruit is eaten, but is not very palatable. It has an acrid quality, and when boiled with meats renders them tender. The juice, at least before the fruit is ripe, contains a remarkable albuminous substance resembling or identical with fibrin, is anthelmintic, and has detergent powers. The root has an offensive odor. (2) In the U. S. the name papaw, or pawpaw, is given to *Asimina triloba*, *parviflora*, *grandiflora*, and *pygmæa*, handsome shrubs, or the first a small tree, of the family *Anonaceæ*. The pulpy fruit of the first mentioned is edible, but is not generally esteemed.

Revised by L. H. BAILEY.

Papayotin: a substance derived from a plant called *Carica papaya*, the juice of which possesses proteolytic power, or, in other words, is capable of transforming proteids into peptones. It is supposed to differ from pepsin not only in its vegetable origin, but also because it acts in the presence of either an alkali or acid. Other derivatives of the juice of *Carica papaya* have been introduced into medicine by various firms, the chief of which are papain and papoid, which it is claimed possess certain advantages not present in other preparations.

H. A. HARE.

Papyrus [from O. Fr. *papier* = Lat. *papyrus* = Gr. *papyrus*, papyrus, paper made of papyrus]: a substance made in the form of sheets or leaves, in varying thicknesses, and employed for writing or printing upon; also for wrapping pur-

poses, and in the manufacture of various articles of common use or of industrial and scientific application.

Base.—Vegetable fiber is the base and chief component of the article of commerce known as paper. This is used in various forms and with different intermixtures, animal as well as mineral fibers being at times incorporated into its substance, with loading or filling material and coloring-matter. In its pure state vegetable fiber is known as cellulose. It is white, translucent, slightly heavier than water, without taste or odor, and is insoluble in all simple solvents; its chemical formula is $C_6H_{10}O_5$. All vegetable growths contain cellulose, some being specially valuable, and holding high rank as paper-making material, while others are of inferior importance. Generally, paper-making material is a by-product, derived from the waste or refuse of other manufactures—as rags, old bagging, old rope, waste paper, etc.—supplemented by other good fibers obtained so plentifully and cheaply as to warrant their conversion into paper pulp.

Loading Fibers. The fibers chiefly used in the manufacture of paper are those of cotton, bast (as linen, jute, and hemp), those derived from whole stems or leaves and associated with various vessels and cells not properly fibers (as straw, esparto, sorghum, and bamboo), and lastly those derived from wood.

History.—It seems strange that nations known to have been adept in arts and sciences centuries in advance of the Christian era should have failed to produce an article at once so important and of so great simplicity of manufacture as is paper. Even the Maoris of New Zealand roughly produced it prior to contact with European civilization by chewing and macerating the leaves of certain plants and spreading the pulp so obtained on a flat stone to dry in the sun. Paper derives its name from an aquatic plant, the papyrus (*Cyperus papyrus*), which grew in Egypt. The material obtained from this plant was the first product, so far as known to us (except the wasp's nest), resembling that which we call paper. (See **PAPYRUS**.) The manufacture originated with the Egyptians at least 2,000 years before the Christian era, and the use of papyrus extended into Greece and Italy. The Egyptian reed held undisputed command of the market for hundreds of years; in Europe till



FIG. 1. THE PAPER MILL. The mill of the ancient country, from Justus Lipsius, *De Architectura*, 1570. (Reproduced from the original in the collection of the Library of Congress, Washington, D. C.)

the twelfth-century attempts were made to supersede it, notably by the use of parchment, but success in this direction was not attained until the introduction of paper made from cotton fiber. The Chinese are credited with the discovery of the art of paper-making by the use of fibers reduced to a pulp in water. Their raw materials were the inner bark of the mulberry-tree, bamboo, rice-straw, rags, etc. A Chinese mandarin is said to have invented a process of making paper from the bark of trees, and in 105 A. D. the fibers of silk and hemp. This was in the year 95 A. D.

Two hundred years later the Romans made strong brown paper from the bark of trees, and 300 years afterward the same material continued in use. About the year 610 the bark of the paper-mulberry was employed as a paper-making material in Korea. The Aztecs also made a paper, resembling papyrus, from the fibers of the maguey (*Agave americana*) plant; but it is not known that any data exist to establish the date of its earliest use or invention.

The Chinese communicated their discovery to the Hindus, Persians, and Arabs, and in the latter part of the sixth or early in the seventh century the Arabians established factories, one of which is reported to have been in existence at Mecca. Another paper-mill is said to have been in operation at about the same time at Samarcand, in Turkestan. At these localities paper was made from cotton, reputedly the raw fiber. The art was carried to Spain, where the Moors, besides linen, hemp, and cotton, used rags as paper-making material. From Spain the business extended to other European countries. The earliest Italian paper-mill is said to have been started in 1250; the first in Germany, 1290; in France, 1340; in Switzerland, 1350; in Austria, 1356; in Belgium, 1405; in England, 1498, or a few years earlier; in America (at Roxborough, now in Philadelphia) in 1690; and in Russia in 1712. Holland probably began paper-making in the fourteenth century, although a much later date has been given. The growth of the industry was much increased by the discovery of printing in 1450.

Hand-made Paper.—The Chinese method of manufacturing paper embodies the principle on which all paper is made. Improvements in processes and appliances have all been in the direction of the more ready manipulation of paper-making material and increase in the production of the finished article. The cost of manufacture in China, even without the facilities afforded the paper-makers of Europe and America, is less than in Occidental countries, cheaper labor and material operating to this end. Chinese paper-makers use a variety of fibers, including those from hemp, rags, linen and cotton, cane, the paper-mulberry, and the bamboo. With all of these the first operation is to make the stock tender, that is, to bring it into a condition in which it may be readily reduced to pulp. This is done by retting, without allowing it to go too far in decomposition. The stalks of bamboo, for example, are soaked in running water, or in water which is frequently changed, for 100 days or more, until the outer covering of the fiber is sufficiently softened. The material is then beaten with mallets until the fibers are separated from the bark or outer covering, after which they are cooked in a vat to which slaked lime has been added, a continuous operation taking about eight days. The fibers are next washed in clean water and again boiled in water made alkaline with wood ashes, after which they are subjected to another bath of water and ashes until they begin to decompose; they are then taken out, rewashed, and reduced to the degree of fineness required in mortars operated when possible by water-power. The pulp thus prepared is mixed in a vat with water to the necessary degree of diluteness, after which the work of the person who makes the sheet of paper begins. This workman has a mould or sieve made with a bamboo frame to which a fine network of threads of silk or other material is attached; he dips his mould into the dilute pulp, and, taking it out with a motion which serves to interlace the fibers, turns the thin film thus formed upon a flat, wooden surface. The sheets are laid one upon the other until a pile is made; a plank is then placed upon the heap, and pressure is applied until the water has been sufficiently pressed out of the sheets, which are then removed to an oven to be dried. Hand-made paper is manufactured in Europe* on almost the same lines, after the pulp has been prepared by machinery. The mould is covered on one side with fine wire-cloth, and has a movable frame, called the deckle, both forming a shallow tray. The vatman takes a mould and lays it upon the deckle; he then dips the mould into the pulp, which is kept uniformly mixed with the water in the vat by means of an agitator, and lifts up as much of the pulp as will form a sheet of paper; to this he gives a shake from him and back again, and then from right to left and back again; this done, he transfers the mould to his assistant, who is known as the coucher, at the same time removing the deckle, which he connects to another mould and proceeds as before. The coucher turns the mould upside down on a piece of woollen felt, and places another piece of felt on the sheet of paper thus deposited. The felts and sheets of paper are alter-

nated until a pile is formed, which is then submitted to great pressure. When this pressure is taken off the felts and sheets of paper are drawn out and laid in separate piles. The paper is afterward put into another press to remove the felt marks and to get rid of more moisture; it is next hung up, sheet by sheet, to dry, after which it is sized with gelatin. The paper is again pressed, dried, sorted, counted, packed, and in this finished condition goes to market.

Western Methods of Preparing the Pulp.—The process of making the sheet of paper by hand has been described, but not the preliminary processes for reducing the raw material to pulp, as practiced in Europe and America. During the eighteenth century and at the beginning of the nineteenth the rags used in paper-making were sold unsorted to the paper-maker. They were therefore carefully picked over when they reached the mill, and graded, chiefly according to color. This work is now done to a certain extent by the packers or rag-gatherers. The rags were then cut into small pieces, soaked in water, and piled in vaults to ferment or rot. After the necessary stage of tendering or decomposition had been reached they were washed, and the next process consisted in reducing them to pulp. In the early days of paper-making this was done in mortars, or cylinders provided with stamps moved by water-power. Wooden troughs in which stamps operated were also used. About 1750 a machine was invented which in time superseded these rude appliances in Europe and America. This was brought out in Holland, and is known as the Hollander or beating-engine. The preliminary treatment of the rags has also changed, the retting process being done away with. When the rags reach the mill they are unpacked from the bale and sorted by hand, women being employed for the purpose. The first handling is for the purpose of removing all extraneous substances, and it includes the threshing, dusting, sorting and cutting, opening seams, removing buttons, pieces of metal, India-rubber, and other foreign materials. They are then cut into small pieces by machinery, or, for special grades of paper, by hand, at long tables, to which scythe-blades are fixed at intervals. After a final dusting the rags are put into large, cylindrical boilers, called rotaries, which are set horizontally. These boilers are provided with manholes, and steam-pipes pass through their trunnions to their interiors. A rotary is packed with rags, and milk of lime and water are added, after which the manholes are closed. The boiler is then slowly rotated, steam being admitted under pressure. Other kinds of boiling apparatus are sometimes used, such as kiers, into which the rags are run on small cars or trucks, which are withdrawn when the operation is completed, thus dispensing with the emptying necessary where rotary boilers are employed. This cooking thoroughly softens the grease or any dirt remaining in the rags, and the latter are in a condition which renders them more readily susceptible to treatment in the washing and beating engines. After draining, the cooked rags are taken to the engine-room, and are there washed by a stream of water through the washing-engine until the water runs clear. The washing-engine consists of an oblong tub or trough made of wood or iron, rounded at the ends. It is made in various sizes, to accommodate from 100 to 1,500 lb. of rags. In the center of the tub there is a partition, the "midfeather," with a passageway at each end for the circulation of the water and rags through the engine. On one side of the "midfeather," occupying the space between it and the wall of the tub, is a cylinder or roll set with a series of steel knives, and beneath this roll is a bed-plate, also furnished with steel knives and set in the floor of the trough, which at this point rises with an inclination to and surrounding the roll at a short distance therefrom, and then drops in an inclined plane known as the "back-fall" to the level of the tub bottom. On the other side of the "midfeather" the floor of the tub is flat and level with the ends, and on this side is located the washing apparatus, which consists of one or two cylinders, whose framework is covered with wire-gauze. The roll and the washing-cylinders are mounted in such a manner as to be raised or lowered at both ends. When the washing is going on the washing-cylinder is partially submerged in the contents of the engine, the water which passes through its gauze covering being discharged through an opening in the journal which rotates it. During the process of washing the stock or material is also treated in such a way by the knives on the engine-roll that the fibers are separated and drawn out so as to be long and flexible.

In some mills the stock is bleached in an engine inter-

* There is only one paper-mill in the U. S. where hand-made papers are produced. There are many vat-mills in Europe.

mediate between the washing-engine and the beating-engine; in others the bleaching is done in the washing-engine. It is effected by adding to the "half-stuff" in the engine a solution of bleaching-powder (chloride of lime), which oxidizes the fibers, its action being accelerated by the addition of a little sulphuric acid. Having reached this point the engine is emptied by the withdrawal of a plug or valve, which lets the "half-stuff" down through a pipe into large vats known as "drainers," and provided with stone flooring, in which there are minute perforations. Here the material remains until it is sufficiently acted upon by the bleaching agent, after which it is conveyed to the beating-engine.

The next operation is that of beating, in which process the "half-stuff" is reduced to that stage of fineness requisite to convert it into paper. The beating-engine is of the same type and form as the washing-engine, but it is provided with sharper knives and the roll is set down closer to the bed-plate. The cylinder-washer is employed for a short time to wash out the bleaching solution, and to eliminate entirely the action of the chlorine a solution of hyposulphite of soda or "antichlor" is added as a neutralizing agent. When this operation is completed, the beating is continued until the fibers are reduced to the proper length. The fibers during this process are in such condition that the cutting action does not impair their strength. Next follows the sizing if engine-sized papers are to be made; also the

provided with knives on its exterior surface. The half-stuff is fed into this engine through a box located at its smaller end, and, power being applied to the shaft carrying the plug,

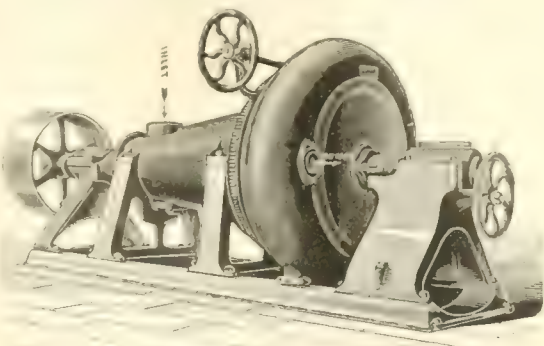


FIG. 1.—Robert engine

the material is drawn by the centrifugal operation of the machines from the small to the large end, where it is discharged through outlets, having undergone the action of the knives in its passage. The Marshall refining-engine is of the same character, except that at the large end of the casing there is a disk fitted with steel knives, which also operate upon the half-stuff and reduce it to the finished state necessary before running it to the machine stuff-chests. The refining-engine saves about one-third of the time usually consumed in beating the stock in the Hollander, from which it takes the material before it is thoroughly reduced; it "brushes out" the fiber, making it "mellow."

The Fourdrinier Machine.—We now come to the paper-making machine, of which there are several types. In 1799 Louis Robert invented a machine which successfully made paper in a continuous web. He put it in operation at the paper-mill of François Didot, in France, and secured a patent for it. In 1801 John Gamble, an Englishman, who accompanied Leger Didot from Paris with Robert's invention, obtained the first patent in England for that machine. Several improvements were patented both in England and France in the succeeding year, but it was not until 1803 that Bryan Donkin, who had been intrusted by Didot and Gamble with the construction of such a machine, succeeded in building one on the plan suggested by Robert, and in 1804 the second machine made by him was set up at Two Waters, England, and ran successfully. In this year Henry and Sealy Fourdrinier, stationers and paper-manufacturers in London, bought the English patents for the machine, and after making various improvements so perfected it that it has since been called the Fourdrinier machine. In 1805 this machine was capable of doing the work of six vats in one day, and the gain in time and labor, at that time so considerable, has been largely exceeded since. So many improvements have been added that the Fourdrinier machine of to-day is as a giant to its original model, not only as to size, but also as to its speed and capacity. The first Fourdrinier machine in the U. S. was set up in 1827.

The processes of paper-making have been described up to the point where the Fourdrinier machine is brought into action. From the vat into which the pulp discharges after it has passed the screens or strainers it flows down over an apron to the endless wire-cloth of the machine. This wire-cloth is generally from 32 to 40 feet long, its width being variable and based upon the greatest width of the sheet of paper which it is intended to make. The widest machine yet constructed is 136 inches in breadth of wire. The wire-cloth is made of fine brass wire woven specially for the purpose, the meshes varying from sixty threads upward to the inch. The ends of the cloth are sewn together with very fine wire. It is necessary that the wire-cloth shall preserve a uniformly even surface, and for this purpose it is supported on a series of brass rolls of small diameter, known as tube-rolls, placed near together, but not so closely as to be in contact. By this means uniformity in the layer of the pulp on the wire is gained, if the stuff in the vat is maintained of even consistency. These tube-rolls are supported in an iron frame to which a violent lateral motion is given by a device known as the "shake." This is done to cause the fibers as they enter upon the wire to interlace in various directions, and thus form a sheet which shall be nearly, if

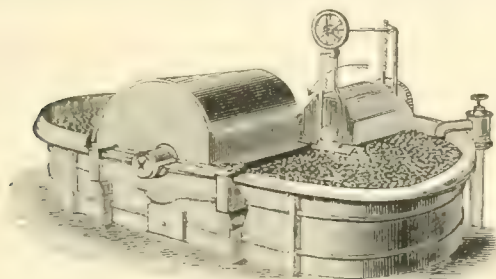


FIG. 2.—Beating engine

"loading." The material used for loading or filling purposes not only adds to the weight, but further serves the useful purpose of filling the pores and giving a finer surface to the paper when it is finished. The ordinary filling is china clay, but other substances in a state of fine subdivision are also employed. Among these are sulphate of lime and talc. Engine-sizing consists in adding to the pulp a resin soap made by boiling powdered resin with soda-ash, or crystals of soda, the alkali having been previously dissolved in water. If not thus sized the paper is treated with animal size as described below, or it may be both engine-sized and animal-sized. The coloring material is also applied in the beating-engine, or in making white papers the pulp is given an addition of ultramarine or other necessary color, mixed in water and strained. This "brings up" the tone of the paper and destroys the yellow tint which the paper would otherwise have.

At this stage the pulp is emptied from the beating-engine into the stuff-chests, which are large cylindrical vats, provided with agitators, in which more water is added to the pulp until it is well mixed and dilute enough to be transferred by means of a stuff-pump to a regulating-box, the function of which is to provide a regular supply of pulp to the machine; thence the pulp is carried to the screen, or strainer, an apparatus covered with smooth brass or bronze plates, having their faces cut into a number of long and narrow slits which widen on the under side to admit of the easier flow of the pulp. This strainer has a jogging motion, and while the pulp flows through the plates all knots and lumps are arrested. On leaving the strainer the pulp passes into a vat in which there is an agitator to keep it well mixed in suspension with the water.

There are numerous modifications of the beating-engine, designed with a view to economy of space, the more rapid and even treatment of the material, etc.

The greatest departure from the original form of the Hollander or beating-engine is in that class of machines known as refiners, of which the Jordan is the original type. This machine has no tub. It consists of a conical casing closed at both ends and having its interior surface provided with knives; inside of this casing there is fitted a plug or cone

not quite, as strong in one direction of its texture as another. The water drains from the pulp through the wire-cloth, and is received in a shallow box or trough called the "save-all," as it also catches fine particles of pulp which escape

surfaces by means of a felt, whereby it is made perfectly dry. Having passed the driers, the web is passed between a series of polished rolls, or "calenders," mounted one above the other in a frame, to form a "stack," their purpose being

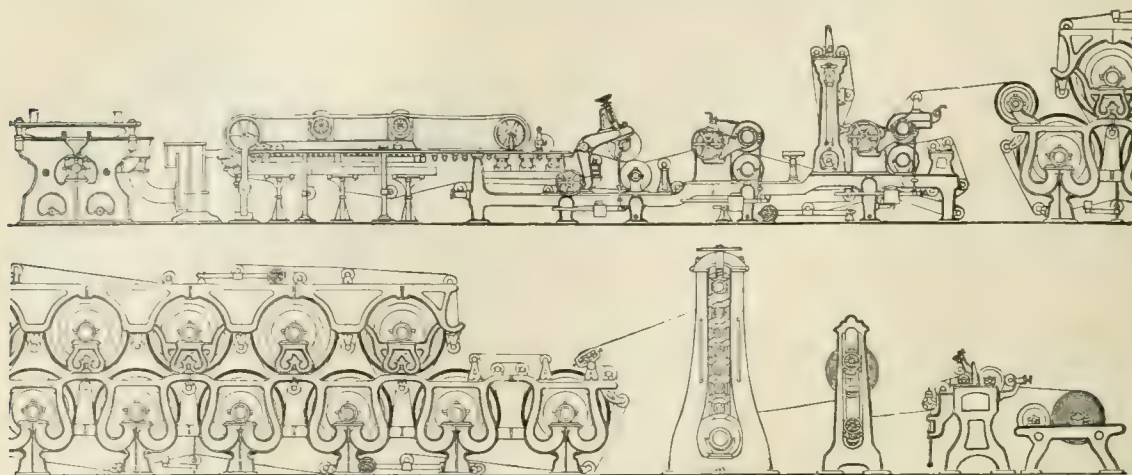


Fig. 4.—Modern Fourdrinier paper making machine.

through the wire. The frame in addition to the tube-rolls carries a "breast-roll," a "guide-roll," on which there is a self-acting guide, and several other rolls. On top of the frame at the point where the pulp flows on the machine, and extending lengthwise of it for about two-thirds of the length of the wire, there is a "deckle-frame" supporting two endless rubber straps, each about $1\frac{1}{4}$ inches thick, and running over pulleys, one on each side of the machine. These "deckle-straps" rest upon the wire-cloth and prevent the pulp from spreading or flowing over its edges, and thus regulate the width of the paper. By the time the pulp has passed the deckles the sheet is formed, although yet in a very moist and weak condition. Next and near to the deckles is located the "dandy-roll," a cylindrical framework of brass covered with fine wire-cloth, which presses on the surface of the wet layer of pulp, and aids in expressing the moisture; it also performs the function of impressing what is known as the "water-mark" upon the paper. This impression is given by means of designs made from wire and soldered to the exterior wire covering of the roll, which thins the sheet at every point where it touches or indents it. If the paper is not intended to receive any special design, but is to be alike on both sides, no device is fixed to the exterior of the dandy-roll, and the impressions made by the latter upon the moist pulp are the same as those received from the machine wire on its under surface. In this case the paper produced is known as "wove." "Laid" paper is that which has parallel lines watermarked at equidistant intervals, the marking being done by a series of wires encircling the exterior of the dandy-roll. For the purpose of extracting a further amount of moisture from the pulp-layer before it leaves the wire, there are two or more suction-boxes having open or perforated tops. A suction-pump attached to these suction-boxes creates a partial vacuum in them, and the pressure of the air upon the pulp assists in withdrawing more of the water therefrom. At this stage the paper has acquired sufficient consistency to pass without breaking to the couch-rolls, two in number, the lower one carrying the wire-cloth and giving it motion. Both couch-rolls are "jacketed" with woolen felt. From the couch-rolls the web is conveyed on an endless woolen felt known as the "wet felt" between the two "first-press rolls." The paper is then carried to the "second-press," where it is transferred to another endless felt, which in turn conveys it further on its way to the "driers." Having come so far the paper is in pretty good condition, having gained in strength by reason of the loss of the greater part of its moisture. The "driers" are metal cylinders of large diameter heated by steam. These drying-cylinders vary in number on different machines, and are ranged one after the other, or in two tiers, one row above the other. A passageway between the second-press and the driers permits the machine-tender or his assistant to pass from one side of the machine to the other. The paper is carried from one drying-cylinder to another, and so on through the whole series, and is pressed against their heated

to give the paper a smooth surface. Leaving the calenders the web is wound on reels, and thence it goes to the cutter, where it is divided into sheets. Where the paper is intended for use on a web printing-press, it is always supplied in rolls. Should it be desired to give the paper a higher finish than it has so far received, it is taken to the finishing-room, where it is subjected to the action of super-calenders having rolls made from disks of paper or cotton-batting, mounted on steel shafts, and so solidly compressed by hydraulic pressure that they can be turned off truly cylindrical in a lathe. These rolls alternate with chilled-iron rolls in a frame. Another method of surfacing is to pass the sheets of paper between highly polished metal plates, through two heavy rolls which give a powerful pressure. So treated the paper is said to be "plated," and the apparatus is known as a "plating-machine." This mode of finishing or smoothing the otherwise rough surface of paper superseded that of pressing between two heated metal plates.

The paper-making machine is driven by power derived from a water-wheel or steam-engine carried through intermediate shafting and gearing, and generally directly connected. The latest form of communicating motion is through an improved driving-train of coned pulleys, subdivided to run the several parts of the machine at variable and graded speeds.

Sizing.—The method of sizing in the engine has been outlined. The sizing is done for the purpose of removing the porous and absorbent character of the paper, so that it can be written on. Further sizing is given on the machine, a weak solution of gelatin or animal size being placed in a shallow box through which the paper passes midway of the driers, going thence between two "squeeze-rolls," which remove the superfluous size; this is known as "tub-sizing" as well as "machine-sizing." Animal-sized paper is sometimes dried by passing it over a series of wire cylinders exposed to the action of currents of air. At other times it is dried, after being cut into sheets, by hanging it in a loft or drying-room, where an evenly warm temperature is maintained, and thus treated it is said to be "loft-dried." The best grades of writing-papers are thus manipulated.

The Cylinder Machine.—An English paper-maker named Dickinson is credited with the invention of the cylinder paper-making machine in 1809. This machine is of an entirely different type from the Fourdrinier in that part on which the web of paper is formed. It consists of a large and square vat, in which is mounted a framework of brass covered with coarse wire-cloth, over which an outer covering of fine wire is smoothly fitted. This is known as the making cylinder; it is of large diameter, and fits closely by means of interposed packing to the sides of the vat in which it rotates. The latter is kept supplied with pulp in the required state of dilution by an even flow, which maintains a uniform level of the fluid. As the cylinder rotates it takes up on its surface a thin film of pulp, which, as it encounters atmospheric pressure, is drained of some of its

water through the wire covering of the mould, the water passing out through the end of the cylinder and through the side of the vat. At the top of the vat, and connected therewith, is a framework carrying a couch-roll, which rests upon the face of the making cylinder, and rotates with the

Harper's improved Fourdrinier is a combination of the Fourdrinier and cylinder machines. It has the wire-cloth and attachments of the Fourdrinier until it reaches the couchers, the lower roll of which is an open forming cylinder, on which the Fourdrinier wire is substituted for the

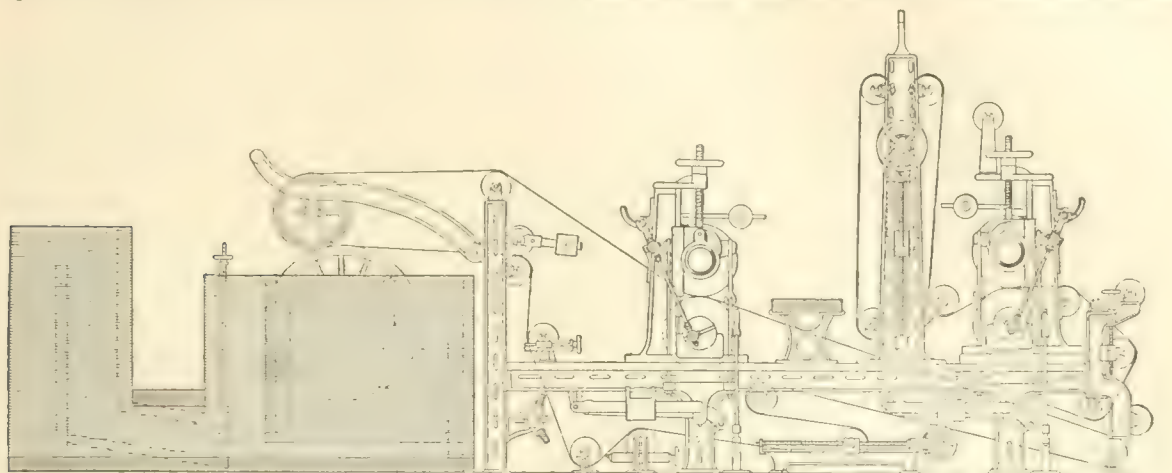


FIG. 5.—Single cylinder paper-machine.

latter. An endless felt runs over the surface of the couch-roll, and passes to and between the first press-rolls, which are located in a stand next to the vat. As the thin film of pulp forms on the cylinder-mould it is brought up and in contact with the felt passing over the couch-roll, and, being taken up by the felt, is carried continuously onward to the first-press, where it loses a further proportion of moisture, thence to the second-press, as on the Fourdrinier machine, and then to the driers and calenders. There is less waste of pulp on the cylinder machine, but as there is no "shake" to give lateral motion to the fibers, the latter lie mostly in the line of travel of the web, the paper thus made being weaker across the grain than lengthwise. A double or triple cylinder machine consists in the combination of two or three vats and making cylinders, such a combination sometimes including twelve vats and cylinders. In such machines as many webs of paper as there are cylinder-moulds are formed and brought in contact prior to going through the press-rolls, where they are pressed together. Thus it is possible to make sheets of varying degrees of thickness. The inner layers may be made of cheaper stock, while the exterior surfaces may be of a better grade of material and colored as fancy may direct.

Wet-machine.—This is the first part of a single cylinder machine, having first-press rolls, and is arranged to wind the sheet of paper in continuous layers upon the upper press-roll until the desired thickness of material has accumulated upon the roll. When this has been attained an alarm-bell rings, and the attendant then operates a hand-lever which moves a knife down and on to the roll, by this means cutting open the paper cylinder formed on the roll

fixed wire-cloth. The upper couch-roll rests on levers, and the wet felt passes thence upward and above the wire of the machine inversely to the direction of the formation of the web of paper and then to the press-rolls.

In *mould-machines* the pulp is deposited on an endless series of square moulds similar to those used for making hand-made paper, but operating continuously after the fashion of the Fourdrinier machine, depositing the sheets on felts or carriers. These machines have found some use in Europe.

Wood and Esparto as Paper-making Materials.—Espano grass (see ESPARTO), otherwise known as alfa and Spanish grass, is used to a great extent in Europe. When it is received at the paper-mill it is picked over by hand on a special apparatus having a traveling-apron, on either side of which the sorters are stationed. Roots, weeds, etc., are removed, and the grass is then shaken and dusted. It is then packed uncut in boilers, although in some mills open tubs are used. In general, the cooking is done under pressure in vertical boilers, a solution of caustic soda (10°) in water being used. This deprives the esparto of its silica and other incrustations. The fiber after bleaching is white, soft, and of excellent quality. A similar boiling process is employed for the production of pulp from ordinary straw. The alkali in the residuum is recovered by evaporation, in special apparatus, to the extent of about 80 per cent.

Wood-pulp.—One of the most important paper-making materials is derived from wood. There is a distinction between wood-pulp and wood-fiber. The first is obtained by mechanical means and the second by chemical treatment. Wood-pulp is produced by grinding. The apparatus for this purpose consists of a rotating grindstone inclosed in an iron casing provided with openings covered by pockets containing blocks of wood, which are kept in bearing against the periphery of the stone by means of pistons controlled by hydraulic pressure. The wood is first prepared by being deprived of its bark and knots, after which it is cut into convenient lengths, and then placed in the pockets of the grinder. Power being applied, the stone is rotated, tearing off the fiber of the wood. Water is introduced into the grinder during this operation, and the particles of wood are carried against a wire screen, which admits of the passage of the finer fibers, but retains the coarser for further treatment. When the wood has been thus reduced it may be shipped with a certain percentage of moisture to the paper-mill, where it undergoes the ordinary beating treatment, or it may be run off in sheets or made into wood-pulp board. This apparatus was invented by Henry Voelter, a German, in 1860, and is largely used in Europe and in North America. Wood-pulp has been the great cheapening agent in what are known as print-papers. While paper can be made entirely from wood-pulp, or mechanical pulp, as it is sometimes called, the fiber is too weak to make a sheet of paper of sufficient strength for most of the ordinary purposes of daily use, and for this reason it is mixed in varying proportions with

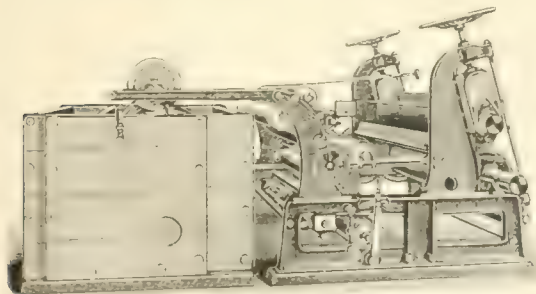


FIG. 6.—Standard wet-machine.

and releasing the sheet. For some classes of work the upper press-roll is grooved along its length, so that the attendant by inserting a knife in the groove can cut the paper, or "board" as it is then called, dispensing with the lever knife arrangement. The wet-machine is used for making binders' board, wood-pulp board, leather-board, etc., and sometimes for straw-board.

other material, wood- (chemical) fiber being the chief admixture.

Wood-fiber.—This is commonly known as chemical fiber. It is produced by two methods—the alkali and the acid processes. The alkali or soda process was invented in England by Charles Watt, who was aided by Hugh Burgess in bringing it into operation. This was in 1853, and since 1854, when Burgess constructed works in the U. S., it has maintained its position as a leading process for the manufacture of paper-pulp from wood. The incrustating matter of wood is easily operated upon by dilute alkali, the power of which is increased at a higher and increasing temperature. The alkali has a solvent and saponifying effect, and the acid products which result from the resolution of the wood are brought into the liquor as salts of soda. Poplar is the wood generally employed in the soda process, although other woods can be and are utilized, including pine, spruce, and hemlock. The wood is denuded of its bark and cut into chips, which, after being dusted, are put into boilers commonly known as digesters. These are about 22 feet long by 7 feet in diameter, and are heated by coils supplied with steam through the journals and rotating with the boiler. Sometimes “globe” or spherical boilers are used; at other times upright digesters are employed. The chipped wood having been packed in the digester, a solution of caustic soda is added to it, the strength of the liquor being from 8° to 15° Baumé. A steam-pressure of about 90 to 100 lb. from eight to ten hours is requisite to cook the wood. The resultant fiber, when washed and bleached, is almost entirely pure cellulose, soft and of a fair degree of strength. The alkali employed in the solution is afterward recovered by evaporation, the apparatus producing the best results, it is believed, being that known as a multiple effect, originally invented for the evaporation of saccharine liquor employed in the manufacture of sugar. The sulphate process is a modification of the soda process, and was invented by Dahl

thick, after which it is packed in the digester. The sulphite liquor is then run in quickly, the digester is closed, and steam-pressure is gradually turned on. The strength of the liquor is generally about 10° T., carrying about 3½ per cent. of sulphurous acid. The corrosive action of the bisulphite liquor is such that it is necessary to line the digesters with acid-resisting coatings. Lead has been used for this purpose to some extent, but is giving place to linings of enameled or glazed bricks set in cement with a leaden backing, or to cement linings, and again to coatings of sulphite of lime deposited by varying methods upon the interior of the steel shell of the digester. The woods chiefly utilized are spruce and Swedish fir and pine. The cooking takes from sixteen hours with high pressure to seventy-two hours at lower pressures. When the “cook” is complete the wood is washed in the digester and is then emptied out, or if the digester has been blown off into a drainer it is washed there, afterward going through the processes of washing, bleaching, and beating in the engines prior to conversion into paper. Unbleached sulphite fiber is of a light-brown color with a pinkish tinge, sometimes harsh and translucent, or again soft and nearly white, its variable quality being due to the treatment which the wood has undergone. When the fiber is well cooked and bleached it is soft, strong, and of pure color.

CLASSIFICATIONS OF PAPER.

Paper is classified under various heads in different countries, and its subdivisions are known by varying names. Its chief divisions are printings, writings, wrappings, and boards. These include nearly all of the grades, there being some special products which do not come distinctly under these heads. Each class has numerous subdivisions. The different named sizes of papers are given in the subjoined table. The figures denote inches, and it will be observed that a name sometimes stands for several sizes. These differences are due to various classifications of paper.

NAMED SIZES OF PAPER.

NAME.	U. S.	U. K.	NAME.	U. S.	U. K.	NAME.	U. S.	U. K.
Antiquarian . . .	31 × 53	31 × 53	Double foolscap . . .	16½ × 26½	16½ × 26½	Letter	10 × 16	10 × 16
Atlas	26 × 33	26½ × 34	Double imperial . . .	22 × 30	22 × 30½	Medium	17 × 22	17½ × 22½
Billet note	6 × 8		Double medium . . .	18 × 46	18 × 46	Medium and half . . .	18 × 23	18½ × 23
Broad twelves . . .	23 × 41		Double post	23 × 26	23 × 26	Medium post	19 × 24	19 × 24
Cap	12½ × 16½		Double pot	24 × 38	24 × 38	Packet note	20 × 24	20 × 24
Check folio	13 × 17		Double royal	19 × 30½	19 × 30½	Packet post	24 × 30	24 × 30
Colombier	17½ × 24		Double super-royal . .	15 × 25	15 × 25	Patched post	7 × 9	7 × 9
Commercial letter . .	23 × 34	23½ × 34½	Elephant	24 × 38	24 × 38	Post	9 × 11½	9 × 11½
Commercial note . .	24 × 34		Extra packet post . .	26 × 40	26 × 40	Pot	11½ × 18	11½ × 18
Copy	11 × 17		Flat cap	28 × 42	28 × 42	Royal	14 × 18½	14 × 18½
Crown	8 × 10		Folio post	23 × 28	23 × 28	Small flat cap	15½ × 19	15½ × 19
Demy	15 × 19	16½ × 21	Foolscap	12 × 19	12 × 19	Super-royal	12½ × 15	12½ × 15
Double demy	14½ × 18½		Foolscap and half . .	19 × 24	19 × 24	Web	18 × 22½	18 × 22½
Double cap	15 × 20	15½ × 20	Imperial	14 × 17	14 × 17		19 × 24	19 × 24
Double crown	16 × 21	17½ × 22½	Large post	17 × 22	17 × 22		19 × 24	19 × 24
Double elephant . . .	16 × 24		Legal foolscap	13½ × 16½	13½ × 16½		20 × 25	20 × 25
	16 × 42			14 × 18½	14 × 18½		20 × 25	20 × 25
	21 × 32			13½ × 24½	13½ × 24½		20 × 25	20 × 25
	17 × 28			13½ × 26	13½ × 26		20 × 25	20 × 25
	17½ × 28			21 × 36	21 × 36		20 × 25	20 × 25
		20 × 30		16½ × 20½	16½ × 20½		20 × 25	20 × 25
		23 × 48		8 × 24	8 × 24		20 × 25	20 × 25
		20½ × 40					20 × 25	20 × 25

in 1888. In this the carbonate of soda is substituted to a large degree by the sulphate of soda.

The acid or bisulphite process has taken a leading position in the manufacture of wood-fiber. It was invented by Benjamin C. Tilghman, a native of the U. S., in 1867, but was not developed fully by him because of the difficulty at that time of securing the necessary apparatus. This invention is the foundation on which the acid fiber industry has been built up to large proportions. The process consists in boiling the previously prepared wood in a solution of bisulphite of lime. This solution is ordinarily made by burning sulphur or iron pyrites in a furnace, and combining the sulphurous acid thus obtained with water containing lime. Other bisulphites, such as bisulphite of magnesium or sodium, may be used, notably the former, which is employed in the Ekman process. This invention was taken up by Fry and Ekman in Sweden, and by Mitscherlich, Kellner, and others in Germany and elsewhere, but not until the apparatus for putting it into successful operation had been invented in Europe was it brought into action in the U. S. The wood is first prepared with great care, the bark and knots being removed, and also all decayed and stained pieces; it is then cut into chips or into disks about 1½ inches

Folded Paper.—Although sheets of paper vary in size, when folded to make up in book-form they have other designations, according to the number of leaves into which a sheet is subdivided. Thus a sheet of paper when folded is described as follows:

Folio,	folded once	= 2 leaves	= 4 pages.	folio.
Quarto,	" twice	= 4 "	= 8 "	4to.
Octavo,	" four times	= 8 "	= 16 "	8vo.
Dodecimo,	" six	= 12 "	= 24 "	12mo.
Sexto-decimo,	" eight	= 16 "	= 32 "	16mo.
Octo-decimo,	" nine	= 18 "	= 36 "	18mo.
Quarto-vigesimo, . .	" twelve	= 24 "	= 48 "	24mo.
Secundo-trigesimo, .	" sixteen	= 32 "	= 64 "	32mo.

SPECIAL KINDS OF PAPER.

There are several kinds of paper which call for special description. Some of these are used in the form in which they come from the mill, while others are subjected to treatment in various ways at the hands of manufacturers, broadly known as converters, who prepare the product for special uses. The following are of the first class, except that *coated paper*, *safety-paper*, and *tracing-paper* are also sometimes produced by converters. *Asbestos-paper* is not one of the regular makes of paper, but is a special product consisting

principally of asbestos-fiber, with which a certain proportion of paper-pulp is incorporated. It is used for roofing purposes and for covering steam-pipes to prevent radiation of heat. *Blotting-paper* is a fibrous product, unsized, and used for absorbing ink and fluids. *Cigarette-paper* is a thin tissue from which all chemicals have been removed or neutralized. It is used with tobacco for making cigarettes. The best is said to be made from straw, and it has been asserted that the finest quality is produced from the worn out straw sandals of the Basque peasantry in Spain. There is a variety of cigarette-paper called *rice-paper*, but this is not the true product bearing that name.

Coated paper is a print paper to which a coating of white material, sometimes china clay, or gypsum, sulphate of barytes, etc., is applied. It is chiefly used for books or for fine prints from wood-cuts and process blocks. The coating is applied by machine brushes, after which the paper is dried in the web, and receives its final finish. White coated paper has a smooth, finely finished surface, enough only of the coating material being applied to fill up the pores of the paper and get the degree of finish desired. In this respect it does not come under the same classification as *surface-coated papers*, so called because a heavier coating is applied to their surfaces, various colors and shades of color, to which a glazed or dull finish is given, being used; *enameled papers* come under this class. Coated book-paper for printing upon with fine wood-cuts or half-tone plates was first adopted in the U.S., where the system of printing with hard packing on the cylinder of the printing-press prevails, and its use has established a distinct advance in the art of the printer.

Copying-paper is a thin tissue made specially for taking copies of letters, bills of lading, etc. *Detail-paper* is a special grade of heavy Manila-paper for the use of artists and draftsmen, its surface being such as to submit to erasures without destroying the texture of the paper. *Enameled paper* is a glazed paper to the surface of which a metallic pigment has been applied and polished. *Filter-paper* is unsized, thick, and spongy, and is employed for filtering solutions in pharmaceutical or laboratory practice. The best is made in Sweden.

India-paper is used for taking those impressions from fine engravings on steel or copper known as India-proofs. It has also been utilized for proofs of the finest wood-cuts and photo-mechanical plates. It is of different qualities, and is made from the inner fiber of the bamboo, which, after separation from its outer covering and incrustating substances, is well beaten, the pulp being then spread on a polished flat surface, which gives it a smooth finish, the upper or reverse side of the sheet being rough. It is of thin, soft texture, taking a mark upon the slightest pressure, and when properly dampened showing the finest line. Cotton-fiber is sometimes used as an admixture in the manufacture of this paper. *Oxford India-paper* is a specialty of the Clarendon Press at Oxford, England, and is the thinnest of opaque papers, so thin indeed that five original octavo volumes of the Bible, containing 2,688 pages, have been printed on it and included in the space of one volume. *Ivory-paper* is Bristol-board coated with animal size, with an admixture of white pigment, and then polished.

Japan-paper.—The Government of Japan has a paper-mill at Opi, where a dozen different kinds of paper, including the silkiest tissue-paper, thick parchment paper, Bristol-board, and the paper much prized by artists, etchers, and plate-printers, are made. The last, generally known as Japan-paper, is made from the fiber of the paper-mulberry, which is also employed in other manufactures of this mill. It is produced in varying thicknesses, sometimes quite thin, and is of strong texture and a creamy color. There are several varieties of the paper-mulberry cultivated in Japan expressly for paper-making purposes, the best being that known as Ts'kuri-kake; but this is scarce and expensive. In making this paper the mulberry stalks are steamed, stripped, washed, and then boiled in water made alkaline with the ashes of buckwheat husks. After this treatment the fiber is again washed, and then a paste or size made from tororo-root or from rice is added. Then follows the pounding or beating of the fibers, the dilution of the stuff in a tub or vat, and the ordinary process of manufacture by hand or on the machine.

Localized Fiber-paper.—This is a specialty adopted by the U. S. Government for use in its Treasury notes and other certificates of indebtedness. It is a bank-note paper containing fibers of colored silk, which are added to the pulp as it is made into paper. *Manifold-paper* is a thin

tissue used for writing upon with a stylus, which produces a number of copies upon as many sheets between which strips of carbon-paper are interposed. It is known in newspaper offices as "flimsy." *Nepaul-paper*, the bark of the *Daphne papyracea*, is after treatment converted into a strong unsized paper bearing this name. It is made in sizes many yards square.

Parchment-paper is made by passing unsized paper through a bath of dilute sulphuric acid. When dried it has a translucent, semi-transparent character, the paper gaining greatly in strength and resembling parchment. The paper is washed in water and then in dilute ammonia after undergoing the action of the acid bath. Glycerin is sometimes combined with the acid. Chloride of zinc is also employed for parchmentizing paper. A tough paper made in the ordinary way at paper-mills is called parchment-paper, but is not like the true parchment-paper or vegetable parchment.

Rice-paper is not paper in the ordinary sense of the word. True rice-paper is made from the pith of a tree indigenous to Asia, and known as *Fatsia papyrifera*. This grows to a height of 20 feet, and the pith is cut with a sharp knife into laminae snow white in color. The sheets are sometimes 95 by 140 inches in size, and are subjected to pressure to make them smooth. Rice-paper is made into artificial flowers, and is also used for taking impressions of fine engravings. Another variety of this paper is made from the pith of the *Aralia papyrifera*. The pith of the *Echynome aspera* is also employed for this purpose, as well as that from the *Hydrangea paniculata* and the *Hibiscus manihot*. There is another so-called rice-paper made by the ordinary processes of paper-making, but it is of different material, and so made the name is a misnomer.

Safety-paper, sometimes known as *protective paper*, is chemically or mechanically prepared so that tampering with any printing or writing upon it may be detected. The chemicals may be applied to the surface or incorporated in the pulp, so that erasures or the action of acids or alkalies will change or discolor the paper. Water-marks of a special design are sometimes employed, as in the Bank of England notes, or silk threads are embodied in the fiber.

Silver tissue is a fine thin paper used for wrapping silverware. It is carefully prepared by the elimination of all chemicals likely to tarnish or discolor the bright surface of the ware, and also averts to a great extent the oxidizing influence of the atmosphere. It is sometimes known as *grass-bleached tissue*. *Sponge-paper* is made from paper-pulp containing pieces of sponge in a state of fine subdivision; used in surgery. *Toned paper* or *tinted paper* is tinted or has its whiteness subdued or modified by a very slight addition of color to the pulp.

Tracing-paper is thin paper which has been treated with oil or a thin solution of resin to make it transparent. It is used by artists and draughtsmen, and is made in various sizes and in rolls. Some kinds of tracing-papers are thin tissues without any treatment with oil, etc. A variety of this paper is known as *pounce-paper*.

The following papers are of the class known as converted papers:

Carbolic acid paper is a paper treated with carbolic acid in combination with stearin or paraffin. *Carbon-paper* is a thin tissue, saturated with a pigment carried in oil, and capable of imparting color to sheets of paper with which it may be brought in contact. It is used in connection with manifold-paper. *Emery-paper* is a tough paper to which a coating of glue is applied, powdered emery being then dusted on the glutinous surface. It is used for rubbing down rough surfaces of metal, etc. *Glass-paper* is an abrading agent, made by coating paper with glue and applying finely ground glass to the surface thus prepared. It is employed for rubbing down the rough surfaces of wood and metal. *Gold-* (or *gilt-*) *paper* is a paper on which a film or coating of gold-leaf, or metal simulating gold, is applied, and retained by means of size. It comes plain and embossed in fancy patterns. *Lace-paper.*—A soft paper with perforations and open-work patterns simulating lace. It is made by rubbing off the elevated sections of paper which has been embossed in various designs. The latest method of manufacture is by machines provided with special cutting dies. *Shelf-paper*, so called because it is used for covering and giving a decoration to the edges of shelving, comes under this head. *Lithographic transfer-paper* is prepared by coating paper with starch paste, and is used for transferring designs from one lithographic stone to another. Chinese (India-proof) paper is employed

for this purpose; also Saxe-paper and good book or writing paper. *Marbled Paper*.—A paper ornamented in various designs in colors representing the striations of marble. It is prepared by depositing the paper upon a surface of a thick solution of gum contained in a trough on which various mineral pigments in dilution are thrown or sprinkled, the disposition of the marbling being regulated by the use of tools which make varied patterns. The colors adhere to the surface of the paper, which when taken up and dried is polished by burnishing. *Moth-paper*.—A Manila-paper impregnated with carbolic acid, tar, or other strong and malodorous solutions, and used for enwrapping furs and woollens, or for placing in closets, chests, etc., to prevent the incursions of moths. *Music-paper* is ruled with lines of the musical staff. *Oiled paper* is a thin paper saturated with an oil and then dried. It is used for tracing purposes. *Oiled board* is a thicker paper of the same character employed to interpose between leaves of paper in books used for copying letters or other written documents. *Pasteboards* are thick sheets made by pasting a number of sheets of coarse and common wrapping-papers together, and finished by glazing between friction calenders. *Pasted Bristols* are a variety of Bristol-boards made by pasting a number of sheets of unruled writing-paper together, after which a finished surface is given by passing the sheets through super-calenders or plating-machines. These are thus distinguished from *mill Bristols*, which are made of required thicknesses on the machine. The very best grades of stock are presumably used in making pasted Bristols. *Photographic paper* is coated or impregnated with various chemical constituents sensitive to light. It occurs under many different names. *Sand-paper* is made by coating paper with glue and applying fine sand, which is dusted over the surface. It is used in smoothing wooden and metal surfaces. *Satin-paper* has a fine glossy surface imparted by means of a satining machine, in which a brush operates in contact with the face of the web of paper. *Silver-papers* are sheets to which silver or white metal-leaf is attached by means of size. It is made plain and in embossed patterns. *Test-paper* is prepared by dipping paper into a solution or decoction sensitive to different reagents and then drying it. When used it is for the purpose of determining the presence of a substance in solution capable of changing the color of the paper. *Litmus-paper*, which is most commonly used, is made in two different colors—blue which changes to red in the presence of an acid, and red to blue in contact with an alkali. Other kinds of test-paper are *Brazil-wood paper*, *buckthorn-paper*, *cherry-juice paper*, *dahlia-paper*, *indigo-paper*, *iodine-paper*, *lead-paper*, *rose-paper*, *starch-paper*, and *turmeric-paper*. *Touch-paper* is a paper saturated with a solution of nitrate of potash and dried.

Velvet-paper and *wall-papers* are described under PAPER-HANGINGS.

Statistics.—The annual production of paper can only be a matter of rough estimate. The returns from the mills in the U. S. afford the nearest approximate for judging of capacity. Data gathered for *Lockwood's Directory of the Paper, Stationery, and Allied Trades for 1894-95* show that there were 1,231 paper and pulp mills in the U. S. at that date. The total daily producing capacity of the mills thus reported is given at 20,986,180 lb. The increase since 1881 (thirteen years) is almost 295 per cent. JAMES A. COLVIN.

Paper-hangings, or Wall-papers: ornamental papers intended to be pasted on the walls or ceilings of apartments. Paper-hangings are reported to have been made in Spain and Holland before 1553, but their manufacture has only in more recent times become a leading industry. The choicest wall-papers are made of good material, but for the low grade large quantities of woolen, hempen, and jute waste are employed. The paper was formerly all printed by hand, either by the process of block-printing or stencil. Cylinder-printing is now used, identical in principle with the processes employed in CALICO-PRINTING (*q. v.*); but choice styles are still hand-printed, the blocks being either engraved wholly in wood or partly made up with metal for the thinner lines. Some striped papers are colored by a simple process which can not be called printing, the colors being imparted through apertures, underneath which the paper is rapidly drawn. Flock-printing is done by printing the pattern in with varnish and then sprinkling on colored flocks, in powder, the flocks being the shearings of woolen cloth. Such papers are generally called velvet-paper. Satin-papers are finished with powdered stearite and polished.

Paper-mulberry: See FIBER.

Paper-nautilus: See ARGONAUT.

Paphlago'nia: in ancient times a district of Asia Minor, extending along the southern shore of the Euxine Sea, from Pontus to Bithynia, and bounded S. by Galatia. It was inhabited by wild and warlike tribes belonging to the Semitic race, and it was celebrated for the excellent horses it produced. Originally it formed an independent state, but it was conquered by Cræsus, and subsequently incorporated in the Persian empire. After the death of Alexander it became independent once more, but was conquered by Mithridates, and after his fall it was made a part of the Roman province of Galatia.

Pa'phos: the name of two ancient cities of the island of Cyprus. One of them, the present *Kukla*, was often called *Palaipaphos* (Old Paphos), and was famous for its temple of Aphrodite, who was said to have been born here from the foam of the waves. The other, the present *Baffa*, was called *Neopaphos* (New Paphos), and was the place where St. Paul preached to the proconsul Sergius.

Pa'p'ias: a Christian Father of the second century, Bishop of Hierapolis in Phrygia, according to Irenæus a disciple of John the apostle, and a companion of Polycarp. He suffered martyrdom at Pergamus during the persecutions of Marcus Aurelius about 163. Of his *Δογματικὴν Ἐκκλήσιαν* only eleven fragments have come down to us. It was a collection of sayings of the Lord, the apostles, and the disciples, with explanatory notes derived from oral tradition. The work existed as late as the thirteenth century, and it is not necessary to give up all hope of its recovery. See *Reliquiæ Sacræ* of Routh (Oxford, 1814; 2d ed. 1846); the *Apostolic Fathers* of Bishop Lightfoot (edited by Harmer, London and New York, 1893), pp. 515-525, and the translation, pp. 527-535. Trans. also in *Ante-Nicene Fathers* (New York), i., 151-155. He was a very strong millenarian.

Revised by S. M. JACKSON.

Papier-maché [= Fr., liter., chewed or macerated paper]: a manufactured material composed chiefly of paper-pulp or of paper in sheets, combined with various adhesive substances, coloring-matters, etc.; usually pressed to the desired form in suitable moulds. This material, although comparatively modern among civilized nations, is nevertheless of great antiquity in China, where doubtless it originated. In Kashmir the manufacture has long been established, and under the name of *kar-i-kalamdani*, or pen-tray work, the production of boxes, trays, and cases of papier-maché is a prominent industry. Paper-pulp was combined with gums and china clay by Martin, a German snuff-box maker, who is said to have learned the art in France about 1740. There are three processes by which the bodies of papier-maché articles are manufactured—the first consists in mixing paper-pulp with gum, resin, paste, or glue, and then placing a sufficient quantity of the mixture in a mould and subjecting it to heavy pressure; in the second process heavy sheets of softened mill-board made from pulp are pressed to the desired shape in moulds; the third process (invented by Henry Clay, of Birmingham, in 1772) employs spongy paper (similar to thin blotting-paper), layers of which are glued or pasted together and pressed into moulds. This process is considered the best, as from the uniformity of its substance it produces the strongest work; but the other methods are cheaper, and are still used for many small articles.

When the bodies of the articles are removed from the moulds, they are dried, filed, smoothed, varnished, ornamented, and polished. Soon after the invention of Henry Clay's process the manufacture of papier-maché in Birmingham rapidly increased, and in 1780 embraced a large variety of articles, such as tables, chairs, cabinets, tea-trays, caddies, panels for doors and ceilings, coaches, sedan-chairs, snuff-boxes, etc.

Pearl-shell inlaying was patented by George Santer in 1825. There is also a process of transferring colored designs from tracing-paper, which was patented in England in 1856. These methods of decoration have been used in a most extravagant and inartistic manner, and have contributed in no small degree to cause a decline in the popular appreciation of manufactures of papier-maché, which is a very suitable material for a large variety of decorative and constructive uses, being a light, tough, strong, durable substance, possessed of some elasticity, little liable to warp or fracture, and unaffected by damp.

W. F. DUFFEE.

Papilionaceæ: See LEGUMINOSÆ.

Pap'in, DENIS: physicist and inventor; b. at Blois, France, Aug. 22, 1647; studied medicine at Paris and practiced for some time as a physician, but devoted himself subsequently to the study of physics and mathematics under Huyghens; visited England, and received in 1687 a professorship in mathematics at Marburg in the present Prussian province of Hesse, where he died about 1712. His writings are numerous, but are scattered in *Acta Eruditorum*, *Recueil de diverses Pièces*, *Philosophical Transactions*, etc.; they contain many valuable discoveries, most of which, however, were not fully recognized during his lifetime. He was the inventor of the so-called Papin's digester. (See DIGESTER, PAPIN'S.) It also appears that in 1707 he tried on the river Fulda a vessel propelled by paddles operated by a steam-engine. He improved the pneumatic machine invented by Otto von Guericke, and was active in the controversy with Leibnitz concerning the so-called "dead" and "living" forces.

Papineau, PAÁ PÉÉ NÔ, LOUIS JOSEPH: political leader; b. at Montreal, Oct., 1789; studied at the Seminary of Quebec, and became an advocate; in 1809 entered the Canadian Parliament, and in 1815, and again in 1827, was Speaker of the lower house; but Lord Dalhousie, who had tried in vain to conciliate him with the conservative party, in the latter year adjourned the Parliament to prevent Papineau from acting as Speaker. He was after that the acknowledged leader of the Lower Canadian radicals, or French party, and after the breaking out of the rebellion of 1837 (which he did not approve) was accused of high treason and escaped to the U. S., and thence in 1839 went to France. In 1847 he returned to Canada, and though sent to Parliament and highly popular with the French element, he never again assumed leadership. D. at Montebello, Quebec, Sept. 23, 1871.

Papinia'nus, ÆMILIUS: a Roman jurist, probably from Syria, who held high and influential positions under the reign of Septimius Severus, and was *præfectus prætorio* 205-212, but was put to death in 212 by Caracalla. His works—37 books of *Questions*, 19 of *Responsa*, 2 of *Definitiones*, etc.—were considered the highest authority in Roman jurisprudence, and several of the most eminent Roman jurists, as, for instance, Ulpian and Paulus, were his disciples. The *Digests* contain 595 extracts from his works, but generally they are very short. See also HUSCHKE, *Jurisprudentiæ antejustinianæ*, pp. 436-449 (Leipzig, 1886).

Revised by M. WARREN.

Pap'pus (in Gr. Πάππος) OF ALEXANDRIA: a mathematician who flourished in the second half of either the third or fourth century A. D. His most important work was the *Μαθηματικὰ Συναγώγαι* (Mathematical Collections), containing besides his own work explanations of earlier mathematicians, with extracts and his own criticisms on them, in eight books, of which the last six and part of the second have been preserved. These are of value in the history of mathematics. A Latin translation appeared in 1588, and portions of the Greek text have been published several times. A complete edition is by Friedrich Hultsch (3 vols., Berlin, 1875-78).

Papua: SEE NEW GUINEA.

Pap'rus [= Lat. = Gr. πάπυρος]: a large reed, various parts of which were employed by the Egyptians in the construction of boats, mats, baskets, and other woven fabrics, but particularly in the preparation of writing-paper. It is known as *Cyperus papyrus* (*papyrus antiquorum*), and is extinct in Egypt, being found only in remote parts of Abyssinia. It is also said to occur in Western Asia. There is some doubt whether it was native to Egypt, but the representations on the monuments, showing rank papyrus-grown swamps where water-fowl abounded, indicate an absence of regular culture. In the hieroglyphic writing the papyrus plant is employed as the symbol of Lower Egypt. The stalks were triangular, from 4 to 6 inches in diameter, and 12 to 15 feet high. The roots were used for fuel, and a part of the inside of the stalk was edible. For paper-making a piece of the stalk of a length corresponding to the width of paper required was cut off, the rind was removed, and the inner portion was unrolled with a needle or a sharp knife. Upon this sheet another was placed transversely, and the two were joined by the juice of the plant or by a thin gum, the union being enforced by heavy pressure. The sheets were smoothed and afterward bleached by exposure to the sun. The color varied from a gray or yellow to a rich brown. The sheets varied from 6 to 17 inches in width,

and any required length was obtained by fastening a number of sheets together end to end. The usual width was about 8 inches. The *Papyrus harris* in the British Museum is the longest known, being 135 feet, and a fairly full copy of the *RITUAL OF THE DEAD* (q. v.) required a roll 15 inches wide and from 80 to 90 feet long. The better qualities had only two layers of fibers; three layers indicate inferior grades. Specimens have been preserved which date from the Middle Kingdom, and the use of papyrus continued till the twelfth century in Europe. For a long time it was an article of Egyptian export, and in great demand. Probably it was never cheap even in Egypt, if we may judge by the fact that it was often used a second time, the first writing having been removed by washing. In later times there were various grades which were known as *charta regia*, *Augusta*, *hieratica*, *Livia*, *Saitica*, etc. Fanniana was the name given to a papyrus retreated and improved at Rome. With regard to writing on papyrus, its methods and subjects, see EGYPTIAN LANGUAGE AND LITERATURE. See also Taylor, *Transmission of Ancient Books*; Birt, *Das antike Buchwesen*; and Budge, *The Mummy*. See also SEDGE FAMILY.

CHARLES R. GILLET.

Pará: a state of Brazil, occupying the lower portion of the Amazon valley; bounded N. by British, Dutch, and French Guiana, N. E. by the Atlantic, E. by Maranhão, S. by Goyaz and Matto Grosso, and W. by Amazonas. Area (allowing the Brazilian claims for disputed boundaries on the side of Guiana), about 714,000 sq. miles. Pop. (estimated, 1892) 495,417. The Guiana table-lands, in the northern part, have an elevation of some 2,700 feet, and outlying portions near the Amazon are nearly 1,000 feet high; the Brazilian plateau, 2,500 feet high on the confines of Matto Grosso, falls gradually to about 300 feet near the Amazon. Between these the plains of the Amazonian depression are in some places not more than 30 miles wide, but broaden out westward into the state of Amazonas and eastward toward the Atlantic; the flood-lands of the river have an average width of about 25 miles above the mouth of the Xingú, and below it they are much wider. The Amazon itself, with its numerous side channels, forms an unrivaled system of interior communication. This is supplemented by the Pará and Tocantins, with a network of channels connecting them with the Amazon. The whole state seems covered with forest; but, hidden from the river by lines of trees, there are extensive tracts of grass on the flood-plains, and especially on the great island of Marajo; large areas on the plateaus, with some near the river, have only the low, scrubby growth of the Brazilian *campos*. Though the state is directly under the equator, the climate, tempered by the trade winds, is nowhere excessively warm; its equability and general healthfulness make it especially beneficial for invalids. Malarial fevers are confined to portions of the swampy lowlands and to the branches of the Amazon; yellow fever is rarely epidemic; the African disease called *beri-beri* is sometimes prevalent on the flood-lands. From the first the settlement of Pará proceeded along the lines of the rivers, and it has never gone much beyond them; with only one short railway and hardly any common roads, communication is almost entirely by steamboats or canoes. A few Indians wander wild in the interior, but the greater part are civilized or submissive to the whites, forming the mass of the country population. The most important industries are the extraction of forest products, especially rubber; sugar-cane (used mainly for making rum), cacao or chocolate beans, tobacco, and manioc are the principal agricultural products; and on the open lands the grazing industry has attained some importance. The principal exports, in the order of their value, are rubber, cacao, hides, and Brazil-nuts; much of the trade is with the U. S. The revenue is derived mainly from a tax on rubber, and the state has nearly always a surplus. The Portuguese settled Pará in 1616, driving out Dutch and French traders. After Brazil became independent this region was ravaged by a rebellion of the lower classes, 1835-37. Amazonas was separated from Pará in 1852. See H. H. Smith, *Brazil* (1879); the *Travels* of H. W. Bates, A. R. Wallace, and William H. Edwards; *The State of Pará: Notes for the Exposition of Chicago* (1893).

HERBERT H. SMITH.

Pará, officially *Belem*: capital and principal city of the state of Pará; on a low point at the mouth of the river Guamá in the Pará; 85 miles from the mouth of the latter in the Atlantic (see map of South America, ref. 3-F). It is regularly laid out with wide streets, which, except in the

business portion, are adorned with mangrove and other trees. The principal public buildings are the cathedral, the custom-house (formerly a Jesuit convent), and the Government theater; the president's and bishop's palaces and the house of the legislature are plain buildings. The finest residences are in the quarter called Nazaré, formerly a suburb; many of them are surrounded by extensive gardens, which are often allowed to run partly to waste, presenting an exceedingly picturesque appearance. The chapel of Nazaré is a noted resort, and the yearly festival held here attracts thousands of visitors. Tropical forest, swampy in many places, comes close to the city, and the suburban streets require constant care to keep them from the encroachments of vegetation. Pará has a marine arsenal, a botanical garden, a small museum, library, theological seminary, and good public and private schools. It is the commercial metropolis of the Amazon valley; its exports of rubber far exceed those of any other port in the world, averaging (including that in transit) over 8,000,000 lb. annually. Owing to strong tides and shallows near the city the harbor facilities are poor; light-draught river-steamers discharge directly at wharves, but large vessels are obliged to anchor some miles below. Pop. (1892) estimated with suburbs, 65,000. H. H. SMITH.

Parable [from O. Fr. *parable*, *parabole* > Fr. *parabole* < Lat. *para'bola* = Gr. *παράβολή*, a placing beside, comparison, parable, liter., a throwing alongside; *παρά*, beside + *βάλλειν*, throw]: a short fictitious narrative intended to illustrate some point in moral or religious teaching. Parables abound alike in the teaching of Christ and in the Jewish Talmudical writings; but the parables of Christ (not used by him in the beginning of his ministry, but only after he had encountered opposition) immensely surpass all others.

Parab'ola [Mod. Lat., from Gr. *παράβολή*, *parabola*, liter., a throwing alongside, so called from its direction as compared to a side or element of the cone. See PARABLE]: a plane curve of the second degree, with a single branch extending to infinity. In modern geometry it is defined as a curve of the second degree, touching the line at infinity. (See GEOMETRY.) This curve is the section of a right cone by a plane parallel to one of its tangent planes, from which point of view it was originally considered.

It is a property of the parabola that every part of the curve is equally distant from a fixed point and from a given straight line. The fixed point is called the *focus*, the given line is the *directrix*, and a straight line through the focus perpendicular to the directrix is the *principal axis*. At every point of the curve the line from the focus and a parallel to the axis make equal angles with the tangent—that is, the two first lines are reflections of each other with regard to the surface formed by the revolution of the curve round its axis. (See PARABOLOID.) Any line parallel to the principal axis is called a *diameter*, and every diameter bisects all the chords of the curve that are parallel to the tangent at the point where it meets the curve. The principal axis is therefore a line of *right* symmetry, and every other diameter is a line of *oblique* symmetry. The breadth of the curve through the focus is called the *parameter* of the curve; it is also called the parameter of the principal axis. The parameter of any diameter, including the parameter of the principal axis, is equal to four times the distance from the focus to the vertex of that diameter. If we neglect the resistance of the air and consider gravity as acting in parallel lines, the path of a projectile is a parabola with its axis vertical and its vertex at the highest point of the path. The equation of the parabola in Cartesian co-ordinates is $y^2 = px$, where p is the parameter, and it has this form if the curve be referred to any diameter and the tangent at the point where it meets the curve. The curves included in the form $y^n = px^m$, where m and n are positive integer numbers, have been called parabolas. Thus the curve $y = px^3$ is called the cubical parabola and $y^2 = px^3$ the semi-cubical parabola. The curve $y = a + bx + cx^2 + dx^3 + \text{etc.} + fx^n$ has also been called a parabola of the n th degree.

Revised by R. A. ROBERTS.

Parab'oloid [Gr. *παράβολή*, *parabola* + suffix *-oid*, having the form of]: a surface of the second order whose plane sections parallel to a certain right line are parabolas. In modern geometry it is defined as a surface of the second degree, touching the plane at infinity. There are two principal kinds, the elliptic and the hyperbolic. In both paraboloids all sections parallel to the straight line called the axis are parabolas, while in the elliptic paraboloid all other sections are ellipses. If the sections of the latter perpendicular to

the axis are circles, the surface is generated by the revolution of a parabola about its axis. This surface is such that parallel rays of light falling upon it in the direction of the axis are accurately reflected to a fixed point called the focus. (See PARABOLA.) It is also the form of the free boundary of a fluid rotating under the action of gravity. (See HYDROSTATICS, *Surface of Liquids*.) Hyperbolic paraboloids are ruled surfaces admitting of two modes of generation. All sections except by tangent planes and those mentioned above are hyperbolas.

R. A. ROBERTS.

Paracatú: a town in the western part of the state of Minas Geraes, Brazil; close to the boundary of Goyaz; near a river of the same name, a western affluent of the São Francisco. It was formerly noted for its rich gold washings, which are now nearly abandoned; it is the center of a rich grazing district, and has a thriving trade with Goyaz and Bahia. Coffee and sugar-cane are grown on a considerable scale in the vicinity. Pop. 10,000. H. H. S.

Paracel'sus: physician and author; the assumed name of Philippus Aureolus Theophrastus Bombastus von Hohenheim; b. at Einsiedeln, Switzerland, in 1493; the son of a physician. He read the works of the alchemists and magicians, and traveled on foot far and wide collecting information regarding the healing art from barbers, blacksmiths, and wise women; spent much time in the mines of the Tyrol; took the degree of doctor in medicine; served for a time as a military surgeon in Denmark, the Low Countries, and Italy, and then resumed his wanderings. Æcolampadius procured him a professorship of medicine and surgery at Basel (1526), but he was soon compelled to leave the place (1527) by the Galenic physicians, for he openly burned Galen's books and denounced the Arabian masters, then so generally studied. Erasmus was one of his patients. If we may believe his adversaries, Paracelsus was almost always drunk, and was guilty of gross irregularities; certain it is that he had to resume his wandering life, and that after many strange vicissitudes he was thrown from a window and killed by the servants of a physician at Salzburg, Sept. 23, 1541. He left six professional treatises, besides a large number of works which bear his name, some of which were written by his enemies to injure his reputation, and others by fanatical admirers. His lectures also were delivered with great rapidity, and published by his hearers in a very imperfect state. Paracelsus, though he displayed many traits of the charlatan, lived a useful life. The profession of medicine at his time needed reformation quite as much as the Church did. He destroyed the humoral pathology, broke the tyranny of Galen and his Arabian followers, and introduced many new and valuable remedies. His empiricism was based upon the principles of careful observation now universally recognized. He paid great attention to diet, condemned the use of strong evacuates and the abuse of mercury, avoided the excessive mixing of drugs, and strove to reduce the overdosing then so prevalent. He is called an alchemist, although he condemned the search for the transmutation of gold, and an astrologist, although he opposed the study of astrology. A curious work regarding spirits is ascribed to him, and the strange jargon regarding sylphs, pygmies, undines, gnomes, salamanders, and other "elemental spirits" is commonly thought to have been invented by him; so that believers in the existence of such beings are called Paracelsists; but it is probable that he never wrote the work (*Libre de Nymphis*, etc., Basel, 1590), for he elsewhere ridicules all such ideas. He taught a singular theosophy—a kind of pantheistic system in which the Cabalah was combined with natural science founded on experience and experiment, but the distinction he made between faith and reason as two different organs of perception, each with its own field of activity, resembles modern attempts of the same tendency. See *The Hermetic and Alchemical Writings of Paracelsus* (2 vols., London, 1894).

Parachute [= Fr. (by analogy of Lat. *para're*, get ready, ward off, or of words beginning with prefix *para-*); *parer*, prepare, ward off + *chute*, fall]: a machine first successfully employed by Blanchard at Strassburg in 1787, and designed to enable aeronauts to descend safely to the ground from a balloon. It is shaped like an umbrella, and is taken up in a collapsed or closed form. The car is first attached beneath the parachute, and the balloon above the whole; a rope passing through the hollow stem of the parachute attaches the balloon to the car; this rope is cut at the proper time, the car falls rapidly, and the parachute is expanded by the action of the air. The car's downward motion is thus

checked, and it descends slowly toward the earth. In practice, the parachute is not to be depended upon. It is liable to oscillations, which frequently prove fatal to the aeronaut.

Paradise [from O. Fr. *paradis* - Lat. *paradisus* = Gr. *παράδεισος*, from Zend *pairidaēza*, inclosure; *pairi*, around + *di*, throw up, pile up]; a park or pleasure-ground; especially the Hebrew Eden (*q. v.*). The Bible uses the term in a double sense—first, for the garden of Eden, and next for the abode of the blessed in heaven (Luke xxiii. 43). It is remarkable, however, that in the discourses of Christ, public or private, the word occurs only this one time, in the words which Christ spoke to the penitent robber. Metaphorically, it is often used synonymously with heaven, denoting the future bliss which awaits the righteous. See HEAVEN.

Paradise'idæ [Mod. Lat. See PARADISE]: a family of birds containing the BIRDS OF PARADISE (*q. v.*), distinguished by their curious plumage, and closely related to the *Corvidæ*. The bill is moderately elongated, strong, slightly decurved; the base of the bill, as well as nostrils, is covered to a greater or less extent by short feathers; the wings are long and rounded; in addition to the ordinary plumage are developed feathers of various forms and styles, diverging from the shoulders, sides, and caudal region; the feet are robust; the toes with long curved claws. The species are confined to the islands of New Guinea and its vicinity. Something like forty-five species are known, most of which are described and figured in Elliot's *Monograph of the Paradiseidæ*.

Revised by F. A. LUCAS.

Paradise of the West: See SUKHĀVATĪ.

Paradox'ure [from Mod. Lat. name *Paradoxurus*; Gr. *παράδοξος*, incredible + *οὐρά*, tail]; any member of the genus *Paradoxurus* of the family VIVERRIDÆ (*q. v.*).

Paræsthesia: See FORMICATION.

Paraffin, or **Paraffine** [Lat. *pa'rum*, little, too little + *affinis*, akin]: a beautiful white waxy solid which occurs native in the mineral wax ozokerite, found in Galicia, Utah, and elsewhere, and in some kinds of petroleum, and also found in coal and shale oil, and the products of the destructive distillation of many other organic bodies, as oil, fats, wax, wood, peat, albertite, grahamite, etc. It was discovered by Reichenbach in 1830 in wood-tar.

Preparation.—(1) Paraffin is obtained from ozokerite by distillation, cooling, and pressing the product, and purifying it by treatment with sulphuric acid and caustic soda, washing and pressing. It is also purified by repeatedly melting it with petroleum naphtha and subjecting it to pressure. (2) By similar means it is prepared from the heavier portions of coal oil and petroleum, which solidify on cooling, owing to the crystallization of the paraffin.

Composition.—Paraffin is generally a mixture of two or more members of the paraffin series of hydrocarbons, $C_{27}H_{56}$, $C_{28}H_{58}$, $C_{29}H_{60}$, $C_{30}H_{62}$, etc. $C_{27}H_{56}$ contains carbon 85.26 and hydrogen 14.74; $C_{30}H_{62}$ contains carbon 85.31 and hydrogen 14.69.

Properties.—A translucent crystalline solid, white in masses, odorless and tasteless, resembling spermaceti. Its specific gravity is about 0.870; it melts at from 113° to 149° F., and forms a colorless oil which solidifies into a crystalline mass. It boils at about 600° F., and may be distilled with but little decomposition, especially if the distillation is aided by a current of superheated steam. That obtained from ozokerite has the highest melting-point, and is consequently preferred for the manufacture of candles. It is insoluble in water, but dissolves in 2.85 parts of boiling alcohol, separating almost completely on cooling, in crystals. It is more soluble in ether, oils, and naphthas. Acids, alkalies, and chlorine have little effect upon it; whence its name. By the long-continued action of nitro-sulphuric acid it is converted into paraffinic acid. Heated with sulphur, it yields impure sulphuretted hydrogen.

Uses.—Paraffin has numerous important applications in the arts. Beautiful candles are made from it, but when the more fusible varieties are employed, the candles are liable to droop and lose their form. The crystalline structure also interferes with the manufacture of candles, but this is met by the use of small percentages of wax, etc., and by chilling the moulds, after the melted paraffin is poured into them, by placing them in cold water. It is extensively used for waterproofing fabrics, cloth, and leather for shoes, even dress silks, which are thus protected from stains. It is used for protecting from rust or decay, and putrefaction, meat,

fruit, timber, metals, cartridges, pills, etc.; for making tight the stoppers of acid bottles; as a substitute for sulphur in the manufacture of matches; for oil-baths of constant temperature; for refining alcohol and spirits, by passing the vapor during distillation through melted paraffin, which abstracts the fusel oil; considerable quantities are used for chewing-gum. Uncrystallized or amorphous paraffin is in very common use in the well-known vaseline or petroleum ointment. See BITUMEN, HYDROCARBONS, and PETROLEUM.

Revised by S. F. PECKHAM.

Paraguay, par'ā-gwī (Sp. *República del Paraguay*): the smallest of the South American republics, except Uruguay; between Bolivia on the N., Brazil on the N. and E., and the Argentine Republic on the S. E., S., and W. Area, according to official figures, 97,707 sq. miles; but this is only approximate, as the boundary with Bolivia is unsettled.

Topography.—The river Paraguay divides the country into two well-marked sections. The portion W. of the Paraguay is a low plain, a wilderness of swamps, forest, and grass-lands. This region, the Paraguayan Chaco, is described in the article GRAN CHACO (*q. v.*). The remaining and larger portion (about 62,000 sq. miles) is sometimes distinguished as Paraguay proper. It occupies a peninsula formed by the rivers Paraguay and upper Paraná, which unite at the southwestern extremity; the northern boundary is the river Apa, a branch of the Paraguay, and the northeastern is formed by lines of hills, the continuation of a line of heights which begins about 75 miles E. S. E. of Asuncion, and extends N. N. E. across the country. The heights, improperly called *sierras* and *cordilleras*, appear to be nothing more than the eastern and southern edges of an extension of the Brazilian plateau, which occupies all the northern and central parts of Paraguay; but this plateau is so cut up by river valleys and varied with hills that it has lost the character of a table-land. The maximum elevation is probably less than 2,500 feet. The steep edges are, at the highest part, close to the divide between the affluents of the Paraguay and Paraná. On the western side the country falls irregularly but gradually to the rolling lands and plains bordering the Paraguay. The hills of Southern Paraguay and the upper Paraná valley are spurs and outlying portions of the same plateau. The southwestern corner of the country is nearly all occupied by an extensive swampy plain, with several shallow lakes; and there are smaller swamps farther N., along the course of the Paraguay. A large portion of the valley of the upper Paraná and the central hills are covered with forest; toward the Paraguay this gives place to open lands suitable for grazing. The rivers PARAGUAY and PARANÁ (*qq. v.*) are natural highways of great importance. The Jejuj and Tibicuary, affluents of the Paraguay, are both navigable, and promise to be of great commercial value. The other Paraguayan branches of the two rivers are numerous, but generally short and navigable for only a few miles.

Climate.—Though two-thirds of the republic is in the south temperate zone, the climate is tropical; but the temperature varies considerably, according to the prevalence of S. or N. E. winds. The mean for the year is about 73° F.; in December and January the thermometer occasionally rises above 100° at Asuncion, and from May to August light frosts are sometimes felt when the S. wind blows. There is no well-marked dry season; showers are more abundant in the warm months, from October to April. In November and December and in June there are frequent tempests, with torrential rains. The whole of Paraguay is healthful, even in the swampy districts of the southwest; malarial fevers are not common, and destructive epidemics are rare. The common diseases arise mainly from poor and insufficient food; lung troubles are almost unknown. Goitre and elephantiasis are endemic in a few districts.

Fauna, Flora, etc.—The animals and plants resemble those of Brazil, but there is an intermixture of the temperate forms of the Argentine Republic. Jaguars, tapirs, deer, wild hogs, etc., are abundant in the wilder districts, and the Paraguay, especially, swarms with alligators. The river-fisheries are very productive. The forests are rich in almost untouched cabinet woods and various drugs. The most valuable forest product is mate or Paraguay tea. The soil, especially in the forest districts, is very fertile. Paraguay is poor in minerals; iron, which is abundant, is little utilized, owing to the lack of coal; copper is reported, and limestone and some varieties of marble are quarried on a small scale.

Population.—Nearly all the civilized population is found in the southern part in a strip along the east side of the Paraguay. The first Spanish conquerors formed numerous unions with the native Guarany women, and their offspring became the ruling class of the country. This half-and-half stock has been perpetuated by intermarriages; it is still the most influential, and by courtesy is called white. The great mass of the population contains far more Indian, and some Negro, blood; almost the only pure whites are a few thousand foreigners. A corruption of the Guarany tongue is still the common language, though Spanish is also spoken in the larger places. The very imperfect census returns of 1886 gave a population of 239,774, evidently much below the truth. The civilized or semi-civilized population may be estimated (1894) at about 450,000. The wild Indians, nearly all in the Chaco, probably do not exceed 40,000. Before the bloody war of 1864-70 the population was larger. This war was especially destructive to the males, and the excess of women over men is even now very noticeable, especially in the cities. Education and refinement are confined to a small class; the mass of the population is densely ignorant and very poor.

Industries.—The only important industries are agriculture, grazing, mate-gathering, and timber-cutting. The common crops are mandioca, maize, beans, sugar-cane, oranges, and tobacco. The small Paraguayan cigars are greatly esteemed in the Platine states. The republic has (1894) about 1,000,000 head of cattle, principally on large *estancias* in the western and northern districts. There are few good roads, and the only railway runs from Asuncion 142 miles E. and S. E. to Villa Rica and Caazapá. Ocean steamers ascend regularly to Asuncion and beyond, and there is telegraphic communication with Europe. Owing to its poverty and its inland position, Paraguay is ill able to compete in trade with other South American countries. The exports, generally amounting in value to less than 3,000,000 pesos annually, are mainly to the Argentine Republic; the principal items, in the order of their importance, are mate, tobacco and cigars, timber, hides, and oranges.

Government.—The government is a centralized republic; the president is elected for four years, and congress consists of two houses. The recognized and common religion is the Roman Catholic, but all sects are tolerated. Education is nominally compulsory; in 1893 there were about 400 Government or subsidized schools, and there is a national college at Asuncion. The army and navy are insignificant. Owing to bad faith little benefit was derived from foreign loans made soon after the war of 1864-70; and though obligations have been partly met by the sale of public lands, there have been recurring deficits and even default of interest on the foreign debt. A large amount of inconvertible paper currency has been issued. Aside from this the internal debt is small; the entire foreign debt, on Jan. 1, 1893, was 26,523,712 pesos. The basis of value is the silver peso or dollar, nominally worth about 96 cents U. S. currency, but commercially much less. The metric system is legalized, but the old Spanish weights and measures are still in general use.

History.—Sebastian Cabot, seeking a more direct route to Peru, explored the lower Paraguay in 1527. After Pedro de Mendoza founded the first colony of Buenos Ayres, he sent an expedition up the Paraguay under Ayolas, who founded Asuncion about Sept., 1536; Buenos Ayres was abandoned soon after, and Asuncion became the capital of Paraguay, a name which then included the whole Platine region; this was soon after attached to the viceroyalty of Peru. The Guarany Indians, who inhabited the country E. of the Paraguay, were at first very friendly, and though they subsequently rebelled, they were easily subdued. The more warlike Indians of the Chaco resisted the whites from the first, and there were constant struggles with them until the tribes were exterminated or driven into the interior. In 1620 Buenos Ayres was separated from Paraguay, both remaining provinces of Peru until 1776, when Paraguay was attached to the new viceroyalty of Buenos Ayres or La Plata. The Jesuit order had little power in Paraguay until 1611, when it was practically given control of the whole Indian and rural population. Among the Guaranies the missionaries formed numerous and rich establishments, principally in the valley of the upper Paraná and in Misiones (now in Argentina). Each mission was a huge, well-ordered farm; all work was under the absolute control of the Jesuit director, and all produce, after providing for the needs of the workmen, was sold for the benefit of the mis-

sion or the order. This system saved the Indians from want and from Spanish slavery, and gave them the rudiments of religious instruction; but it left them childish and fit tools for the political tyrants of later times. The Jesuits had many disputes with the civil and ecclesiastical authorities at Asuncion; several times they were temporarily expelled, and at others they had entire control of the Government. After 1685 the missions suffered severely from the incursions of Portuguese slave-hunters from São Paulo. The order was expelled in 1767, the missions fell into decay, and only the ruins of their fine churches and buildings remain in the forest. Paraguay, following Buenos Ayres, declared its independence in 1811; but it fell almost immediately under the dictatorship of Francia, and took no further part in the struggle for South American independence. Francia was succeeded, after a short interval, by Carlos Antonio Lopez (1841), who bequeathed the government (1862) to his son, Francisco Solano Lopez. All these dictators or presidents continued the policy of isolation which had been introduced by the Jesuits. Foreigners were seldom allowed to enter the country or Paraguayans to leave it, and ignorance and low morals were deliberately fostered. Under cover of this isolation nearly all industries and commerce were drawn into the hands of the chief of state, who practically managed the country as his own property. Though the country made hardly any material or intellectual progress, it was free from debt and generally at peace. The mad ambition of the younger Lopez plunged it into a war with Brazil, the Argentine Republic, and Uruguay, which lasted from 1864 to 1870. (For events of this war see LOPEZ, FRANCISCO SOLANO.) It ended with the death of Lopez, but left the whole country ruined, and its population reduced to little over one-third. Misiones, part of the Chaco, and a considerable territory on the N., were given up to Argentina and Brazil. The present constitution was adopted soon after the war, and since then the republic has enjoyed internal and external peace, but its recovery is necessarily slow. The tide of immigration is slowly increasing. In 1894 an unpopular president was deposed by a bloodless revolution—the first since the war. A boundary dispute with the Argentine Republic, involving part of the Chaco, was referred to the arbitration of the President of the U. S., and in 1878 was decided in favor of Paraguay. See Demersey, *Histoire physique, économique, et politique du Paraguay* (2 vols., 1860-64); du Graty, *La république du Paraguay* (1865); Washburn, *History of Paraguay* (2 vols., 1871); Bourgade la Dardye, *Paraguay* (Eng. trans. by Ravenstein, with map, 1892). HERBERT H. SMITH.

Paraguay River: a river of South America; rises near the center of the continent, on the Brazilian plateau of Matto Grosso; flows S. through Brazil, between Brazil and Bolivia, through Paraguay and between Paraguay and the Argentine Republic, and finally joins the upper Paraná to form the lower Paraná near lat. 27° 13' S. The Paraguay rises in a group of little ponds, the Sete Lagoas, on a low part of the Brazilian plateau, 1,000 feet above the sea. Swelled by numerous affluents it is already a large stream at Villa Maria; 30 miles below and only 400 feet above the sea it enters the great depression of the Paraguay and Paraná. This is a continuous low plain occupying all of Southwestern Matto Grosso, Eastern Bolivia, Western Paraguay, and a large tract in the Argentine Republic W. of the two rivers. By its vegetation and its relations to the river it is divided into three regions—the Charaés marshes, the Gran Chaco, and the pampas. The two latter are described in separate articles. The Charaés marshes, called the Pantanaes by Brazilians, form the northern end of the plain, a tract about 400 miles long from N. to S., and at least 150 miles wide in parts. The Brazilian plateau falls to it sharply, often precipitously, on the N. and E. On the W. there are hills bordering the Paraguay, but through breaks in these the marshes extend far into Bolivia. On this side the great depression is separated from the head-waters of the Madeira only by a low ridge. The Charaés marshes are a confused labyrinth of channels, islands, marshes, and lakes, through which only an experienced pilot can follow the Paraguay and its branches. Most of the land is open, but narrow strips of forest generally follow the channels. The only inhabitants are a few Guató Indians; the few Brazilian settlements are on the highlands bordering the west shore of the river. The Paraguay in this region rises every year, sometimes 40 feet, overflowing the plain and barely leaving a few acres dry here and there. It is remarkable

that the highest waters are toward the end of the dry season (July and August) and the lowest during the rainy season. The reason is that it takes several months for the rains which have fallen on the plateau to spread themselves over this vast basin, and several more mouths are required to drain them off. Near the southern end of the Charras spurs of the plateau and isolated hills border the river. The Fecho dos Morros (lat. 21° 26' 40" S.) is a narrow pass where the river runs between two of these hills. Below this the river hugs the highlands on the eastern side of the great plain and cuts deeper and deeper into the plain itself, which is thus beyond reach of the overflow. In the Chaco, however, large tracts are swampy or are flooded by the rains. The Paraguay is over 1,800 feet wide at Asuncion, and about three-quarters of a mile at its confluence with the Paraná. The longest affluents are the Pilcomayo and Bermejo, which join it from the W. in the Chaco region, but they are tortuous and only navigable for short distances. Nearly all the other branches are on the eastern side. The most important navigable ones are the São Lourenço (with its branch, the Cuyabá), the Jaquary, and Miranda in Brazil, and the Jejuy and Tebicuary in Paraguay. The main river is open to free navigation; it is the only commercial outlet of Paraguay and Matto Grosso. Steamers drawing 9 feet ascend to Corumbá, Brazil, at all seasons, and smaller ones to Villa Maria and by the branches to Cuyabá and Miranda. The Paraguay was discovered by Cabot (1526), and explored nearly to its source by Irala and others before 1550. See Page, *La Plata, the Argentine Confederation and Paraguay* (1859); Fonseca, *Viagem ao redor do Brazil* (1880). H. H. S.

Paraguay Tea: See MATE.

Parahyba, pã-rã-ee-bã: one of the smallest states of Brazil; on the extreme eastern part of the coast, between Rio Grande do Norte on the N. and Pernambuco on the S. Area, 28,849 sq. miles; pop. (1894) estimated, 559,271. The coast lands for 30 or 40 miles inland are low; the country then rises abruptly to the Brazilian plateau. As in Ceará, the dry season (April to October) is strongly marked, the vegetation drying up except in favored places; occasionally there are severe droughts, lasting several years. The only river of importance is the Parahyba do Norte, and its mouth forms the only harbor. The principal occupations are grazing and agriculture; the exports are hides, sugar, cotton, tobacco, and rubber. Parahyba, the capital and largest town, is on the right bank of the river Parahyba do Norte, 11 miles above its mouth; pop. about 15,000 (see map of South America, ref. 4-II). It is one of the oldest towns in Brazil, dating from 1579; among the ancient buildings are the cathedral and the college of the Jesuits; the modern Government buildings are unpretentious. Only light-draught vessels can ascend to this point, larger ones anchor at Cabadello, near the mouth of the river, a thriving little town which is rapidly superseding Parahyba as a commercial center. HERBERT H. SMITH.

Parahyba, or Parahyba do Sul: a river of Southeastern Brazil; rises in São Paulo, flows eastward between Minas Geraes and Rio de Janeiro, nearly parallel to the coast, and enters the Atlantic near lat. 21° 38' S. Length (with its principal head, the Parahytinga), 658 miles. The valley of the Parahyba, which separates the Serra do Mar from the Serra da Mantiqueira, is populous, and is one of the richest coffee regions in Brazil. Vessels of light draught ascend to São Fidelis, 54 miles, and an upper section of 193 miles is also navigable for small steamers. H. H. S.

Paraldehyde: a clear, colorless liquid, having a peculiar ethereal odor and a warm followed by a cold taste. It is prepared by treating ordinary aldehyde at a moderate temperature with small quantities of hydrochloric acid, and is purified by repeated freezing and rectifying. It is employed in medicine as a hypnotic, but has the disadvantage that it is apt to disturb the stomach and that the dose is bulky.

Paralepididae [Mod. Lat., named from *Para-lepis*, the typical genus; Gr. *παρά*, beside, near + *λεπίς*, *λεπίδος*, scale]: a remarkable family of fishes of the open seas, allied to the *Scopelidae*. The form is elongate and pike-like; the body covered with deciduous scales; the head pointed; opercular apparatus with the suboperculum much reduced; the upper jaw with its margin formed by the intermaxillaries, behind which, and closely adherent to it, are the supramaxillaries; teeth on the jaws as well as palate; branchial apertures enlarged; dorsal fin short, far behind, and still farther behind an adipose fin; anal elongated; caudal emarginate; pec-

torals well developed; ventrals small, inserted below or in front of the dorsal fin. The species are few and confined to northern waters, some occurring at considerable depth, others chiefly in the Arctic. Revised by D. S. JORDAN.

Parallax [from Gr. *παράλλαξις*, alternation, change in direction between two lines forming an angle, *parallax*; deriv. of *παράλλασσειν*, change alongside of, go aside, deviate; *παρά*, beside + *άλλάσσειν*, change]: in the most general sense of the word, the difference in the directions of an object as seen from two different points. It is evident that if two observers, A and B, look at the same object, the direction in which they see it will be different according to their distance apart and the character of the triangle which they form with it. The term is mostly used in astronomy, and is applied in a variety of ways, according to circumstances.

In its common acceptance the word is used to mean the difference between the direction of a body from the center of the earth and from any point on its surface. Let us, for illustration, take the case of the moon. From no two points on the earth's surface will the moon appear in absolutely the same direction. Hence in the astronomical ephemeris the direction of the moon at any moment is given as it would be were it seen from the center of the earth; in other words, the right ascension and direction of the moon are those corresponding to a line drawn from the center of the earth to the center of the moon. Actual observations of the moon, however, are made from the surface of the earth. Hence the difference between the direction as seen from the center and from the surface must be computed. If the position of the moon is given by right ascension and declination the difference in question is called *parallax in right ascension* and in *declination*, respectively. If the altitude of the moon above the horizon is in question, the difference between the altitudes as seen from the earth's center and from the position occupied by the observer is called *parallax in altitude*. The same appellations are used in the case of a planet or any other body of the solar system.

As a standard of parallax astronomers take the difference between the direction of a body as it would appear in the horizon to an observer at the equator and as it is seen from the center of the earth. This difference is called the *equatorial horizontal parallax*. It is equal to the angle subtended by the earth's equatorial radius as seen from the object itself, and is therefore an index to the distance of the latter. Actually it is calculated by the aid of the known distance of the body.

The fixed stars are so distant that they appear in absolutely the same direction from every point of the earth. They have therefore no parallax in the preceding sense; but the refined measurements of recent times have shown that there is a slight difference in the direction of a few of the nearest stars as seen from one part of the earth's orbit and from the opposite part. This gives rise to a new parallax, called *annual*, which is defined as the difference between the direction of a star seen from the sun and seen from the earth. This difference does not in any case amount to a single second of arc. Since the parallax of a body depends on its distance, the determination of the distance of the sun, the moon, or a planet is the same as that of determining its equatorial horizontal parallax. For the determination of the parallax or distance of the sun, see SOLAR PARALLAX. S. NEWCOMB.

Parallelogram [from Gr. *παράλληλογράμμουν*; *παράλληλος*, parallel + *γράφειν*, write, draw]: a quadrilateral whose opposite sides, taken two and two, are parallel. If one angle of a parallelogram is a right angle, all the other angles are right angles, and the figure is a rectangle. If two adjacent sides are equal, the other sides are also equal, and the figure is a rhombus. The diagonals of a parallelogram mutually bisect each other; conversely, if the diagonals of a quadrilateral bisect each other, the figure is a parallelogram. If the diagonals of a parallelogram are equal, the figure is a rectangle; if they are perpendicular to each other, the figure is a rhombus; if they are equal and perpendicular, the figure is a square. The area of a parallelogram is equal to the product of its base and altitude.

Parallelogram of Forces: See COMPOSITION.

Parallelopiped [from Gr. *παράλληλεπίπεδον*, liter., neut. of *παράλληλεπίπεδος*, having parallel sides or surfaces; *παράλληλος*, parallel + *ἐπίπεδον*, a plane (liter., neut. of *ἐπίπεδος*, on the ground, level; *ἐπί*, on + *πέδον*, ground): a polyhedron bounded by six parallelograms. If the faces are rectangles, the volume is a rectangular parallelopiped; if the faces are

squares, the volume is a cube. In any parallelepiped opposite faces are equal to each other, as are also diagonally opposite polyhedral angles. A plane through two diagonally opposite edges divides the volume into equivalent triangular prisms. The volume of any parallelepiped is equal to the product of its altitude and the area of its base.

Parallels of Latitude [*parallel* is from Gr. *παράλληλος*, *parallel*, liter., alongside of each other: *παρά*, beside + *ἀλλήλων*, (of) one another]: on the terrestrial sphere circles drawn around the earth on planes parallel to the equator. Through the center of each circle passes the earth's axis. The equator itself is the only one of these parallels which is a great circle. The others are smaller circles, whose limits are the great circle (the equator) on the one hand, and zero (at the poles) on the other. The tropics and polar circles are important parallels. See EARTH.

Paralysis [= Lat. = Gr. *παράλυσις*, palsy, deriv. of *παράλυν*, disable on (one) side; *παρά*, beside + *λύειν*, loosen, dissolve, destroy]: loss of voluntary or reflex motion, generally through failure of nervous excitation. A partial loss of motion is termed *paresis*. A knowledge of the causes of paralysis is easily gained. There are on the surface of the brain certain areas known as motor centers, in which all impulses to voluntary motion originate. From these centers nerve-fibers travel downward, converging at the base of the brain to enter the spinal column. In the latter are secondary motor cells or centers which produce motion only after receiving impulses from the brain, through the fibers indicated. From the secondary spinal-cells originate nerve-fibers which constitute the nerves of the body, and which carry the impulse to the muscles. Paralysis may be due to disease or some destructive change anywhere along this tract, from the cells of the surface of the brain down to the terminal nerve-fiber as it enters the muscle. If the disease is in the brain, we speak of cerebral paralysis, as in apoplexies; if in the spinal cord, of spinal paralysis, as in essential palsy of infants; if in the nerves, of peripheral palsy, as in paralysis from pressure of a crutch on the recurrent spiral nerve of the arm. It is conceivable and possible also to have paralysis due to disease of the muscle without affection of any part of the nervous system, but such cases are exceedingly rare. Idiopathic muscular atrophy is an example of this form of paralysis.

Any part of the body containing muscle fibers, either striped or unstriped, may be paralyzed. Thus we have paralysis of the heart, of the arteries (vaso-motor paralysis), of the intestines, of the limbs, the face, the eyeballs, the pupil, etc. In the study of paralysis it is customary to divide the cases into groups according to the parts of the body affected. **HEMIPLEGIA** (*q. v.*) is the name used to designate paralysis of one lateral half of the body. It is generally due to a cerebral lesion, and nearly always follows after cerebral hæmorrhage or **APOPLEXY** (*q. v.*). Sometimes the face is paralyzed on one side, while the arm and leg of the opposite side are affected. This "crossed palsy" is due to disease in the *pons Varolii*. **PARAPLEGIA** (*q. v.*) is paralysis of the lower half of the body, affecting both legs and perhaps part of the trunk. It is due to disease of the spinal cord, or more rarely of the nerves of the legs. It is practically, though not theoretically, impossible to have paraplegia of cerebral causation. **MONOPLEGIA** is the paralysis of a single member, as one arm or leg. It is due to disease of the peripheral nerves, or to affection of the motor center on the surface of the brain. In the lower part of the brain and in the spinal cord a diseased area is more apt to involve fibers of many muscles.

Multiple paralysis is the term by which are designated groups of palsies of irregular distribution. **Glossoplegia** (paralysis of the tongue), **cycloplegia** (paralysis of the pupil), **laryngeal palsy**, etc., are instances of *local paralysis*, in which only a certain muscle or group of muscles is affected. See **Facial Paralysis**, and for **General Paralysis** see **INSANITY**.

WILLIAM PEPPER.

Paralysis Agitans, or Shaking Palsy: a disease of advanced age, characterized by weakness, tremor, and rigidity of the muscles. Men are more often affected than women, and worries and mental strain are important causes. Sometimes the shaking of fear has been followed directly by this disease. There is a fine and continuous tremor of the hands, feet, and less commonly of the head, which, however, ceases during sleep. The muscles are apt to be rigid, and a peculiar mask-like immobility of the facial expression is a marked characteristic. The weakness of the muscles is rarely marked, but is a constant symptom. There is a peculiar

staggering gait in which, as one author remarks, the patient seems to be running after his center of gravity. The disease is incurable.

WILLIAM PEPPER.

Paramar'ibo: capital and principal town and port of Dutch Guiana; on flat land by the right bank of the Surinam river, which is navigable beyond this point; 19 miles above its mouth (see map of South America ref. 2-E). It presents a very fresh and pleasing appearance, owing to its wide streets, shaded with orange and tamarind trees, and the gardens around most of the houses. Nearly all the buildings, and even the governor's mansion, are of wood. There are many Protestant and Catholic churches, hospitals, barracks, etc. The climate is warm, and the place has a reputation for unhealthfulness, but it is improving in this respect. The principal export is sugar. Paramaribo dates from the end of the sixteenth century; it was twice bombarded by the French, and has repeatedly been almost destroyed by fire, the last time in 1822. Pop. (1890) 28,831.

HERBERT H. SMITH.

Paramat'ta: town of New South Wales, Australia; on a river of the same name, near its entrance into Port Jackson, on which Sydney is situated (see map of Australia, ref. 7-1). It is a well-built and growing town. Pop. (1891) 11,680.

Revised by C. C. ADAMS.

Param'eter [Gr. *παρά*, beside + *μέτρον*, measure]: in mathematics, a term generally expressing a quantity, by whose variation systems of equations or curves, etc., are represented. Thus if the shape and magnitude of a curve be considered, but not its position, the radius is the sole parameter of a circle, and the major and minor axes of an ellipse are its two parameters. The coefficients in the equation, or equations, of a curve may be considered as parameters determining its shape, magnitude, and position in a plane or in space, as the latter differ from those of another curve of the same species. In particular if a conic section be written in rectangular co-ordinates

$$y^2 = px \pm mx^2$$

(which represents a parabola if $m = 0$), the quantity p is called the parameter. (See **PARABOLA**.) Further, a parameter is also used to denote a variable, in terms of which the co-ordinates of a point on a curve can be expressed. If the co-ordinates involve the parameter rationally, that is, without square roots or other radicals, the entire curve can be described by continuous motion of a point, and is said to be *unicursal*.

R. A. ROBERTS.

Pāramitās [Sanskrit]: in Buddhism, "transcendent virtues," the practice of which leads to Nirvāna, or "the other shore." These are six in number, but other four are sometimes added. They are (1) charity, or generosity in giving to all who ask; (2) moral conduct; (3) patience; (4) energy or fortitude; (5) fixed contemplation, or meditation (see **DHYĀNA**); and (6) wisdom. The four added virtues are variously given. Those usually enumerated are (a) truth; (b) steadfastness of resolution, or fixedness of purpose; (c) good-will, or kindness; and (d) imperturbability, or apathy.

R. LILLEY.

Paraná, *páa-rã-naa'*: a southern state of Brazil, bounded N. by São Paulo, E. by the Atlantic, S. by Santa Catharina, and W. by the river Paraná, which separates it from Paraguay and Matto Grosso. Area, 85,438 sq. miles; pop. (1894) estimated, 223,942. A strip of low and often swampy land along the coast is succeeded, 20 miles inland, by the Brazilian coast range, which here rises in parts to more than 5,000 feet, but with passes below 3,200 feet; the mountains and coast strip are covered with forest, the most abundant trees above 3,000 feet being *Araucaria* pines. W. of the coast range is the open table-land of Curitiba, 3,000 feet above the sea; farther inland this falls, by a succession of terraces, toward the Paraná; the western part of the state is an almost unknown forest, with intervals of open land, and is inhabited only by roving Indians. All the important rivers flow to the Paraná; the principal ones are the Paranápanema on the northern frontier, the Ivahy, the Piquiry, the Taquary, and the Iguassú on the southern boundary; none of these is freely navigable. Nearly all the population is gathered on the high plateau, where there are considerable colonies of German and Italian immigrants. Paraná is one of the poorest and most backward of the Brazilian states, though it has abundance of fertile land, especially in the western part. Agriculture, grazing on the open lands, and the collection of mate are the only important industries; almost the sole export is mate. The capital, Curitiba,

is connected with the principal port, Paranaguá, by railway. Paraná was separated from São Paulo in 1853. See Bigge-Wither, *Pioneering in South Brazil* (1878). H. H. S.

Paraná (originally *Bajada del Paraná*; capital and largest town of the province of Entre Ríos, Argentine Republic; on a bluff overlooking the right bank of the river Paraná, nearly opposite the mouth of the Salado (see map of South America, ref. 8-E). It is the center of a rich grazing region, and in the vicinity are thriving colonies of Germans, Swiss, and Italians; steamers ascending the river touch regularly at this port, which is connected by railway with Concepción, on the Uruguay. Paraná was founded in 1730. From 1852 to 1861 it was the capital of the Argentine Republic. Pop. (1892) about 20,000. H. H. S.

Paraná: one of the largest rivers in South America; draining, with the Paraguay, nearly all the space between the Brazilian coast range and the Andes, from about lat. 16° to lat. 35° S. It rises in Brazil, flows at first S. W., then S. and W. along the borders of Paraguay, separating that country from Brazil and the Argentine Republic; and finally, after being joined by the Paraguay, keeps a southward course through the Argentine to the Río de la Plata and the Atlantic. The upper Paraná, or the portion above the junction of the Paraguay, is essentially a highland river. Its two main heads are the Parnahyba, 500 miles long, rising in the Pyreneos Mountains of Goyaz, and the Grande, 650 miles long, rising in the Brazilian coast range of Minas Geraes; both are obstructed by rapids and falls. They meet at the angles of the states of Minas Geraes, São Paulo, Matto Grosso, and Goyaz, near lat. 19° S. The united flood, now called the Paraná, separates São Paulo and Paraná from Matto Grosso. Shortly below the junction is the little-known cataract of Urubú-ponga. Below this the river flows over the table-land without serious obstruction for 600 miles. At the foot of this navigable part it is broken by a large island, and forms a lake-like expanse. Suddenly the whole flood is poured into more than twenty narrow clefts, spreading over an arc 2 miles wide, and converging in a basin 70 feet below. In each chasm the water leaps over a fall, and then rushes down a slope with immense velocity. This is the celebrated but seldom visited cataract of Guayrá, or the Sete Quedas, where the Paraná begins to form the frontier of Paraguay (lat. 24° 2' 59" S.). Below it the river rushes for 400 miles through a deep valley, often between cliffs, and with a constant succession of rocky shallows and rapids. The last obstruction is the rapid of Apipé, 150 miles from the junction of the Paraguay, and marking the limit of navigation on the lower river. The valley of the upper Paraná, above Apipé, has few civilized inhabitants, and from the Guayrá fall down it is occupied by an extensive forest. In direct contrast the lower Paraná is a river of the plains—like the Paraguay. It is, indeed, properly a continuation of the PARAGUAY (*q. v.*), pursuing the same southerly course; but in length and volume of water the Paraguay is the lesser of the confluent. The lower Paraná has cut rather deeply into the pampas, which appear as clay cliffs on the west side. In parts it is over 2 miles wide, and by its sea-like reaches resembles the Amazon. It is entirely navigable for large vessels. The most difficult navigation is near the mouth in the Plata, where for over 200 miles a multitude of low islands forms a delta. The deepest channels in this region give over 15 feet when the river is lowest. The Río de la Plata is properly the estuary of the Paraná, though also receiving the Uruguay, which may be regarded as a branch. The length of the lower Paraná is 850 miles, or, with the Plata, 1,080 miles. From the mouth of the Plata to the head of the Río Grande, which may be regarded as the source of the Paraná, the distance by the rivers is about 2,950 miles. Aside from the Paraguay with its numerous branches, the principal affluent of the lower Paraná is the Salado, on the western side, and it is not navigable. The chief branches of the upper Paraná are on the eastern side, in Brazil (São Paulo and Paraná). The most important are the Pardo, Tietê, Agoapehy, Paranapanema, Piquiry, and Iguaçu. These rise on the well-peopled western slope of the coast range, and they are navigable for greater or less distances in their upper courses, but are obstructed by falls and rapids as they approach the Paraná. Those which join it in the great gorge below the Guayrá fall often have cataracts at or near their mouths. One of these, on the Iguaçu (or Yguazú), 6 miles above its mouth, is easily accessible, and hence has often been visited by travelers. The river, divided into several channels, falls over a horseshoe-

shaped precipice nearly 200 feet high, forming a scene said to rival Niagara.

HERBERT H. SMITH.

Paranaguá, *para-rá-náa-zwa* (SOULTEDES WITHEN *Paranaguá*): principal seaport of the state of Paraná, Brazil; on Paranaguá Bay; terminus of a railway which crosses the mountains to Curitiba (see map of South America, ref. 7-F). Pop. about 7,000. The harbor is large and good, but there is little commercial activity. The principal export is mate. There are few good buildings, the streets are badly paved, and the climate is hot and often unhealthful. H. H. S.

Paranahyba: See PARNAHYBA.

Paranaphthalene: See ANTHRACENE.

Paranhos, JOSÉ MARIA DA SILVA: See SILVA PARANHOS.

Parapet: See FORTIFICATION.

Paraple'gia [Mod. Lat., from Gr. *παρπληγία*, hemiplegia, deriv. of *παρπλησσειν*, to strike beside or at the side; *παρά*, beside + *πλήσσειν*, strike]: loss of motor power in both legs. It is almost always due to injury or disease of the spinal cord or its membranes, though it sometimes happens that a neuritis involves the nerves of the legs alone. The onset is sudden when caused by wounds, hemorrhage into the substance of the cord, or fracture or dislocation of the spinal column, rapid when caused by myelitis or meningitis, and slow when due to pressure from a tumor or from Pott's disease. Paralysis of the bladder and rectum are generally present. The character of the palsy varies with the level of the lesion in the cord. If it involve the whole transverse area of the cord there is complete loss of sensation below. If it be in the lumbar region, there is absence of the reflexes and wasting of the muscles. If higher up, there is rigidity, no wasting, and the reflexes are increased. The term is sometimes used, but improperly, to include cases in which the arms as well as the legs are palsied. See PARALYSIS.

WILLIAM PEPPER and C. W. BURR.

Pará River: a large inlet in the coast of Brazil, state of Pará, S. E. of the island of Marajó, generally regarded as the southern mouth of the Amazon. Physically, it is the estuary of the river Tocantins, but through a network of channels S. and W. of Marajó it receives a volume of Amazonian water exceeding that of the Tocantins itself. These channels are navigable for large vessels, and owing to the strong currents and unsheltered banks of the true mouths of the Amazon, the Pará has always formed the natural outlet of that river. The Pará, up to the junction of the Amazonian channels, is 120 miles long, 10 miles wide above and over 30 miles at the mouth. The effect of the tides is felt in strong currents, but no salt water enters it.

HERBERT H. SMITH.

Par'asang [from Gr. *παρσάγγης*, from O. Pers.; cf. Pers. *farsang*]: a Persian measure of distance. Herodotus (ii., 6, etc.), Xenophon (*Anab.* ii., 2, § 6), Suidas, and Hesycheus are all agreed in estimating the parasang at 30 stadia, or about 3½ miles. Afterward the measure seems to have varied; for in a Byzantine writer, Agathias (about 530 A. D.), we find the parasang reckoned at 21 stadia. Strabo (xi., p. 518) states that it was variously reckoned at 30, 40, and even 60, stadia. According to Pliny (*Nat. Hist.*, vi., 30), the Persians themselves were divided as to its length. The parasang is still in use among the Persians. Modern travelers concur with Herodotus and Xenophon in fixing its length variously at from 3¼ to 4 miles.

Paraselenæ: See HALO.

Parasita: a sub-order of insects which includes the Lice (*q. v.*). See also ENTOMOLOGY.

Parasites [from Gr. *παράσιτος*, liter., eating beside or at another's table; *παρά*, beside + *σιτέω*, to take food, deriv. of *σῖτος*, food]: originally, persons who flattered the rich and were fed at their tables; in zoölogy, animals that live in or on other animals. In its broad sense parasitism includes all cases where one organism depends upon another for its food; but, as more usually employed, it is limited to those still numerous cases where there is a more or less intimate connection between the gainer in the process, the *parasite*, and the form lived upon, the *host*. Even with these limits there are different degrees of parasitism to be recognized, which may be grouped under the heads commensalism, symbiosis, and parasitism proper. In commensalism there is an association of forms wherein, so to speak, one profits from the crumbs which fall from the other's table. Thus in the mouth of the menhaden there frequently occurs a crustacean "messmate" which holds to the roof of the mouth by

its sharp legs, and there selects its food from the objects eaten by the fish. In symbiosis there is a reciprocity which does not exist in commensalism. Each profits to a greater or less extent by the other's presence. Thus we have certain hermit-crabs which constantly bear sea-anemones about upon the shell which they inhabit; the anemone profits from the particles of food dropped by the crab, while the crab receives protection from its enemies, many of which do not care to brave the nettle-cells of the anemone. Slightly different is the case of the "yellow cells" of the Radiolaria. Here we have an association of animal and plant, the former profiting by the oxygen given off by the latter, while the plant in turn uses the carbon dioxide produced by the animal. In parasitism proper the parasite lives directly upon the substance of the host. The union between them may be only temporary, as in the case of the leeches, which attach themselves to other animals only while sucking blood; or it may be permanent, as in the great majority of parasitic worms. In the latter there may be external or internal parasitism; but in all cases there is such an adjustment of one to the other that while the host is weakened by the drain, it but rarely, and then slowly, succumbs. Its preservation is necessary to the perpetuation of the parasitic species.

In one way or another all groups of the animal kingdom present instances of parasites. Passing by the tapeworms, trichina, etc., we may here instance a few of the more interesting cases. Among the vertebrates the fishes alone afford cases of parasitism, and prominent here are the lampreys and hagfishes, the former living upon the slime excreted from the bodies of other fishes, the latter actually burrowing their way into the body-cavity of the cod. Among the molluscs parasites are rare. Most striking is the case of *Entoconcha*, the young of which is a true gasteropod, while the adult, an elongate worm-like body without a trace of molluscan features, lives in the intestine of certain holothurians (*Synapta*). In the Crustacea parasites occur among the Isopoda, the barnacles, and especially among the Copepoda, and in the latter group almost every grade can be found to illustrate that law of nature that the more perfect and more prolonged the parasitism, the more complete the resulting degradation. Thus in the Lerneans almost every crustacean feature has disappeared; all that remains may be summed up as means of fixation and absorption, combined with enormous organs for the reproduction of the species. True parasitism is rare among the Coelenterates, but here must be instanced the hydroid *Hydrichthys*, described by Fewkes as parasitic upon certain fishes.

LITERATURE.—Cobbold, *Entozoa* (London, 1864); P. J. van Beneden, *Animal Parasites and Messmates* (New York, 1876); Leuckart, *Die Menschlichen Parasiten* (Leipzig, 1863-68). J. S. KINGSLEY.

Parasites, Human: Man is liable to invasion of a considerable variety of parasitic organisms, both animal and vegetable. The latter, by far the more important and numerous, belong to the families of bacteria. Upon them are dependent many of the infectious diseases, such as tuberculosis, typhoid fever, and diphtheria. (See BACTERIOLOGY.) The animal parasites are much less varied and frequent, but are still quite numerous. Some forms live upon the exterior parts of the body, and are known as *Ectozoa*; others within the cavities or tissues, and are called *Entozoa*.

Ectozoa.—These include representatives of the Insecta, such as lice, fleas, chiggers, etc.; and of the Arachnoidea, such as the mites found in acne pimples, or the itch-mite. A very important class of lower organisms belonging to the Protozoa have recently been discovered in certain skin diseases, such as molluscum contagiosum and Paget's disease of the nipple. These belong to the genus *Coccidium*. They invade the epithelial cells of the skin and lead to their destruction. A similar organism is claimed as the cause of cancer. The evidence is not yet conclusive, but is very suggestive.

Entozoa.—Among the internal parasites are species of various families of Protozoa, Arachnoidea, and Vermes. Of the Protozoa, to which of late attention has been specially directed, the important forms are the *Amoeba coli*, which occupies the intestinal canal and causes certain forms of dysentery; the *plasmodium malariae*, an organism which thrives in the blood in malarial fever and is doubtless the cause of this disease. The *coccidia* occur in the intestines and liver as well as in the skin. Other Protozoa of the intestinal canal, such as *Trichomonas* and *Cercariums*, *Myxosoma entericum* and *Paramecium coli*, are relatively unimportant.

Of the Arachnoids but one occurs, and that rarely—the *Pentastoma lenioides*. This organism occupies the nasal cavities and frontal sinuses of various animals, and occasionally of man. Its larvæ, *Pentastoma denticulatum*, are found in the liver or spleen, less frequently in other organs, of man and various animals.

By far the most important group of animal parasites of man are the worms, of which the cestodes or tapeworms, the trematodes or flukeworms, and the nematodes or roundworms are the subdivisions met with. The commonest of the tapeworms in America is the *Tania saginata*, the beef tapeworm, but occasionally *Tania solium* (pig), and *Tania elliptica* (cat and dog), and *Bothriocephalus latus* (fish) are met with. The last named is very common in parts of Switzerland, Norway, and other countries. Man is the occasional host of the adult *Tania echinococcus*, a dog tapeworm; but very frequently the larvæ of this form occur in man, producing the so-called hydatid cysts of the liver and other parts. This disease is common in Iceland and Australia. Rarer tapeworms of man are *Tania nana*, *T. flavopunctata*, *T. madagascariensis*, *T. negré*, *T. tarella*, *T. algeriana*, *T. of Cape of Good Hope*, also *Bothriocephalus cordatus* and *cristatus*.

The trematodes or flukeworms are comparatively unimportant, being much less frequent. There is a number of the genus *Distoma*, including *D. hepaticum*, the liver fluke, *D. hæmatobium*, the blood fluke, and the less frequent *D. lanceolatum*, *D. conjunctum*, *D. rathonisi*, *D. heterophrys*, *D. spathalatum*. An interesting form is *D. pulmonale*, the lung fluke of Japan, Korea, and other Eastern countries. *Monostoma lentis* and *Amphistoma hominis* are rare forms.

The nematodes include some of the most frequent and important forms, such as the common roundworm, *Ascaris lumbricoides*, the seatworm or pinworm, *Oxyuris vermicularis*, and the destructive *Trichina spiralis*, derived from improperly cooked meat of the hog. Relatively unimportant forms are *Ascaris mystax*, *Anchylostoma duodenale* (the organism so prevalent among the workers at St. Gothard's tunnel), *Strongylus longevaginatus*, *Eustrongylus gigas*, *Rhabdonema intestinalis*, *Trichocephalus dispar* (the whipworm), *Filaria bancroftii*, *medinensis*, and *loa*. *Echinorhynchus hominis* is the only representative of the Acanthocephali.

It will be seen that the number of animal parasites is large, and that the variety of forms is very great; moreover, very frequently several forms are found coexisting, and a patient may suffer invasion by a number of the same or different forms in succession. Habits of uncleanness are the greatest cause of internal and external parasites. The larvæ are carried to the mouth or exterior of the body by unclean hands, clothing, and the like. Tapeworms are conveyed to man in the larval form in "measled" flesh of the beef, hog, or fish, or more directly by the eggs being taken in water or food. The prevention of parasites therefore requires careful attention to habits of cleanliness and to the proper preparation of food.

WILLIAM PEPPER.

Parasites, Vegetable: plants which live upon other living organisms, and obtain their food wholly or in part from their living tissues. They are to be distinguished from SAPROPHYTES (*q. v.*), which obtain their food from dead tissues.

As in animals, so in plants, we must regard all parasites as having been derived from non-parasitic forms. In many cases this derivation is quite obvious: thus the dodders (species of *Cuscuta*) are clearly modified members of the morning-glory family (*Convolvulaceæ*), the Indian pipe (*Monotropa*) is essentially a modified heath (*Ericaceæ*), the downy mildews (*Peronosporaceæ*) are structurally so nearly like the green felts (*Vaucheriaceæ*) that they have been long associated with them, etc. In other cases their derivation is not so obvious, as in the black fungi, rusts, and smuts.

It is a well-known law that parasitism is always followed by structural degradation, especially of the vegetative organs, and where the parasitism is excessive, all parts of the organism suffer degradation. Thus parasitic flowering plants are usually leafless, or nearly so, as in *Cuscuta* and *Monotropa*, and the degradation has been carried so far in *Rafflesia* and its relatives, and in *Balanophoraceæ*, that the ovules and seeds are reduced to a state of great simplicity. Where the parasitism is partial, as in the Mistletoe, the leaves are still well developed, both structurally and functionally, but with an increased dependence of the parasite

upon its host the leaves are chlorophyll-less and bract-like, as in *Arcnuthobium*, a relative of the mistletoe.

The principal families in which parasites occur in the vegetable kingdom are distributed as follows: In the Protophytes, the bacteria; in the Phycophytes, the black moulds, fly-fungi, water-moulds, downy mildews, etc.; in the Carpophytes, many families (twenty or more) of the fungi; in the Anthophytes, the orchids (a few genera), vine-rapes (*Cytinaceæ*), mistletoes (*Loranthaceæ*), Balanophorads, Indian pipes (*Monotropææ*), morning-glories (the dodders, of the genus *Cuscuta*), and broom-rapes (*Orobanchaceæ*). Few, if any, of the mossworts and fernworts are true parasites, and none of the Gymnosperms. It is impossible to give the total number of parasites in the vegetable kingdom, but from 12,000 to 15,000 lower plants (Protophytes, Phycophytes, and Carpophytes), and about 1,000 Anthophytes are true parasites. To these should be added also many species which are partially parasitic. See DEGENERATION and VEGETABLE KINGDOM.

CHARLES E. BESSEY.

Parasols: See UMBRELLAS.

Parcæ: See FATES.

Parchments [M. Eng. *parchemin*, from O. Fr. *parcamin*, *parchemin*; Ital. *pergamino*; Span. *pergamino*; Vulg. Lat. **pergamini* num for *pergame* num, deriv. of Pergamum, a city in Mysia where parchment is said to have been first used]: the well-cleansed and carefully dried skins of hares, rabbits, calves, asses, or sheep. Common parchment is prepared from sheepskins, but vellum, a far finer variety, is made from the skins of young calves, goats, or still-born lambs. Sheepskins are often split and made to yield two sheets of parchment. The skins are soaked in water, and then subjected to the action of milk of lime. The wool or hair is then removed, the skins are washed, planed with a sharp knife to remove superfluous parts, and then stretched on frames singly and dried in the air. For bookbinders' use the dried parchment is planed to impart a rough surface, capable of being dyed or written upon. The dried parchment is finally dusted over with chalk and rubbed with pumice-stone. Drum-heads are made from calves' skins, heads of kettle-drums from asses' skins, sieves for gunpowder-mills from hogs' skins. Parchment was known long before the invention of paper. It is made at Bentheim and Schuttorf in Hanover, at Augsburg, Nuremberg, Breslau, and Dantzic, and in Holland, England, and France.

Revised by IRA REMSEN.

Pardessus, PAÏR DĀ SÛ, JEAN MARIE: jurist; b. at Blois, France, Aug. 11, 1772; studied jurisprudence; became mayor of Blois in 1805; member of the Legislative Assembly in 1807; Professor of Mercantile Law at Paris in 1810; member of the Chamber of Deputies 1815-16 and 1824-27, but retired from public life after the Revolution of 1830. D. on his estates near Blois, May 26, 1853. By his numerous works, of which the most prominent are *Traité des Servitudes* (1806), *Traité du Contrat et des Lettres de Change* (1809), *Éléments de Jurisprudence commerciale* (1811), *Cours de Droit commercial* (1814-19), *Collection des Lois maritimes antérieures au 18^e siècle* (6 vols., 1828-45), *Us et Coutumes de la Mer* (1847), a *Collection des Ordonnances des Rois de France*, with an introductory essay on the organization of the French courts, etc., he exercised a great influence on French jurisprudence.

Par'do, MANUEL: statesman; b. at Lima, Peru, Aug. 12, 1834. He came of a wealthy family, was educated in Chili and Europe, and was established as a banker in Lima, besides conducting several large plantations and holding various public positions. From Aug. 2, 1872, to Aug. 2, 1876, he was president of Peru. He was the first civilian ever elected to this office, and was one of the best and most popular presidents that Peru ever had. Subsequently he was president of the senate. He was assassinated by an obscure person, who attacked him in front of the senate-house at Lima, Nov. 16, 1878.

HERBERT H. SMITH.

Pardo Bazán, EMILIA: novelist and critic; b. at Coruña, Galicia, Spain, in 1852. In 1868 she was married to Señor Quirogariche, a proprietor in her native province. Later, however, she lived mainly in Madrid, though her imagination still preferred Galician themes. As a novelist she is distinguished by great truth of local coloring, and by the kind of realism in depicting life and action of which Mr. Howells is the chief representative in the U. S. Among her novels may be mentioned *Los Pazos de Ulloa* and its

continuation, *La madre natural*; *La hija de la angustia*; *La tribuna*; the novelettes *Insolación* and *Morriña*; *Pascual Luna*; *Autobiografía de un estudiante*; etc.; the collection of tales, *Cuentos de Marinada*; *El Cisne de Villamorta*; *Una Cristiana* and its sequel, *La Prueba*. As critic she has written *Estudio crítico de las obras del P. Feijóo* (1876); *San Francisco de Asís: Siglo XIII.* (1880); *La Revolución y la Novela en Rusia* (1887); *La crítica palpitante* (realism vs. romanticism, 4th ed. 1891). In *Mi Patria* (1888) and *De mi Tierra* (1888) we have impressions, recollections, and reflections of a more serious kind connected with her Galician home. This also is the character of her studies in folk-lore—*Folk-lore gallego—Miscelánea* (1884). In 1891 she began to issue a periodical, devoted to theatrical criticism, written wholly by her own pen—*Nueva Teatrócrata*. On the whole, she is the most important woman of letters now writing in Spain. Her *Obras Completas* in a new edition began to appear in Madrid in 1891 (9 vols., 1891-93).

A. R. MARSH.

Pardon [from O. Fr. *pardon*, deriv. of *pardonne*, concede, indulge, pardon; *par-* (< Lat. *per-*), thoroughly + *donner*, give]: an act of grace by which an offender is released from the consequences of his offense, so far as such release is practicable and within the control of the pardoning power. In monarchies it is a prerogative of the king, who is deemed the source of justice. It is properly employed to correct some injustice for which the ordinary judicial machinery does not provide, or to make allowances for exceptional circumstances, or from considerations of public policy.

Power to Pardon.—A serviceable Parliament once declared that the King of Great Britain hath the whole and sole power of pardon, "united and knit to the imperial crown of this realm." (27 Hen. VIII., c. 24.) The royal prerogative, however, even in the matter of pardons, has been greatly curtailed since the age of the Tudors. A pardon can not be pleaded to an IMPEACHMENT (*q. v.*). The committing any person to prison out of the realm is unpardonable by the crown. (31 Car. II., c. 2.) Nor can the British sovereign by pardon inflict an injury on an innocent person, "as in the case of a nuisance yet unredressed, or of a breach of certain statutes after an informer has become entitled to a reward payable out of the penalty." The pardon can operate only to relieve the offender from his liability to the crown. It can not affect the private rights of individuals. At present the sovereign exercises this prerogative upon the recommendation of the Home Secretary. It is rarely employed, save in cases of serious miscarriage of justice, which can not be remedied otherwise; or in the cases of political offenders who engaged in riots, unlawful assemblies, or other like proceedings for the purpose of influencing the action of Parliament or public officials.

In the U. S. the pardoning power is the subject of constitutional provision. It is generally vested in the executive. The Federal Constitution authorizes the President "to grant reprieves and pardons for offenses against the U. S., except in cases of impeachment." (Art. II., § 2.) It is to be noticed that "offenses against the U. S." can be pardoned only by the President. Offenses against the several States are pardonable by the injured State alone. Again, the private consequences of a wrong are not subject to the pardoning power of the President. Within the constitutional domain, however, the President's prerogative of pardon is unlimited; "it conveys the idea of the power exercised by the English crown, or by its representatives in the colonies"; it "extends to every offense known to the law, and is not subject to legislative control." (*Ex parte Wells*, 18 Howard 307; *ex parte Garland*, 4 Wallace 333.) It may be exercised before conviction, or even before indictment; and there is judicial authority for the doctrine that it extends to persons committed for contempt of court. (*Re Mullee*, 7 Blatchford 23.) This view has been severely criticised. See 45 *Albany Law Journal*, 1, and authorities cited.

Forms of Pardon.—In Great Britain a warrant of pardon must be certified by the great seal affixed by the Lord Chancellor, or, in cases of felony, by the sovereign's sign-manual countersigned by a principal Secretary of State. In the U. S. the usual form is a writing signed by the executive, with the great seal attached. Where this form is employed, delivery and acceptance are necessary to its validity. A pardon may be limited to a specified individual and a particular crime, or it may be framed to include a number of named individuals, or even a class of persons designated otherwise than by name. It may be granted by a general

proclamation, and take effect from the time it is signed. It may be absolute, or it may be given upon a condition precedent or subsequent. It may also take the form of a commutation of punishment, though it can not substitute a punishment of a different nature.

Its Effect.—An absolute pardon releases the offender from all disabilities imposed by public law, and restores him to all his civil rights, in the absence of a statute to the contrary—e. g. 2 N. Y. R. S. 139, § 7. It gives him a new credit and capacity. It does not make amends for the past, nor afford relief for what has been suffered by imprisonment, forced labor, or otherwise. (*Knote vs. U. S.*, 95 U. S. 149, 153.) It restores a convicted criminal's competency as a witness, even though it recites that it was granted because his testimony was desired by the Government (*Boyd vs. U. S.*, 142 U. S. 450); but the conviction may be used to affect his credit. If the pardon is granted upon a condition precedent, the condition must be performed before the pardon takes effect. If the condition is subsequent, its breach operates to annul the pardon, and to transform its effect into a reprieve or stay of execution. In such a case the prisoner can not be arrested and remanded to his original punishment upon the mere order of the executive, unless the pardon contains an express provision, or a statute gives clear authority therefor; but he is entitled to a hearing before a competent court, though not to a jury trial, upon the question whether he has broken the condition. (*State ex rel. O'Connor vs. Wolfer*, 53 Minn. 135.) A pardon induced by deception is void. An executive pardon must be brought to the attention of the court by appropriate procedure, generally by a special plea; but courts are bound to take judicial notice of a pardon by act of Parliament.

FRANCIS M. BURDICK.

Paré, pā'ā'rā', AMBROISE: surgeon and author; b. at Bourg-Hersent, near Laval, Maine, France, 1517; became an apprentice to a barber-surgeon in Paris; also studied surgery; joined the society of St. Côme, and in 1536 entered the army in Italy as a surgeon. His introduction of the ligature for bleeding arteries after amputation was the foundation of modern surgery, and he wrote a work on gunshot wounds which is still of value. His great invention dates from 1536. When the supply of oil failed the army in Piedmont (for up to that time hot oil was used to stanch bleeding), he was obliged to tie arteries with a thread, and found that cases where the ligature was employed did much better than the others. From 1552 to 1590 he was surgeon to four French kings. He was a devout Huguenot (although Malgaigne denies it), but his reputation for surgical skill saved him at the massacre of St. Bartholomew and at other critical junctures. His professional works are very much in advance of his times, in spite of the fact that he was only a barber-surgeon, and as such unrecognized by the surgical faculty. His principal work was *Cinq Livres de Chirurgie* (1562). D. in Paris, Dec. 22, 1590. See the *Life* by Paulmier (Paris, 1884), and the article SURGERY.

Parégoric [from Lat. *paregoricus* = Gr. *παρηγορικός*, deriv. of *παράγορος*, soothing, consoling; *παρά*, beside + *ἀγορεύειν*, speak, harangue, deriv. of *ἀγορά*, assembly]: a well-known anodyne compound (*tinctura opii camphorata*), made by taking 4 grammes of powdered opium, benzoic acid, and camphor, and adding 4 cc. of oil of anise, 40 cc. of glycerine, and enough diluted alcohol to make 1,000 cc. The preparation is completed by shaking, maceration, and filtration. It is a mild anodyne and antispasmodic.

Paraíra Brava [Portug.; *paraíra*, from the Brazilian name + *brava*, brave, i. e. of full strength]: the dried woody root of some South American climbing plants of the family *Menispermaceæ*. It is a tonic and diuretic drug, used especially in chronic inflammations of the bladder and the urinary passages. The plant in question was long supposed to be the *Cissampelos paraíra*, but Hanbury ascertained that it is *Chondrodendron tomentosum* of Ruiz and Pavon, *Cocculus chondrodendron*, D. C.

Parenchyma: SEE HISTOLOGY, VEGETABLE (*Soft Tissue*).

Parent and Child: English common law secures to the parent the right to the custody and discipline of his minor children, and to their services.

Custody and Discipline.—This right is accorded to the parent that he may properly train his offspring, and give them a proper education in learning, morals, and religion. It is subject to the state's supervision. A serious abuse of it by the parent, or by one to whom he has delegated it—for

example, a school-teacher—is treated as a CRIME (*q. v.*), and will also sustain an action in TORT (*q. v.*) against the offending delegate. It has been held, however, that public policy forbids the maintenance of a tort action by the child against the parent in such case (*Hewlett vs. Ragsdall*, 68 Miss. 703); but its abuse may work a forfeiture of the parental right. In *Wellesley vs. Duke of Beaufort*, 2 Russell's Reports, the father insisted "that a man and his children ought to go to the devil in their own way if he please;" but Lord Eldon decided that the law recognized no such right. It is well settled that if a father is guilty of gross ill-treatment or cruelty toward his infant children, or if he habitually indulges in drunkenness, or blasphemy, or gross debauchery, or if his domestic associations tend to the corruption of his children, or if his acts are in any manner seriously injurious to their morals or interests, a court of chancery will deprive him of their custody and discipline, and appoint a suitable person as their guardian, to care for them and superintend their education. This practice is based upon the doctrine that parents have no right of property in their offspring; that their parental rights are accorded to enable them to perform their parental duties, and that such rights are held in trust to be forfeited to the state by their abuse. However, courts will interfere between parents and children with great caution, and only in cases where the parent's wrongdoing and the child's danger are clearly established. In many of the U. S. societies for the prevention of cruelty to children have been incorporated, with authority to institute various proceedings on behalf of minors whose parents, guardians, or custodians treat them unlawfully. See ch. 122 N. Y. Session Laws, 1876.

Services.—The parent has a legal right to the services of his minor children while within his custody, and to any wages which they may earn in the service of others. He may waive this right by emancipating or freeing the child from parental subjection; or, in some States, by his failure to notify the employer, pursuant to statutory requirement, that the wages must be paid to him and not to the child. According to the prevailing view, the legal marriage of a minor emancipates him or her from parental control. (*Commonwealth vs. Graham*, 157 Mass. 73.) An unlawful injury to the child, which invades any parental right, will subject the wrongdoers to an action by the parent as well as to one by the child. Hence where a child had recovered \$2,800 for personal injuries, the parent was allowed to recover against the same defendant for loss of service and for reasonable expenses in the care and cure of the injured child. *Horgan vs. Pacific Mills*, 158 Mass. 402.

Parental Duties.—It is generally declared that these are maintenance, protection, and education, though to what extent the common law obliges parents to perform them is a matter of much diversity of opinion. The weight of judicial authority in England favors the doctrine that the parent is under no common-law duty to support his child; that his legal duty in this regard is the creature of statute. According to this view, if a parent refuses to provide for his child the latter can not pledge the former's credit for necessities, nor can he maintain any legal proceeding against the parent. His "only resource, in the absence of anything to show a contract on the parent's part, is to apply to the parish," which may take the proper steps to enforce the parent's statutory duty. The same view prevails in some of the U. S. (*Kelley vs. Davis*, 49 N. H. 187.) Other State courts have held that "the duty of the parent to maintain his offspring until they attain the age of maturity is a perfect common-law duty." (*Porter vs. Powell*, 79 Ia. 151.) In these jurisdictions, persons who supply minor children with necessities (see INFANT) which the parent refuses or neglects to provide can recover their value from the parent on a quasi-contract. Where a child possesses an estate in his own right, a court of equity will authorize the father, in a proper case, and the mother in almost every case, to use the income, or even the principal, of such estate for the infant's suitable maintenance and education. A parent may lawfully resort to force in repelling an attack upon his child, as he may in repelling an ASSAULT (*q. v.*) upon himself. If he incurs a great risk in attempting to save his child from injury, he is not chargeable with NEGLIGENCE (*q. v.*), and he may uphold his children in their lawsuits without being guilty of MAINTENANCE (*q. v.*). Although the parental right of protection is unequivocal, the law does not compel its exercise. The parental duty of educating children, which was very imperfect at common law, has been regulated to some extent by recent statutes both in Britain and in the U. S. (See EDUCATION.) A

parent's duty to support his children does not survive him, but he is free, in the absence of a statute on the subject, to disinherit them. The parental liability upon the contracts and the torts of his children is governed by the law of MASTER AND SERVANT (*q. v.*). A husband does not assume the legal relation of parent to his wife's children by a former marriage. While they remain in his family he has the right to control them, and the law presumes, in the absence of any contract on the subject, that he supports them and they render services to him without charge.

Under modern legislation, though not at common law, the legal relation of parent and child may be instituted by ADOPTION (*q. v.*). While the adopted person becomes the legal child of the adopter, he retains the right of inheriting from his natural parents, unless the statute expressly deprives him of such right. *Wagner vs. Farmer*, 50 Iowa 532.

Filial Rights and Duties.—Most of these have been set forth in presenting the duties and rights of parents. At common law the child was not legally bound to maintain his parents, but modern legislation has subjected him to an enforceable duty in this respect.

For the rules of law relating to illegitimate children, see BASTARD.

LITERATURE.—Schouler's *Domestic Relations*; Blackstone's *Commentaries*, bk. I., ch. xvi.; Kent's *Commentaries*, lect. 29; Church's *Habeas Corpus*; Story's *Equity Jurisprudence*. FRANCIS M. BURDICK.

Parepa-Rosa: See ROSA.

Par'esis: loss of power less marked than that to which the term paralysis is applied. The causes and the manifestations of paresis are similar to those of PARALYSIS (*q. v.*), differing only in degree.

Paresis, General: See INSANITY (*General Paralysis*).

Parga: town; in the vilayet of Yanina, European Turkey; surrounded on three sides by the sea and defended on the fourth by an almost impregnable citadel (see map of Turkey, ref. 5-B). From 1401 to 1797 it was a prosperous commercial republic under the protection of Venice. From 1797 to 1814 it was nominally subject to the Ottomans, who gave it to Ali Pasha of Yanina. The inhabitants, about 5,000 Christian Albanians, refused to submit, and by desperate exertions maintained their independence, being aided after the treaty of Tilsit (1807) by the French. On the fall of Napoleon the Pargiotes solicited and obtained the protection of Great Britain, which placed a British garrison in the city; but in 1819 the British Government quietly delivered Parga to Ali Pasha, whereupon the Pargiotes dug up the bones of their ancestors, burnt them, abandoned their city, and went into exile. See Mustoxides's *Exposé des faits qui précédèrent et suivirent la cession de Parga* (Paris, 1819). E. A. GROSVENOR.

Parhelia: See HALO.

Paria, paá-ré-áá. **Gulf of**: a small inland sea (105 miles long from E. to W.; 40 miles wide) between the lowlands at the mouth of the Orinoco, the island of Trinidad, and the peninsula of Paria, a rocky extension of the Venezuelan coast range. It communicates with the Caribbean Sea by the Boca del Drago, or Dragon's Mouth (between Trinidad and the peninsula), and with the Atlantic on the S. E. by the Boca de la Sierpe, or Serpent's Mouth. Columbus, who discovered and named these straits in 1498, had great difficulty in passing through them owing to their strong currents. Here he first saw the continent.

HERBERT H. SMITH.

Pa'riah [from Tamil *paraiyan*, a man of low caste performing the lowest menial services, liter., a drummer (the pariahs being hereditary drum-beaters), deriv. of *parai*, a large drum used at certain festivals]: one of the lowest class in India, which does not belong to any of the four castes. The pariahs have woolly hair and thick lips, and are found especially in the south of India; they are supposed to represent the aboriginal race conquered by the Sudras. In the Madras Presidency they number more than 4,000,000. They are very degraded, are not allowed to approach within many feet of any Hindu, and have to some extent adopted a system of caste among themselves. Chandalas and outcasts sink to the rank of pariahs. Successful efforts are being made by missionaries and others to elevate the character and intellect of these wretched beings. See CASTE.

Paridae [Mod. Lat., from Lat. *parus*, a titmouse (the typical genus) + *idae*, family termination]: a family of small

thick-set birds, containing the titmice, characterized by soft, loose plumage; short, stout, rather conical bill; strong feet, with a pad beneath the hind toe; ten primaries, first short or spurious. The titmice are nearly all confined to the northern hemisphere, and occur in temperate or cold regions of both worlds. See TITMOUSE. F. A. L.

Pari'etal Bones [*parietal* is from Lat. *paries*, wall, partition]: in vertebrates, the two bones which close in the skull above. They are never preformed in cartilage, but arise from the ossification of membranes, ossification in each proceeding from a single center.

Parietal Eye: a vestigial organ peculiar to vertebrates. In the brain of all vertebrates there has long been known a structure of unknown functions, called the pineal gland. It arises from the roof of the brain, between the cerebrum and mid-brain, and in the human being, where it is a structure about the size of a pea, it is completely covered by the cerebrum as it folds back over the cerebellum. In the lower vertebrates, where the cerebrum is less developed, it is exposed upon cutting into the cranial cavity. One of the most brilliant discoveries of recent years was Spencer's demonstration that this problematical organ was a vestigial eye, and that in certain lizards it reached nearly to the surface of the head, retaining in its most complete development lens, retina, pigment, and traces of a nerve. In these forms its presence can be recognized from the exterior in a small spot between the parietal bones, whence the name. Since Spencer's paper numerous investigators have studied the structure, and they recognize in it a compound organ, the anterior part of which alone develops the eye, while the posterior (for which the name epiphysis is retained) is more lymphoid in nature. It would, however, appear probable from the recent investigations of Klinkomstrow and Lucy (1894) that the parietal eye is paired in origin, and that the epiphysis may be a second eye, behind the first, which has become more degenerated than its fellow. So far as is known this eye is no longer functional, but in some of the fossil vertebrates a cavity exists in the skull in the right position and of proper size to accommodate a third eye with its appropriate muscles. One of the most interesting features connected with the parietal eye is that it is built upon the invertebrate type: that is, the retinal layer is not inverted as it is in the functional vertebrate eye. See Spencer, *Quarterly Journal Micros. Science* (xviii., 1887); Leydig, *Senckenberg. Abhandl.* (1889); Ritter, *Bulletin Mus. Comparative Zoölogy* (xx., 1891). J. S. KINGSLEY.

Parima, Sp. pron. paá-ree-máa, **Serra**, or **Sierra de**: a line of highlands forming the divide between the headwaters of the Orinoco on the W. and the Rio Branco, a secondary affluent of the Amazon, on the E.; marking part of the boundary between Venezuela and Brazil. According to Codazzi, some points are over 7,000 feet high. On the side of the Orinoco the general trend appears to be from N. W. to S. E. The name is often extended to all the central highlands of GUAYANA (*q. v.*). Originally it was given to a mythical lake of large size supposed to exist in this region and connected with the story of El Dorado. H. H. S.

Parini, GIUSEPPE: poet; b. at Bosio (Brianza), May 23, 1729; d. at Milan, Aug. 15, 1799. Of humble family, he made his way by pure ability into the best society of Milan, and thus acquired the knowledge of its manners necessary for his satiric purposes. His actual career was that of a teacher, though he was also a priest; and from 1773 to his death he was Professor of Belles-lettres in the Academy of the Brera at Milan. He was a member of several of the literary academies so popular in Italy in his time, notably of the Trasmonti of Milan and of the Milanese offshoot of the Roman Arcadia. His life was not an eventful one, though at its end he endured some unhappiness through unfortunate mingling in public affairs, and consequent retirement into something like actual poverty. His fame as a poet chiefly rests on his satiric poem, *Il Giorno*, begun by him in 1760. This appeared in four parts—*Il Mattino* (1763), *Il Mezzogiorno* (1765), *Il Vespro* and *La Notte* (the last incomplete, both published after Parini's death in the Reina edition of his *Works*, 6 vols., Milan, 1801). The work is an ironic description of the daily occupations of the Milanese aristocracy, its effeminate and too often corrupt customs, its idleness, its vanity. Pretty episodes are interwoven, and at times the author finds opportunity for noble and sincere protests against social injustices. Besides this poem we have from Parini's pen a number of odes (1st ed. Milan, 1791) and several occasional poems. In these the

neo-classicism of the Arcadia is everywhere to be seen—modified, however, by a certain intentional roughness, which is the poet's protest against the too soft and delicate manner of his contemporaries. A good edition of *Il Giorno* is that by A. Borgognoni (Verona, 1892); of the *Odi*, that of F. Salveraglio (Bologna, 1882). See also A. Giannini, *La vita e le opere di G. Parini* (Salerno, 1891); G. Carducci, *Storia del Giorno di G. Parini* (Bologna, 1892); C. Cantù, *L'abbate Parini e la Lombardia nel secolo passato* (Milan, 1854).

A. R. MARSH.

Paris [*< Late Lat. Parisii* (Lat. *Lutetia Parisiorum*, Lutetia of the *Parisii*, a people of Celtic Gaul, bordering on the Senones); the capital of France; on both sides of the Seine, 110 miles by rail from the river's mouth; in lat. 48° 50' N. and lon. 2° 20' E. of Greenwich (see map of France, ref. 3-F). It has a mean elevation of 120 feet, and lies in a basin between lines of heights, which reach 404 feet on the north side and 190 feet on the south side. The Seine enters Paris on the west and leaves it on the southeast side, forming in its passage the islands of St.-Louis and La Cité. The granitic substratum is covered by Jurassic, Cretaceous, and Tertiary formations, and at several points a light-colored limestone is quarried, which has been used in constructing most of the buildings of the city.

Area and Population.—The present boundary coincides with a line of ramparts, 22½ miles in length; it includes an area of 78 sq. km. (a little over 30 sq. miles), of which one-fifth is occupied by the streets, 458 acres by squares and gardens, and 642½ acres by the river and canals. In 1891 the population was 2,447,957. Barely a third were born in Paris, and of the remainder more than 11 per cent. were foreigners. At the end of the thirteenth century the population was 200,000; in 1675, under Louis XIV., 540,000; in 1789, at the outbreak of the Revolution, 600,000; in 1851, at the beginning of the Second Empire, about 1,000,000; ten years later, 1,500,000, an increase chiefly due to the extension of the boundary; in 1871, on the advent of the Third Republic, nearly 2,000,000. The increase is now at the rate of about 25,000 a year. The population is denser than in any other great European city. Marriages average annually 26,500; births, 75,000; deaths, 70,000.

Climate.—The climate is fairly uniform, but liable to changes at all seasons, and on the whole is healthful and agreeable. The average temperature is 51° F. The highest temperature recorded in the nineteenth century was in July, 1881, when it was over 100°; the lowest was in Dec., 1879, when it sank to about -7°. From 1804 to 1876 the average temperature for each season was as follows: winter, 39°; spring, 51°; summer, 64°; autumn, 52°. January is the coldest and July the warmest month. The Seine seldom freezes; generally there is skating for a few days only each year, and the snowfall is slight. The average height of the barometer is 29.55 inches. During an average year there are about 143 rainy days, divided about equally among the four seasons.

Fortifications.—Paris is entirely surrounded by a fortified wall, which, with the first line of detached forts, was constructed between 1840 and 1860. This first line of forts, eighteen in number, is situated at a distance of about 1,600 yards from the city walls. The second line of forts, built since the war of 1870-71, is several miles distant from the city and consists of eighteen forts, placed on the various heights which surround Paris. The capital is now believed to be impregnable from a military point of view.

Streets.—The streets of no city in the world are so fascinating as those of Paris. They are well paved with stone, wood, or asphalt, or are macadamized; they are well lighted with electricity or gas, many of the lamp-posts being in bronze, and some of them being real objects of art. The sidewalks, though rather narrow in the small and old streets, are extremely wide in the boulevards and many of the avenues, and are in all cases smooth and neat. The streets are cleaned daily, and sprinkled frequently, while the gutters are washed out with running water once or twice every twenty-four hours. Trees, shrubs, and flower-beds abound. Comfortable benches are scattered along all the boulevards and avenues. Paper-stands, fruit-stands, etc., are generally neat, and all are constructed on the same models. A system of pneumatic tube telegraphy supplements the postal service. The means of conveyance are chiefly by cabs, omnibuses, and horse-cars, and an underground railway is being constructed. There are also steam-boats plying up the river to Charenton and down to Suresnes;

and a circular railway, the Chemin de Fer de Ceinture, runs round the city just within the walls. The names of the streets are at all the street-corners, and the numbers on the houses are large and conspicuous. The dwellings and public edifices, almost always built of limestone, are well constructed, and for the most part are of about the same height and same style of architecture. On their fronts, in scores of cases, are tablets bearing historic inscriptions, informing the public that on this or that site or in this or that house some famous man lived or died, or some great event happened. No two streets bear the same name. Most of the names are given to perpetuate the memory of famous men or women of all ages and nations, or to recall celebrated historical and political events. Among the citizens of the U. S. who are thus remembered are Washington, Lincoln, Franklin, and Fulton.

From the Madeleine to the Bastille the line of boulevards, 3 miles in length, forms the busiest and most fashionable thoroughfare in the world. The thoroughfare of the boulevards of Sébastopol and Strasbourg stretches N. and S. between the Gare de l'Est and the Seine, and then by the Boulevard du Palais and Boulevard St.-Michel reaches the observatory, the total length being 2½ miles. The Rue Royale, the Malesherbes and Haussmann boulevards, and the Avenue de l'Opéra are among the finest quarters of the town. The Rue de la Paix, Rue Auber, and Rue 4 Septembre are remarkable for their shops. The Place de l'Étoile is the center of twelve avenues issuing from it like the spokes of a wheel. On the south side the main thoroughfare is the Boulevard St.-Germain.

Bridges.—The Seine is of the proper width to favor the construction of graceful bridges, which are among the most attractive ornaments of the city. The oldest are Notre Dame, occupying the site of a Roman bridge; the Pont Marie, constructed between 1614 and 1628; the Pont d'Austerlitz, begun under the first Napoleon, rebuilt during the Second Empire, and enlarged during the Third Republic. The names of the principal officers killed at the battle of Austerlitz are inscribed on the ornamental portion of this structure. The present Pont au Double, which dates from 1880, supplanted a bridge of the seventeenth century, where a toll of a *double*, an old piece of money worth the sixth of a sou, was collected. The Pont St.-Michel, rebuilt several times since the fourteenth century, is one of the widest and most frequented. The famous Pont Neuf is now the oldest of the Paris bridges. It was begun in 1578 under Henry III. and finished under Henry IV., whose statue adorns it. Mansart was the architect of the Pont Royal, which was constructed between 1685 and 1689. The Pont de Solférino commemorates the chief French victories during the Italian campaign of 1859. The Pont d'Iéna dates from the closing years of the First Empire. The bridge and viaduct of Auteuil, one of the finest of the kind in existence, was built in 1866. It serves for railway, vehicle, and foot traffic.

Parks and Gardens.—The public garden of the Tuileries covers about 70 acres, and was laid out in 1665 by Le Nôtre, the landscape-gardener of Louis XIV.; but the original plan has been much altered. The garden contains many fine, large trees and numerous pieces of sculpture by famous French artists. The Luxembourg Garden is a little smaller than the Tuileries. The hothouses, sixteen in number, contain more than 25,000 plants. Besides other statuary there is a series of portraits of famous French women, erected during the reign of Louis Philippe (1830-48). The Palais Royal garden, in the form of a large parallelogram, is much smaller than the two gardens already mentioned. It is surrounded on all four sides by buildings and an arcade, where are many fine jewelry-shops.

The Jardin des Plantes, which is a little larger than the Tuileries, was designed by Guy la Brosse, Louis XIII.'s physician, and was first opened to the public in 1650. At that time it contained only medicinal herbs. To-day the botanical school has a reserve of nearly 5 acres filled with some 13,000 kinds of plants. Most foreign trees and shrubs which can live out of doors in the climate of Paris are found here, and are labeled. There are nearly 2,000 varieties of fruit-trees and many hothouses. A zoological collection forms a part of the garden. The Monceau Park was laid out in 1778 by the father of Louis Philippe, but did not become public property till the Second Empire. It contains several bits of historical ruins, notable modern statues, and is surrounded by some of the most fashionable streets and magnificent private residences of Paris. The Trocadéro Park dates from the Exhibition of 1878. After the foun-



tain and palace the most interesting object is the aquarium. The Buttes-Chaumont Park is in the extreme northeast part of Paris on the Belleville hill. Till the end of the Second Empire what is now a beautiful park of over 55 acres was a waste quarry-ground. A fine view of Paris may be had from the heights of this park. The Montsouris Park (nearly 40 acres) is on the southern outskirts of the city, and contains the meteorological observatory.

The Champ de Mars, which used to be a sandy field for military manœuvring, is now laid out as a public garden. It is surrounded by the principal buildings of the Exhibition of 1889, and in the center is the EIFFEL TOWER (*q. v.*). At the southeast end is the military school. The Champs Élysées is the most frequented garden of Paris.

Outside of the walls are the two great parks, the Bois de Boulogne and the Bois de Vincennes. The first, of about 2,000 acres, contains two large lakes, many beautiful drives and walks, and a race-course—Longchamps—where the Grand Prix is run for and where the grand annual military review takes place. A fashionable skating-rink is opened here in winter. The aristocratic drive is the Allée des Acacias. The Garden of Acclimatation, situated here, embraces the finest zoological collection in Paris. The Bois de Vincennes contains over 2,075 acres. In the center is a large field for military manœuvres and also a race-course.

Public Monuments.—The streets, squares, and parks contain many groups of statuary by noted sculptors, and numerous monuments. The most remarkable monument is the Arc de Triomphe in the Place de l'Étoile, begun by Napoleon I. and completed by Louis Philippe. It is about 160 feet in height. Another triumphal arch stands in the Place du Carrousel, and commemorates the campaign of 1806. In the Place Vendôme is a shaft 143 feet in height, with bas-reliefs commemorating Napoleon's campaigns in 1805. The *Column of July*, a bronze pillar 154 feet in height, stands in the Place de la Bastille, and is dedicated to the citizens who fell in the Revolution of 1830. In the center of the Place de la Concorde, on the spot where stood the guillotine used during the Revolution, is the obelisk of Luxor, 75 feet in height. (See **OBELISK**.) It was removed from Egypt in 1833, and in 1836 was set up where it now stands. A colossal lion in the Place Denfert symbolizes the defense of Paris in 1871. A reduction of Bartholdi's *Liberty Enlightening the World*, a gift of citizens of the U. S., stands on one of the islands in the Seine. Among those to whose memory statues have been erected are Charlemagne, Joan of Arc, Louis XIV., Napoleon, Danton, Gambetta, Dante, Shakspeare, Béranger, Voltaire, and Dumas. The Medici fountain in the Luxembourg garden, the two fountains in the Place de la Concorde, copies of those at St. Peter's, Rome; the fountain in the Place Louvois, the Fountain of Victory in the Place du Châtelet, the Cuvier fountain near the Jardin des Plantes, the fountain at the north end of the Boulevard St.-Michel, the fountain at the north end of the Avenue de l'Observatoire, that in the Place de Notre Dame, that by Bouchardon in the Rue de Grenelle, and the colossal fountain in the Champ de Mars, are a few of the works of art of this kind that adorn the city. The great Trocadéro fountain may be termed a cascade.

Palaces.—Paris is rich in splendid palaces. The origin of the Louvre is almost coeval with the French monarchy, although the name first appears about the year 1204, during the reign of Philip Augustus, who entirely rebuilt it. The Louvre was then an exceedingly strong fortress. Catherine de Medicis was the first royal personage to take up a residence in the Louvre. Here in 1610 Henry IV. was laid out in state after his assassination. When Louis XIII. died the Louvre was abandoned as a royal residence, till occupied by the widow of Charles I. Louis XIV. held a *lit-de-justice* there, and during the same reign Molière's troop of actors played in one part of the palace. On the outbreak of the Revolution of 1789 the Louvre was in a semi-abandoned state; but the Convention made a complete change in its management by converting it into a grand picture gallery and museum.

The TUILERIES (*q. v.*), on the right bank of the Seine, was begun in 1564, and was the scene of many historic events. The whole central portion and a part of the wing along the Rue de Rivoli were burned by the Communists in 1871. This wing was rebuilt during 1875-76, while, a few years later, the ruins of the historic central part were leveled to the ground and a garden laid out on the site.

The Élysée Palace was built in 1718. Among its early occupants were Mme. de Pompadour and, later, Murat.

Napoleon retired thither after his defeat at Waterloo, and there signed his abdication. It was Louis Napoleon's official residence when he was president of the Second Republic, and there he prepared the *coup d'état* of Dec. 2, 1851. Since the establishment of the Third Republic the Élysée has been the residence of the president.

On the site of the Palais Royal once stood the *hôtels* of Mersœur and Rambouillet, celebrated in literary history. Cardinal Richelieu bought these two *hôtels*, tore them down, and constructed on the ground a palace which was completed in 1634. Here he died eight years later. In 1643 Anne of Austria took possession of the palace with her two sons, one of whom afterward came to the throne as Louis XIV. It was Philippe Égalité, father of King Louis Philippe, who surrounded the garden with the shops which still stand, and whose rentage enabled him to keep up his expensive establishment. It was in the garden of the Palais Royal that Camille Desmoulins gave the first popular impulse to the Revolution. Between 1872 and 1876 it was reconstructed and restored, having been partially burned during the Commune, and is now occupied by state bodies.

The Luxembourg Palace is an ancient royal residence, built by Marie de Medicis in the beginning of the seventeenth century. Among other famous personages who have lived there are Mlle. de Montpensier, Louis XIV., and Louis XVIII. The Revolution converted the palace into a prison, and here were confined the future Empress Josephine, Danton, Camille Desmoulins, Thomas Paine, and others. Toward the end of the eighteenth century it became the seat of executive or legislative bodies, and has continued to be used for this purpose down to the present day, the Senate now occupying it. Here in 1815 Ney, in 1830 the ministers of Charles X., and in 1840 Prince Louis Napoleon after his landing at Boulogne, were imprisoned and tried; and here, during the republic of 1848, Louis Blanc established a sort of official labor bureau. The interior of the palace is rich and spacious, and contains many objects of historic and artistic value. A large public garden is connected with the palace, and a gallery of modern pictures and sculptures is established in an annex. The historic Petit Luxembourg, a wing of the larger palace, is now the official residence of the president of the Senate.

The Palais Bourbon was built in 1722, but has been much enlarged since that time. Here sat the Council of Five Hundred, and here, under different names, the Chamber of Deputies has met, with slight interruptions, since the Restoration down to the present day. In this hall the greatest parliamentary orators of France have been heard, and here occurred several of the most famous scenes in the political history of France during the nineteenth century. The palace occupied by the president of the Chamber of Deputies is connected with the Palais Bourbon. Here Gambetta once resided.

The palace of the Legion of Honor was built in 1786 for the Prince of Salm; but during the Revolution it was put up at lottery and won by a baker. In 1803 the offices of the Legion of Honor were established here. The edifice was burned by the Commune, but was restored.

The Palace of the Institute is due to Cardinal Mazarin, and was finished in 1662. It was at first used as the College of the Four Nations. During the early days of the Revolution it became a jail, and later the meeting place of the Committee of Public Safety. The First Empire established the Institute of France in this edifice, and there it has since remained. The famous French Academy, which forms a part of the Institute, meets here.

Museums and Picture Galleries.—Paris is remarkably rich in museums and picture galleries, there being nearly fifty in all. The most important is that of the Louvre, whose origin was a private collection of pictures which belonged to Francis I. Louis XIV., Louis XV., and Louis XVI. increased the collection, and on the eve of the Revolution the Louvre Gallery was one of the finest in the world. Additions were made during the Revolution, and during the wars which followed Napoleon sent to Paris the most famous works of art of all Europe, many of which became the permanent property of the Louvre. Its most noted piece of ancient sculpture is the Venus of Milo, discovered in 1820, and bought by the French Government. Since 1870 valuable gifts and the results of artistic and scientific expeditions under Government authority have considerably increased the value and extent of the collections.

Among the other important museums and galleries are the Carnavalet, specially devoted to the history of Paris and

the Revolution; the Cluny, mediæval art, containing over 10,000 objects; the natural history collections in the Jardin des Plantes, one of the largest of its kind in the world; the Luxembourg, a gallery of living painters and sculptors; the Artillery Museum in the Hôtel des Invalides, embracing some 4,000 specimens of military weapons of all kinds and of all countries and ages; the Trocadéro, comparative sculpture, architecture, and ethnology; the Guimet, devoted to the religions of the far East; the Galliera, a miscellaneous art collection housed in a magnificent stone structure which was ten years (1878-88) in building; the mint, containing a large collection of coins and other curiosities; the National Archives, a great mass of original documents, some of which may be seen by the general public, autographs, the keys of the Bastille, etc.; the Dupuytren, at the School of Medicine, a valuable collection bearing on pathological anatomy, formed in 1835; the art collection at the School of Fine Arts; and the scientific collections at the School of Mines.

Libraries.—There are many great book collections in Paris. The National Library, the largest in the world, contains some 3,000,000 volumes. It was begun by Charles V. (1364-80), and went on increasing steadily, but it was the suppression of the convents and the confiscation of their libraries, during the Revolution, that placed it, with one bound, at the head of the list. Besides its books the library contains some 300,000 maps from all parts of the world, over 90,000 volumes of manuscripts, ancient and modern, many volumes of rare autographs, more than 200,000 coins and medals, and 14,500 volumes and 4,000 portfolios of engravings.

The Ste.-Geneviève Library, near the Panthéon, is of ecclesiastical origin, and contains some 196,000 volumes, 4,000 manuscripts, and 25,000 engravings. Its books are mostly of an encyclopædic nature. Nearly 150,000 persons enter this library every year. The Mazarin Library, at the Institute, begun by Cardinal Mazarin, has 250,000 volumes, 6,000 manuscripts, and 1,700 incunabula, and is one of the leading libraries in France in bibliographical rarities. It is, furthermore, a museum, containing many scientific curiosities and objects of art. The Arsenal Library has 200,000 volumes and 8,000 manuscripts, and is notable for its works of the early minor French poets and for documents relating to the theater. The Library of the Opéra, kept in the Opera-house, is devoted principally to the history of the theater and music. It contains 15,000 bound volumes and pamphlets, 60,000 engravings, and the original drawings for the costumes of 200 operas or ballets.

Theaters.—The drama being one of the chief sources of amusement in Paris, there are many theaters. Four of them—the Opéra, Théâtre Français, Opéra Comique, and Odéon—receive state aid. The Opéra is one of the finest theatrical edifices in the world. It cost some 30,000,000 francs, covers an area of about 11,000 sq. yards, and can seat 2,156 spectators. It took over ten years to build the edifice, which was first thrown open to the public in 1875. The architect was Charles Garnier. The grand staircase and the foyer are the most admired portions of the structure. The annual subvention is 800,000 francs.

The leading theater of France and of the world is the Théâtre Français, or Comédie Française. It has a large and talented stock company, which enjoys many privileges. The present edifice was built in 1782, and contains, besides a large auditorium and handsome foyer, numerous busts and portraits in oil of celebrated dramatists and actors, and other interesting histrionic objects; also a curious collection of autographs and objects associated with famous actors. The Théâtre Français was created in 1680, and receives an annual subvention of 240,000 francs. Among its most famous actors have been Talma, Mars, Rachel, Coquelin, and Sarah Bernhardt.

The Opéra Comique was burned in 1887, but a new building is being erected. The Odéon, opened in 1782, was burned in 1799, rebuilt in 1808, and again burned in 1818, but immediately rebuilt. It contains one of the best auditoriums in Paris, and enjoys a subvention of 100,000 francs.

Among the non-subsidized theaters are the Gymnase, founded in 1820, which owed its early prosperity to Scribe, whose pieces were first brought out on its stage; the Palais Royal, whose troupe has contained many celebrated actors; the Porte St.-Martin; the Château d'Eau, which has the largest auditorium of all Paris theaters; the Vaudeville, Variétés, Renaissance, Gaité, Châtelet, Nouveautés, etc. Several cirques, concerts, *cafés-chantants*, etc., complete the list of places of amusement.

Restaurants and Cafés.—In no other city is restaurant and café life so highly developed as in Paris. At the Café Américain congregate literary men and painters; bankers and brokers predominate at the Café Riche; at the Café du Helder are found army and navy officers and St.-Cyr cadets; rich foreigners frequent the Café de la Paix; the Café de Madrid is the headquarters of journalists; actors are numerous at the Café de Suède and the Café des Variétés; the Café Vachette, in the Quartier Latin, is patronized by students; the Café de la Régence is the meeting-place of Scandinavians and chess-players. The principal Montmartre quarter *cafés* were the Rochefoucauld and the Nouvelle Athènes, but the famous *café* of the Chat Noir has eclipsed them and has become one of the curiosities of Paris. There are fashionable restaurants in the Champs Élysées, where one may dine and watch at the same time the performances of the *cafés-chantants*. In the Bois de Boulogne are some *cafés* and restaurants, the Cascade restaurant being very popular in summer, when it is used as a resting-place after an evening drive.

Educational Institutions.—The Panthéon may be considered the center of the Quartier Latin, the students' part of Paris. Here, within five minutes' walk of one another, are the Sorbonne, the heart of the UNIVERSITY (*q. v.*); the Collège de France, which might be called the Post-graduate University; the special schools of law, medicine, mines, pharmacy, fine arts, Oriental languages, etc., the historic École Polytechnique, the École Normale Supérieure, etc. In the faculties are over 325 professors, and more than 100 lectures are delivered every day. The thousands of students in attendance come from almost all the nations of the earth; there are over 5,000 at the medical school alone.

Churches.—There are seventy parish churches, of which Notre Dame, the metropolitan cathedral, is the largest and most famous. Its corner-stone was laid in 1163 by Pope Alexander III., then a refugee in France, but the edifice was not completed till nearly a century later. In 1845 a thorough restoration of the church was begun. Notre Dame is one of the finest specimens in France of the ogival style of architecture. The interior is 132 yards long, 53 wide, and 37 high, and contains thirty-seven chapels. There are three grand rose windows, whose stained glass dates from the thirteenth century. The large bell in the south tower was cast in 1686, and weighs about 30,000 lb. The Sainte Chapelle is perhaps the most beautiful structure in Paris. It was built by St. Louis to house the supposed crown of thorns and a portion of the true cross. It was finished in 1247, and restored at the end of Louis Philippe's reign. The Chapelle Expiatoire, on the Boulevard Haussmann, was built by order of Louis XVIII. (1814-24), and finished in 1826. It is consecrated to the memory of his brother and sister-in-law, Louis XVI. and Marie Antoinette, who were buried on this spot, and to the memory of the victims of the Revolution. The first church bearing the name St. Étienne-du-Mont dates from the thirteenth century, but was reconstructed in 1517 under Francis I. The jube, or rood-loft, the work of the sculptor Biard, senior, was made at the beginning of the seventeenth century, and is considered a masterpiece. The stained-glass windows of this church are also notable, representing the work of the best artists from the middle of the sixteenth to the end of the seventeenth centuries.

St.-Germain-des-Prés is a remnant of the ancient abbey of that name. It was begun in 1001, but was not completed till the twelfth century. Near by was the prison of the abbey, which was the scene of much bloodshed during the Reign of Terror. It disappeared in 1860.

There was a church on the site of St.-Germain-l'Auxerrois as early as 560. Some portions of the present edifice date from the twelfth century. A cloister once surrounded the church, and was in the days of Charlemagne the seat of a famous school. On Aug. 24, 1572, its bell rang out the signal for the massacre of St. Bartholomew.

The Madeleine was begun by Louis XV., but was not opened till 1842. Napoleon I. intended it to be a Greek temple, dedicated to the soldiers of the Grand Army. It is now one of the most richly ornamented and fashionable churches of Paris. The corner-stone of St.-Roch was laid by Louis XIV. in 1653. On the top of the flight of steps leading up to the doors of this church, Bonaparte placed the cannon which checked the uprising against the Convention Oct. 5, 1795. Corneille, the dramatist, is buried here. The Church of the Sacred Heart on the heights of Montmartre is a large and conspicuous basilica in Byzantine

style, whose construction was decreed in 1874 by the National Assembly. A fine view of Paris can be obtained here.

St-Sulpice was begun in 1646. During the Convention it was known as the Temple of Victory. Val-de-Grâce was raised by Anne of Austria as a thank-offering to God for the birth of the future Louis XIV. The cupola, which is considered to be the best imitation in France of the cupola of St. Peter's, Rome, is decorated with a large composition by Pierre Mignard—*Gloire des Bienheureux*—containing over 200 figures. Henrietta, queen of Charles I. of England, and daughter of Henry IV. of France, is buried here.

Among the other churches may be mentioned St.-Vincent de Paul, with its frieze over 170 yards long and 3 high, by Hippolyte Flandrin; Ste.-Elisabeth, Rue du Temple, whose cornerstone was laid in 1628 by Marie de Medicis; St.-Eustache (1532-1642), where Colbert is buried; Notre Dame de Lorette, in imitation of a Roman basilica; Notre Dame des Victoires, remarkable for the large number of *ex-votos* which cover the interior walls; and the Chapel of the Sorbonne, now the center of the immense parallelogram of new university buildings, and noted for its tomb of Richelieu. Of the forty-five or more Protestant churches the Oratoire is the most conspicuous.

Cemeteries.—Paris has nineteen cemeteries, thirteen of which are inside the walls. Of the latter, only three are of historic interest: Père Lachaise, Montmartre, and Montparnasse. The largest and most notable is the first named. It covers about 100 acres, and here are the tombs, among those of other celebrities, of Arago, Thiers, Rachel, Cuvier, Béranger, Molière, Ingres, and Balzac. It is also provided with a crematory, the first and only one established in Paris. In the Montmartre Cemetery are buried Delaroche, Gautier, Comte and the heart of Marshal Lannes, whose body is in the Panthéon. At Montparnasse are the graves of Henri Martin, Rude, Le Verrier, Malte-Brun, and Sainte-Beuve. La Fayette is buried in the little cemetery of Picpus, near the eastern extremity of Paris, and in the Passy Cemetery is the conspicuous tomb of Marie Bashkirtseff.

Reviews and Journals.—The oldest of the reviews published in Paris is the *Revue Britannique*, founded in 1825; the most important, which has a worldwide reputation, is the *Revue des Deux Mondes*, founded in 1829; and among the others may be mentioned Mme. Adam's *Nouvelle Revue*, the *Revue Historique*, Ribot's *Revue Philosophique*, *Revue Bleue*, which enjoyed considerable popularity during the life of its founder, Eugène Yung, the recently established *Revue de Paris*, and Richet's *Revue Scientifique*. Among the illustrated and artistic journals are *L'Illustration*, founded in 1843, the *Journal Amusant*, the *Journal Illustré*, the *Magasin Pittoresque*, founded in 1833, the *Monde Illustré*, the *Univers Illustré*, *La Vie Parisienne*, *L'Art*, one of the high art publications, the *Gazette des Beaux-Arts*, and the *Revue des Beaux-Arts*. Among the daily papers of note are *Figaro*, *Le Temps*, the leading evening newspaper; the *République Française*, founded by Gambetta; the venerable *Journal des Débats*; the *Rappel*, which used to be Victor Hugo's organ; the *Univers* and *Monde*, the two Roman Catholic organs; the *Petit Journal*, a one-sou morning paper with over 1,000,000 readers, the largest circulation in France; the *Gaulois*, which circulates largely in the fashionable world; and the *Journal Officiel*, the official organ of the Government.

Hospitals.—The oldest of the Paris hospitals is the Hôtel-Dieu, founded about 660 and rebuilt between 1868 and 1878. It contains nearly 600 beds. La Charité, founded in 1602 by Marie de Medicis, is the chief lying-in hospital. The Lariboisière takes its name from the Comtesse de Lariboisière, who left nearly 3,000,000 francs to the Paris poor. The hospital contains 690 beds. The Necker is named from the mother of Mme. de Staël, who used to found it a sum given her for charitable purposes by Louis XVI. La Pitié was built by Louis XIII., and has 729 beds. St.-Antoine is another of the early hospitals. It is surrounded by large gardens and has 647 beds. St.-Louis dates from 1607, during the reign of Henry IV., and is given up to patients suffering from skin diseases. The Midi is confined to the venereal diseases of men and the Lourcine to those of women. The Maternité occupies the old abbey of Port-Royal, which was used as a prison during the Revolution. There is attached to it a school of midwifery for female pupils. The hospital of the *accouchement* clinic, 89 Rue d'Assas, possesses a fine obstetric museum. The hospital for sick children in the Rue de Sèvres contains over 650 beds. The Trousseau, founded in 1660, is also devoted to children.

Prisons.—The Dépôt is a temporary lock-up at the prefecture of police, where prisoners are first sent when arrested. Mazas is filled chiefly with prisoners awaiting trial. The Conciergerie is the most famous, politically and historically. There Marie Antoinette passed the last days of her life, and was succeeded by Danton, Mme. Roland, Camille Desmoulins, Robespierre, etc. In Sept., 1792, 288 prisoners were murdered there. Georges Cadoudal, during the First Empire, and Prince Napoleon and the Duke of Orleans during the Third Republic, were confined there. The Roquette can accommodate nearly 450 convicts. Those condemned to suffer capital punishment are held here. In the street in front of the central door is the spot where the guillotine is put up. Ste.-Pélagie is the lock-up of journalists and writers who violate the press laws. Béranger, Lamennais, Proudhon, and a host of other French literary celebrities have been confined there. La Santé is another of the large prisons. St.-Lazare receives only women; during the Convention it was used as a political prison.

Government and Administration.—The city is divided into twenty *arrondissements*, each of which is subdivided into four quarters. Each of the latter elects, by universal suffrage, a member of the municipal council. The functionaries of the *arrondissement* are a mayor and three deputies, nominated by the prefect, or governor, of the department of the Seine, who act as registrars and take charge of the poor relief, and a justice of the peace nominated by the Government. The municipal council discusses and votes upon the budget of the city. The prefect of the Seine and the prefect of police, both government officials, represent the executive central authority as opposed to the municipal council. The prefecture of the Seine comprises a departmental service and a municipal service, the latter much the more important. Elections, taxes, the municipal debt, city schools, public lands, markets, cemeteries, etc., are under the control of the prefecture of the Seine. The prefecture of police includes the whole department of the Seine and part of Seine-et-Oise. It consists of three sections, the political police, the police of public safety, and the administrative police; but the two former are rather national than municipal.

Markets.—Wholesale trade in foodstuffs is carried on in the central markets—Les Halles. These comprise ten pavilions of glass and iron, each about half an acre in size, and separated from each other by covered streets. Butcher's meat is also sold in the market attached to the La Villette abattoir. The Chemin de Fer de Ceinture brings the cattle-trucks into this market, which, with the abattoirs, extends over an area of 111 acres. The places of sale are capable of holding 4,600 horned cattle, 4,000 calves, 22,000 sheep, and 7,000 pigs. Close to Les Halles is the corn-market; but the greater part of the grain arriving in Paris does not pass through this building; it is either stored at the stations or taken directly to the warehouses or the bakers. There are three great markets for wine and spirits at Bercy, Quai St.-Bernard and Pont de Flandre. There are also important markets for skins and hides, horses, charcoal, etc. The curious Marché du Temple, rebuilt in 1864, is devoted to the sale of second-hand articles of all kinds.

Water-supply and Drainage.—Paris derives its water-supply chiefly from (1) the Seine, whose water is pumped up and stored in reservoirs at the highest points in Passy, Montmartre, Charonne, and Gentilly. (2) The Marne, a loop of which, closed by a canal at St.-Maur, supplies several districts by means of the head of water and the application of steam-pressure. (3) The Ourcq Canal, also used as a waterway, which comes from the department of Aisne and terminates at the La Villette basin. (4) The Dhuis and the Vanne, two streams of La Champagne. The former is diverted near Château-Thierry and conveyed by an aqueduct 81 miles long to the Ménilmontant reservoirs. The aqueduct from the Vanne ends in reservoirs at Montrouge. (5) The Aure, a tributary of the Eure. The water is diverted near the junction with the Vigne and brought by an aqueduct 63 miles long, by turns under and above the ground, to the Montretout reservoirs at St.-Cloud (opened Mar. 30, 1893). The last is calculated to have raised the daily water supply from 150,000 to 270,000 cubic metres, so that Seine water is no longer used for drinking purposes.

The drainage on both sides of the river is collected in a great sewer terminating in the Seine at Clichy. The two main sewers on both sides are connected by a siphon which passes under the Seine by a tunnel near the Pont de l'Alma. A departmental sewer receiving the drainage of the higher districts on the north side ends at St.-Denis. The sewers in

general are also used as passages for water-pipes, gas-pipes, telegraph wires and pneumatic tubes. (See PNEUMATIC TRANSMISSION.) The largest class have a height of 17½ feet at the keystone and a width of 17 feet at the spring of the arch.

Financial Institutions. After the Bank of France (see BANK) the chief financial establishments are the Caisse des Dépôts et des Consignations, which receives voluntary deposits and those obligatory in cases fixed by law; the Crédit Foncier de France, which makes advances on real estate; and the Comptoir National d'Escompte. There are also numerous private joint-stock banks. The Bourse is open from noon to 3 P. M. for dealings in stocks and shares, and from 3 P. M. to 6 P. M. for commercial transactions. The former are effected by means of *agents de change*, named by ministerial decree and possessing nominally the exclusive right to act as brokers; but a large business is done by the unauthorized brokers called *coulissiers*.

Manufactures and Commerce.—In proportion to its population Paris can not be regarded as pre-eminently a manufacturing or commercial city. It contains a great number of officials, on account of the highly centralized government of France. It is a great financial center; and as it offers a variety of attractions appealing to the appetites, the senses, the æsthetic feeling, and the intellect, it is the residence of wealthy men from all parts of the world, as well as of numerous authors, artists, and scientific men. The chief industries are the production of articles not depending upon the cost of material, but upon the skill and taste of intelligent workmen, such as bronzes, jewelry, decorative furniture, and *articles de Paris*. The publishing business of France has been almost monopolized by Paris, and has reached a very high state of development, especially in the production of engravings and illustrated books. The larger manufacturing establishments include engineering works, chiefly in connection with the railways, foundries, and sugar-refineries. Among Government works are two tobacco-factories, the national printing establishment, the mint, and the Gobelins tapestry-factory and dye-works. Next come the chemical-factories, printing-offices, cabinet-makers' workshops, tailoring establishments, and hat-factories. Several plans have been discussed with the object of making Paris a seaport in the modern sense, and it has at length been decided to open up the port by the canalization of the Seine. In 1891 the plans were completed, the final estimates being: length of canal, 112 miles; depth, 20½ feet; cost, \$27,000,000. The goods arriving by the Seine are chiefly building materials, timber, grain, coal, coke, charcoal, and wines; building materials and flour are brought by the Canal de l'Oureq, and coal and coke from the north of France, Belgium, and England by the Canal St.-Denis. By the Seine, Paris dispatches manure, pyrites, and refined sugars. To the traffic of the river should be added that of the canals, especially of La Villette, on the Canals St.-Denis and Oureq, which is the third port in France, measured by its traffic.

History.—The generally accepted opinion is that the city was primitively one of those many fishing villages which the early Gauls established on the islets scattered along the course of the Seine, for the heart of the city is even to-day known as the Île de la Cité and the Île St.-Louis. The first historic mention of Paris and its inhabitants occurs in the year 52 B. C., when Cæsar says in his *Commentaries*, book vii.: "Labienus leaves for Lutetia with four legions. This is the fortress of the Parisii, situated on an island in the river Seine." At the end of the fourth century Lutetia, *Lutèce* in French, had become the seat of a bishop and was called Paris, from the name of the little nation whose capital it was. The Roman emperor Constantius Chlorus is said to have fixed his residence there (292-306), and Julian was there proclaimed emperor by his soldiers (360). In 506 Paris became the residence of Clovis, and later Charlemagne sometimes visited it, though in his time it ceased to be the capital. The growing town suffered from the devastations of the Normans. In 885-886 30,000 of them encamped in front of the Île de la Cité, which was besieged, but in vain, during thirteen months. "By this heroic siege," says the French historian Henri Martin, "Paris took the first step toward its grand destiny; thenceforth it was the head and heart of France." In 987 Hugh Capet, the first of the dynasty, made Paris the capital of his kingdom, and his successors resided there. During the reign of Philip Augustus (1180-1223) the city's growth was great. The streets were then first paved with stone, the two wooden bridges which connected the Île de la Cité with the mainland were rebuilt in stone, three colleges were founded, and

soon 20,000 students flocked to the city from all parts of France and foreign countries. This was the foundation of the university, which did much to increase the population and importance of the city. Under Louis IX. (1215-70) was founded a theological college, which became the celebrated Sorbonne. Philip the Fair added greatly to the importance of the city by making it the seat of the highest court in the kingdom—the *Parlement*, which he organized in the opening years of the fourteenth century. During the reign of Charles IX. (1560-74) religious and civil wars checked the development of the city, and Henry III. in the closing years of his reign found himself excluded from his own capital, which fell completely under the control of the League. Both he and his successor, Henry IV., were obliged to lay siege to it, the second siege lasting four years, and bringing terrible sufferings upon the inhabitants (1590-94). During the minority of Louis XIV. the city sustained another siege, and suffered from frequent riots in the streets. (See FRONDE.) During the reign of Louis XIV. (1643-1715) the streets began to be lighted at night with lanterns containing candles, but only when there was no moon. Colbert was put in charge of public works, and he effected great improvements. He was ably seconded by Perrault and Mansart, the architects, and by the great sculptors and painters of the age. The centralizing policy of Louis XIV. and his opposition to the residence of the nobility on their estates drew to Paris the most brilliant and distinguished men of France. From his time the history of the city becomes in a sense the history of France, and for an account of the principal events see that title. Paris suffered severely from the excesses of the Revolution, whose worst crimes were committed within its limits. It was the scene of the Revolutions of 1830 and 1848, and it suffered from siege in the FRANCO-GERMAN WAR (q. v.) and from the violence of the Commune. See COMMUNE OF PARIS and FRANCE, HISTORY OF.

BIBLIOGRAPHY.—Among the vast number of works on Paris only a few of the modern ones can be mentioned. See Baedeker's and Murray's guides; Dickens's *Dictionary of Paris*; the official *Annuaire Statistique; Guide de Paris par les principaux écrivains et artistes de la France* (1867-68); A. Joanne, *Paris illustré* (1881); Philip G. Hamerton, *Paris in Old and Present Times* (1884); *Histoire Générale de la ville de Paris*, published by the municipality since 1866; Lacombe, *Bibliographie de Paris* (1886).

THEODORE STANTON.

Paris: a port of entry of Brant co., Ontario, Canada; on the Grand river; at the junction of two branches of the Grand Trunk Railway; 61 miles S. W. of Toronto (see map of Ontario, ref. 5-D). It has valuable beds of gypsum, great water-power, many mills, foundries, knitting-works, and other industries, and two weekly newspapers. Pop. (1891) 3,094.

Paris: city; capital of Edgar co., Ill. (for location, see map of Illinois, ref. 7-G); on the Cleve., Cin., Chi. and St. L. and the Vandalia line railways; 170 miles S. of Chicago, 200 miles E. of St. Louis. It is the center of a rich agricultural region, and is an important grain, produce, and stock market. There are 2 national banks with combined capital of \$208,000, a private bank, a new court-house, and a monthly, 3 daily, and 4 weekly periodicals. Pop. (1880) 4,373; (1890) 4,996.

EDITOR OF "BEACON."

Paris: city; capital of Bourbon co., Ky.; on Stoner creek, and the Louisv. and Nashv. and the Ky. Midland railways; 19 miles N. E. of Lexington, 80 miles S. by E. of Covington (for location, see map of Kentucky, ref. 3-I). It is the principal place of manufacture of Bourbon whisky, has large live-stock and tobacco interests, and contains five State banks with combined capital of \$800,000, several classical and female institutes, and a semi-weekly and a weekly newspaper. Pop. (1880) 3,204; (1890) 4,218.

Paris: city (founded in 1823); capital of Henry co., Tenn. (for location, see map of Tennessee, ref. 6-C); on the Louisv. and Nashv. and the Paducah, Tenn. and Ala. railways; 110 miles W. of Nashville, 130 miles N. E. of Memphis. It is in a wheat and tobacco growing region, and contains 5 churches, high school, university training-school, public school for colored youth, 2 cotton-factories, 2 grist-mills, a roller-mill, 2 tobacco-factories, a pottery, a barrel-factory, headquarters of the Henry County Fair and Trotting-horse Association, and 2 weekly newspapers. Pop. (1880) 1,767; (1890) 1,917; (1894) estimated, 3,000.

EDITOR OF "POST-INTELLIGENCER."

Paris: city; capital of Lamar co., Tex. (for location, see map of Texas, ref. 2-5); on the Gulf, Col. and S. F. R. R., the St. L. and San Fran., and the Tex. and Pac. railways; 15 miles S. of the Red river, 64 miles E. of Sherman. It is in a wheat and cotton growing region and is the trade center of a large territory. There are 15 churches, 3 public-school buildings, public-school property valued at over \$65,000, the North Texas University, 4 banks, cottonseed-oil mill, canning-factory, and 2 daily and 2 weekly newspapers. Pop. (1880) 3,980; (1890) 8,254. Editor of "News."

Par'is, or Alexander (in Gr. Πάρις, 'Αλέξανδρος): a son of Priam, the King of Troy, and Hecuba. He carried off Helen, the wife of Menelaus, King of Sparta, thereby bringing on the war between the Greeks and Trojans. By Homer he is described as shrewd, but cowardly; in art he is represented as a youthful and handsome man, though somewhat effeminate in appearance. Being wounded during the siege by a poisoned arrow, he died before the capture of the city. For Paris in art, see the article *Paris und Parisurtheil* in Baummeister's *Denkmäler*; Overbeck, *Die Bildwerke zum Theibischen und Troischen Heldenkreis* (Stuttgart, 1857), pp. 206-263. J. R. S. STERRETT.

Paris, ALEXIS PAULIN: French author; b. at Avenay, Marne, France, Mar. 25, 1800; studied at the *lycée* at Reims and afterward in Paris, where he began the study of law, but soon devoted himself to literature and history, and became distinguished for his knowledge of mediæval French literature. He became connected with the great library, now the Bibliothèque Nationale, in 1828, and was attached to the department of manuscripts in it. In 1837 he was made a member of the Académie des Inscriptions et Belles-Lettres. He was Professor of the French Language and Literature at the Collège de France from 1853 to 1872, when he retired with the title of honorary professor, leaving at the same time his position at the Bibliothèque Nationale. His writings deal mostly with the mediæval literature of France, including text editions, modernizations, and studies, but are not limited to that field. Among them are *Apologie de l'école romantique* (1826); a translation of Byron's *Don Juan* (1827); *Li romans de Boite aus grans piés* (1832); *Li romans de Garin le Loherain*, 1833 (the same *en nouveau langage*, etc., 1862); *Le romancero français* (1833); *Les grandes chroniques de France* (6 vols., 1836-38); *De la conquête de Constantinople par Joffroi de Villehardouin et Henri de Valenciennes* (1838); *Les manuscrits français de la bibliothèque du roi* (7 vols., 1836-48); *La chanson d'Antioche* (1848); *Les aventures de Maître Renart*, etc. (1861); *Les romans de la Table Ronde mis en nouveau langage* (5 vols., 1868-77); *Étude sur François I.*, etc. (2 vols., 1885); further a large part of the contents of vols. xx.-xxiii., xxv.-xxviii. of the *Histoire littéraire de la France*, notably the articles on the *Chansons de geste* in vols. xxii., xxv., xxvi. D. in Paris, Feb. 13, 1881. E. S. SHELDON.

Paris, GASTON BRUNO PAULIN: philologist; b. at Avenay, France, Aug. 9, 1839. Graduating at the Collège Rollin, he studied Romance philology at Göttingen and Bonn. Returning to Paris, he became in 1865 instructor in Romance languages in the École Pratique des Hautes Études, and in 1866 and 1869 lectured at the Collège de France in place of his father, Paulin Paris (1800-81), whom he succeeded in 1872. He was an untiring contributor to the early history of French language and literature, and the flourishing young school of Romance philologists in France is largely due to his influence and composed of his pupils. He was one of the founders of the *Revue Critique* (1865) and of the *Romania* (1872), which he continues to direct, and in which many of his studies have appeared. Among his more considerable works are: *Étude sur le rôle de l'accent latin dans la langue française* (1862); *Histoire poétique de Charlemagne* (1866); *Les contes orientaux dans la littérature française du moyen âge* (1875); *La vie de saint Alexis* (1872); *La Poésie du moyen âge* (1885); *La Littérature française du moyen âge* (1888). A. G. CANFIELD.

Paris, par'is, JOHN AYRTON, M. D., D. C. L.: therapeutist; b. at Cambridge, England, Aug. 7, 1785; graduated in medicine at Cambridge University 1808; resided some time in London, and several years at Penzance, Cornwall, where he founded the Royal Geological Society of Cornwall; returned to London 1817; lectured on *materia medica* and the philosophy of medicine at the Royal College of Physicians, of which body he was president from 1854 until his death; invented the tamping-bar, an implement coated with copper for the protection of miners from the perils

caused by the sparks emitted from iron bars; published, among other works, a *Memoir of Sir H. Davy* (1810); *Pharmacology, or the History of Medical Science* (1819); *A Treatise on Diet* (1826); *Philosophy in Spoken and Science in Earnest* (3 vols., 1827); *Elements of Medical Chemistry* (1833); and *Medical Jurisprudence* (3 vols., 1823), in which he was aided by J. S. M. Fonblanque. D. Dec. 24, 1856.

Revised by S. T. ARMSTRONG.

Paris, par'ree', LOUIS PHILIPPE ALBERT D'ORLÉANS, Comte de; claimant to the French throne; son of the Duc d'Orléans and grandson of King Louis Philippe; b. in Paris, Aug. 24, 1838; appeared with his mother in the French Chamber of Deputies in the Revolution of 1848, but his claims to the throne were not recognized, and he was taken to England and lived at Claremont, where he received his education. After traveling in Greece, Egypt, and the East, the prince and his brother, the Duc de Chartres, accompanied their uncle, the Prince de Joinville, to the U. S., Aug., 1861, and offering their services to the Federal Government, were attached to the personal staff of Gen. McClellan with rank of captain, but free at any moment to relinquish the service and return to Europe. They remained with the army for several months, serving with bravery and efficiency, especially in the battle of Gaines's Mill. In 1864 the count married his cousin, the Princess Isabella, eldest daughter of the Duc de Montpensier. In 1871 he was admitted as a member of the National Assembly, and in the following year that body voted the restitution of the property of his family. In 1873 he acknowledged the Comte de Chambord as the head of the royal house of France, but after the latter's death in 1883 the Comte de Paris united in his person the claims of both branches of the Bourbons, and was accepted by most of the legitimists as the successor of Chambord. He was again forced to leave France in 1886, in consequence of the Expulsion Act, which forbade the heirs of former reigning families to live in France. After this he lived in England, and in spite of occasional manifestoes calling upon his compatriots to restore the monarchy he did not receive a large share of public notice till 1890, when the escapade of his son, the Duc d'Orléans, who tried to enlist in the French army in violation of the law of exile, caused considerable excitement among the royalists, and revived for a time the popular interest in their cause. D. in Stowe House, Buckinghamshire, England, Sept. 8, 1894. The Comte de Paris won some fame as a writer, especially by his *Histoire de la guerre civile en Amérique* (1874-89). He also wrote *Situations des ouvriers en Angleterre*, and various articles in periodicals.

Paris, MATTHEW OF: See MATTHEW OF PARIS.

Paris, Declaration of: See DECLARATION OF PARIS.

Paris Green: See SCHWEINFURTH GREEN AND INSECTICIDES.

Paris, Plaster-of: See GYPSUM.

Paris Yellow: See CHROMIUM.

Park: in the usual sense of the term, a considerable extent of ground laid out and maintained as a public pleasure-ground. In the course of its development first comes the glade and meadow with woods and waters where the hunter seeks his game. Inclosed by wall or fence this becomes the *chace*, and is still mainly devoted to the preservation of game. Finally the desire for open-air pleasures felt by the home-dweller asserts itself, and walks and resting-places are made for the quiet enjoyment of outdoor features. In this way at last came the gentleman's country-place of to-day. Notwithstanding this increasing desire for the peaceful enjoyment of woods and waters, paths and resting-places, there still remained the green or common. This continued to exist, but beside it grew up the park modeled on the gentleman's country-place, and comprising certain other features, such as roads and open spaces, required for public use.

History.—The Egyptians doubtless had parks earlier than the earliest records on their monuments. Their parks were formal, rectangular, little more than promenades full of architectural features, colonnades, and sculptured objects of diverse form and significance. Parks to them meant little more than a cluster of gardens. In the mountainous regions of Assyria glimpses of the modern idea of a park began to appear. Idealized conceptions of the mountain idea have been ascribed to the "hanging gardens of Nebuchadnezzar," and the paradises of the Assyrian Semiramis and the later Persians with wild animals and birds, trees and flowers, approached still nearer the park of modern Europe.

The Greeks derived much of their science and art from Egypt, and their landscape architecture apparently came in large part from the same source. There is little evidence that they comprehended the true park idea in design. The Romans, however, developed a great love for parks, and Rome became in the time of the Cæsars one great pleasure-ground. Lanciani says that there were at this time eight campi or commons for foot-races and thirty parks or gardens belonging to the city. The largest common was the Campus Martius, a vast level space with buildings, playgrounds, and water-works on an extraordinary scale, surrounded by miles of sumptuous colonnaded porticoes inclosing beautiful gardens. The Golden House of Nero included miles of gardens in the very heart of Rome. In every direction the architectural masses were broken and enframed by the green of gardens and parks, while the water was used in canals, fountain-basins, and cascades to an extent unknown before or since.

During the Middle Ages little attention was paid to gardening as an art. (See LANDSCAPE-GARDENING.) In the days of the Renaissance, however, the taste for public works of this sort gradually increased, and in France during the reign of Louis XIV. the great parks and gardens by Le Nôtre and others appeared, and the kings of Spain, Germany, and Poland sought to signalize their reigns in the same manner. Paris and two or three other great cities remained for a long time the only seats of these public enterprises.

In the nineteenth century, as a consequence of the revival among poets and painters of a love for natural effects, public parks have sprung up all over Europe and North America.

Different Styles of Park-making.—The different styles of park-making have been divided into the regular, mixed, and irregular or natural. The division is arbitrary, and in some of the finest public parks the different styles mingle. There is a quality about the formal style that suits it to the immediate surroundings of great public buildings like those of Paris or Rome. The mixed style enables the designer to preserve valuable formal features, such as ruins, straight promenades, and regularly laid-out flower-gardens. This system has been adopted in many of the parks of Europe. The natural style lends itself better to all the requirements of a public park than any other. The essentials of a public park, whether regular or irregular and natural, are public ways laid out in conjunction with greensward and planted with shade trees. Climate, topography, and surroundings must determine which style is to be used, and if both styles are employed the one should be isolated from the other and one predominant character given to the entire park. A ruin, a formal old-fashioned flower-garden, a system of gay parterres and regular walks, may all be retained, but they must be masked and isolated by trees and shrubbery.

The keynote of the composition of natural park landscape is peace and restfulness, the pastoral idea. Meadows, hedges, shaded lanes are the types for the study of the park-maker. There should be as much open meadow, with bordering shrub and tree plantation, as possible, and the rugged effects of rock and hillside should be toned down to the semblance of somewhat cultivated or not unkempt mountain scenery. All violent contrasts of form and coloring are to be carefully avoided in the composition of the general mass of natural park landscape as well as in the arrangement of the smallest details.

The Selection of Park Lands.—A level site or a slightly undulating one is preferable to one that is hilly or rocky, and great variety of effect may be secured on the level site by means of planting and other landscape-gardening devices. Among hills, ravines, and rocks, drainage and roads are difficult to design and construct, and the open lawn effect characteristic of the true park idea may be almost impossible of attainment. An excellent selection of park lands has been made in the Prince's Street Gardens site in Edinburgh. Here a steep hillside slopes down from the castle to a valley that borders on Prince's Street. It is not a large territory, but gains greatly in its appearance of size from the hollowing contour lines of its valley and the picturesque and artistic disposition of its shrubbery and trees. Wherever rough land is selected for a park its peculiar features should be intensified rather than obliterated.

The Making of a Park.—In the preparation of the plan of a park various landscape pictures must be secured by the arrangement of plantations and other devices, and at the same time the necessary convenience of the public must be

considered. There must be also unity of idea governing the entire design. In the execution of the plan a landscape architect, a constructing engineer, and a superintendent of labor are needed to carry it out on the ground. The landscape architect or park-maker should control the execution of the plan, and decide whether the lines are laid out correctly and what changes should be made. No map can be worked out so precisely on paper as to prevent the necessity of frequent changes that have been indicated by the experience of actual execution.

Drainage, grades, road and building construction, and all engineering problems should be under the control of the engineer of construction, but on the superintendent of labor, more than on any one else, depends the successful execution of the architect's plans. The offices of landscape architect and constructing engineer can be hardly held successfully by the same person, for the reason that the engineer is trained to use mathematical straight lines or segments of a circle, while the landscape architect, except in strictly formal designs, never uses them; but one person may serve well as both landscape architect and superintendent. It is also important that the landscape architect should continue to control the execution of the design until, after years, it has reached its full development.

Walks.—Primarily, parks should be laid out with special reference to the needs of the pedestrian who seeks open air, skies, stretches of greensward, and shady trees. The walks should never run parallel with anything, or be of uniform width, unless the entire design is strictly formal. They should run above or below the road or lawn they border, and should widen or narrow as the designer sees fit. In no case should they run nearer the road than 10 feet, that space being needed for trees and groups of shrubs. They should be constructed with broken-stone foundation and covered with asphalt or cement for comfort, and with gravel if the most harmonious effect be desired.

Roads.—Roads should be laid out with a view of reaching the landscapes and other attractive features of the park. The masses of the park, the open meadows, and large groves should be determined by the course of the roads. Sometimes, as in Central Park, New York, the arrangement of a road that comes in at a corner and bends off diagonally increases the apparent size of the park greatly, or, in the case of the English Garden at Berlin, a narrow park will have its roads forced close together to the diminution of the apparent size of the park. This has been overcome in the English Garden by skillfully devised masking plantations. Park roads should be laid out on long and easy curves for the safety of the driving public and to avoid abruptness, and should be built 45 to 50 feet wide. A greater width tends to dwarf the lawns and diminish the appearance of breadth throughout the park. All roads should have a foundation of a foot or more of broken stone and a surface of gravel or fine broken stone, and should be bordered with low graded edgings of turf.

Lawns.—A bit of greensward is the most essential and characteristic feature of a park. The pictorial element of park-making is found to a large extent in the greensward or meadow. Trees and shrubs frame and develop the lawn, and thus serve a purpose more important than the exhibition of their own attractions. The comparatively level line of the meadow inspires a sense of serenity, and produces far-reaching sky effects. No path should traverse the main parts of a meadow, or tree or shrub mar the restfulness of its surface. There should be a recognition of the original topography of the region, a smoothing out and blending of minor inequalities which will leave a play of long lines of slightly undulating surface.

Treatment of Water.—The employment of the level line in park-making may be much extended by designing various water effects, and this is one of the most difficult problems of park-making. An abundant supply of pure water should be always at hand. Natural positions where watercourses or pools already exist are preferred to purely artificial ones. Every landscape feature in park-making should be suggested by actual conditions of the original surface. The charm of water lies chiefly in its broad, level, glass-like reflecting surface, and in the play of ripples, but of almost equal importance is the picturesque treatment of the shore by means of small promontories, bays, creeks, inlets, and islets. By this means the whole extent of the water is not seen at once, and the sense of size and distance is greatly increased. Rustic buildings, rocks, or some fine tree or bush may also be so arranged as to be reflected in the water, and seats

may be placed that will command the best views. The most attractive reflections are those of water-plants, lilies, lotuses, flags, and rushes. Grass should be encouraged to grow to the surface of the water, except where an actual beach has been constructed. Drooping trees and shrubs should also be permitted to dip their branches in the water.

Employment of Rocks in Parks.—A desire for natural effects in park-making leads to the employment of groups of rocks at certain points, but they should be used only where neighboring rocks create a reason for their presence. They should peep out of the earth on some curved surface or mound and along the borders of walks and steps and pools and streams of water. They should have rounded or weather-beaten surfaces, and should be so buried as to give no adequate conception of their size. Rocks should not be planted irregularly in a mass, to support a bank of earth. The bank should be, if possible, so graded as to support itself, and a regular dry wall of stone should be constructed if this is not possible.

Park Plantations.—Shade trees are the most important park plantations. Along all drives and walks shade trees should be set at intervals of 50 or 60 feet. The masking plantations of the park, the framework that with the greensward produces the vistas and landscape pictures, should be made up of a series of groups of trees and shrubs. There should be groves of trees and entire groups of low shrubs, but both trees and shrubs should be skirted by a border of drooping bushes. Outlying specimens of both trees and shrubs may stand on the flanks of the main shrub group. The sky-line of these groups should be waving with emphatic points, and the outlines of the base should be varied into bays and points of foliage. Groups and single specimens of trees and shrubs planted near them should be disposed around the lawns and down the hillsides and along the water-courses, so as to secure the greatest possible apparent length of vista and breadth of greensward, and at the same time most surprising, varied, and mysterious effects.

Plantations of trees and shrubs should mask all roads and paths as far as the opening of vistas and broad stretches of greensward will permit. It is important especially that they should mask completely the junction of different roads and paths. The sense of variety, surprise, and mystery, and the rural effect are thereby greatly increased.

Trees and shrubs may be used effectively at the top of steep hills, where the presence of such trees as the Lombardy poplar and the birch tend to intensify the suggestion of mountain scenery. A few of the trees valuable for shade and mixed groups are the American elm, the sugar, Norway, and scarlet maple, the linden, the tulip, poplar, the honey locust, the horse-chestnut, the birch and the beech, and the white-oak and pin-oak. Vigorous hardy shrubs are *Spiræa opulifolia*, privet, snowball, viburnum, mock-orange, bush honeysuckle (*Lonicera fragrantissima*), golden bell (*Forsythia*), weigela, red-twigged dogwood (*Cornus sanguinea*), *Rhodotypus kerrioides*, Japan quince (*Cydonia japonica*), *Spiræa thunbergii*, and *Berberis thunbergii*. The best coniferous evergreen trees are the white pine (*Pinus strobus*), blue Colorado spruce (*Abies pungens*), Mugho pine (*Pinus mughus*), hemlock (*Abies canadensis*), atlas cedar (*Cedrus atlantica*), Nordman fir (*Abies nordmanniana*), Japan yew (*Taxus cuspidata*), and Japanese cypress (*Chamaecyparis obtusa*).

Good broad-leaved evergreens are the American laurel (*Kalmia latifolia*), the rhododendron, the Japanese azalea (*Azalea amœna*), and the tree-box (*Buxus arborescens*). Overcrowding these trees and shrubs should be carefully avoided. The large-growing trees, such as the elm or maple, should all be planted 50 feet apart, and the smaller 25 feet. Large shrubs, such as privet, should be 10 feet apart, and smaller ones, as the Japan quince, 6 to 8 feet; even the smallest should be allowed from 3 to 4 feet.

Along the borders of many shrub groups and rocky places should be planted hardy herbaceous plants, i. e. perennials, or wild flowers, such as larkspurs, daisies, phloxes, asters, sedums, irises. These perennials should stray out over the turf in irregular belts, and should constitute an intermediate gradation between the lower-sized shrubs and the grass.

Bedding-plants, cannas, coleuses, geraniums, etc., should be planted as a framework around buildings and other architectural structures in the park, and nowhere else. Their treatment must be somewhat formal and should be considered as an ornamentation of the building and not an integral part of the park itself; but since the outer portions of these beds must connect with the grass and make a part of

the lawn, the same principles of design should apply to them as to the tree and shrub group.

Generally high plants should be in the middle or at the back, and low plants in front or on the borders, but this rule should be frequently broken in the interest of true art by thrusting high plants directly over the border-line, and in the case of single specimens by setting them outside near points of the bed in the greensward.

The outline of the border, like that of shrub groups, should be wavering, running in and out in promontories and smooth slopes and bays, and the curves should never be segments of a circle. Form combinations of the most artistic design can be thus contrived, and the blending and the contrast of both form and color made more subtle and brilliant than any carpet bed plants where the contrasts of color are nearly always strong and not artistic and the form flat and ill proportioned.

Plants suitable for bedding are musas, cannas, achalyphas, geraniums, begonias, coleuses, alternantheras, salvias, bouvardias, castor-oil plants, solanums, and achyranthus and periwinkles. Groups of lilies, lotuses, and other water plants should be treated in the same artistic way.

Climbing vines should be used over rocks, banks, walls, bridges, and buildings. Wherever they appear they add to the variety and picturesqueness of the landscape. Useful vines are the honeysuckle, Virginia creeper, Japan ivy (*Ampelopsis tricuspidata*), clematis, Dutchman's pipe (*Aristolochia siphon*), wistaria, trumpet creeper, climbing rose, and akebia.

Architectural Structures.—All architectural structures in a park should be of simple, unobtrusive design and thoroughly masked by trees, shrubs, and vines. No statues should be allowed in a rural park, except at the entrances and adjoining buildings. Stone bridges should be rough-faced and rustic in character, with as small amount of wall effect as possible. Bridges over walks and roads for the safety of the public should not be multiplied to the detriment of the general rural effect of the park. All entrances to bridges should be masked by planting. Stone steps should be made of rough-faced blue or neutral-tinted stone, and the borders protected by narrow strips or curbs of the same material. The earth all about the steps should be mounded up until from most directions only slight glimpses of the stonework can be obtained.

On the higher parts a few single rocks may be buried with good effect, provided there are other rocks in the neighborhood. Stone walls suit the outer boundaries of parks better than any other fence. They should be made of neutral-tinted, gray, or brown stone.

Arbors, summer-houses, and seats may be built successfully of knotty and crooked gnarled wood. All bark should be peeled off, and the most durable kinds of material employed, such as locust, red cedar, and sassafras.

Rights of the Public in Parks.—Much confusion often arises as to the rights of the public in parks, and great injury comes in this way from people who wish to secure fair-grounds, grounds for military parades, speeding-tracks, and for shows of all kinds. Parks are for the use of the public, and occupation of ground by one set of people to the exclusion of others is an infringement of personal rights. Games of all kinds may be played on the lawns, provided every one who desires is allowed to take part in them. An exception is made in the case of children, who, it is conceded, should have their ball-ground, swings, merry-go-round, and arbor. Music should be isolated in some spot arranged for the purpose, where the crowds will not mar the restful effect of the remainder of the park.

City Squares and Places.—City squares are hardly recognized as parks in the usual sense of the term. They must be somewhat more formal in effect on account of the proximity of city buildings, but the principles on which they are constructed should be the same as those of the largest parks. The boundaries should be planted with a series of masking trees and shrubs, and as much open lawn secured as the general design will permit. Architectural structures, statues, and fountain-basins find an appropriate home in the small squares of the city. Around these structures brilliant beds of cannas, geraniums, and begonias may be arranged in an effective manner. Children's playgrounds may be also devised after the manner of some Paris parks, by making a special widening of the walk in one of the angles of the territory, and there planting one or more shade trees.

Noted Parks.—Among the best-known parks in the world are the

ent day are Hyde Park (with Kensington Gardens), 598 acres, Regent's Park, 472 acres, Victoria Park, 300, Battersea Park, 250 acres, all in London; Princes Street Gardens, Edinburgh; Phoenix Park, nearly 2,000 acres, Dublin; Central Park, 862 acres, New York; Prospect Park, 515 acres, Brooklyn; Thier Garten, 200 acres, Berlin; the Bois de la Cambre, 124 acres, Brussels; the Garden La Flora, Cologne; the English Garden, 500 acres, Munich; the Prater Gardens, 1,500 acres, Vienna; Paulovsk Park, near St. Petersburg; the Bois de Boulogne, 2,000 acres, and Bois de Vincennes, 2,075 acres, Paris. SAMUEL PARSONS, Jr.

Park, EDWARDS AMASA, D. D., LL. D.: theologian; b. at Providence, R. I., Dec. 29, 1808; graduated at Brown University 1826 and at Andover Seminary 1831; became in 1831 Congregational pastor at Braintree, Mass.; was 1835-36 Professor of Moral and Intellectual Philosophy in Amherst College; held the Bartlet professorship of Sacred Rhetoric in Andover Theological Seminary 1836-47, and in the latter year became Abbot Professor of Sacred Theology in the same institution, resigning in 1881. He was one of the editors and translators of *Selections from German Literature* (1839). In 1869-70 he traveled extensively in Europe and the East; was one of the founders and (1844-83) one of the principal editors of the *Bibliotheca Sacra*; author of *Lives of Hopkins* (1852), *Emmons* (1861), *D. B. Edwards* (1853), and *W. B. Homer* (1849), prefixed respectively to editions of their writings; a *Life of S. H. Taylor*; edition of *Discourses and Treatises on the Atonement* (1859); *Discourses on some Theological Doctrines as related to the Religious Character* (1885); author of numerous published discourses, sermons, essays, etc.; a preacher and theological teacher of great ability. Revised by G. P. FISHER.

Park, MUNGO: traveler; b. at Fowlishiels, Scotland, Sept. 10, 1771; studied surgery at Edinburgh, and was 1792-93 assistant surgeon in India. Under the auspices of the African Association, London, he was the pioneer in the modern exploration of Africa. He journeyed up the Gambia (1795), suffering extreme hardships, and being a prisoner for some time in the hands of a Moorish king. Escaping on July 1, 1796, he reached the upper Niger, the great object of his search, at Segu, and followed the river toward Timbuctoo as far as Silla, where he was compelled to turn back. After seven months' illness and great hardships he reached the mouth of the Gambia, having been nineteen months in the interior. This journey was described in his book *Travels in the Interior of Africa*. The British Government sent him (1805) to descend the Niger from the upper river, and trace its entire course. Most of his party died of fever, and before the Niger was reached only five white men were left out of forty-four. The party set sail down the river, at first in two canoes, but soon built a little schooner, with which they descended the Niger some 1,500 miles, when they were treacherously attacked by a large party of natives, and Park and all his company perished in the attempt to escape by swimming. The journals he sent home and information collected by Clapperton and Lander have given all the facts that are known of his last expedition. Revised by C. C. ADAMS.

Park, ROSWELL, M. D.: surgeon; b. at Pomfret, Conn., May 4, 1852; educated at Racine College and Chicago Medical College; demonstrator and Adjunct Professor of Anatomy, Chicago Medical College, 1877-82; lecturer on surgery, Rush Medical College, 1882-83; Professor of Surgery, Medical Department, University of Buffalo, since 1883; author of *The Mütter Lectures on Surgical Pathology* (1892); of numerous encyclopædia articles and surgical monographs; and one of the joint authors of *An American Text-book of Surgery* (1892). He was editor of the *Chicago Weekly Medical Review*; then of *The Medical Press of Western New York*; and associate editor of the *Annals of Surgery*.

Park City: city; Summit co., Utah; on the Union Pac. and the Utah Cent. railways; 30 miles E. of Salt Lake City, the Territorial capital (for location, see map of Utah, ref. 4-M). It is in a mining region, and contains a valuable silver mine, sampling-works, several quartz-mills, sawmills, a national bank with capital of \$50,000, and a weekly newspaper. Pop. (1880) 1,542; (1890) 2,580; (1895) 4,491.

Parke, JOHN GRUBB: soldier; b. near Coatesville, Pa., Sept. 22, 1827; graduated at the U. S. Military Academy July 1, 1849, when he was appointed brevet second lieutenant, topographical engineers (first lieutenant July, 1856; captain Sept. 9, 1861), being engaged in various surveys in the Western States, as secretary of the lighthouse board,

and for many years as chief astronomer and surveyor in locating the northwestern boundary of the U. S. Appointed brigadier-general of volunteers Nov., 1861, he accompanied Burnside to North Carolina, and commanded at the capture of Fort Macon; promoted to be major-general Aug., 1862, he served as chief of staff of the Ninth Corps in the battles of South Mountain and Antietam, and on Gen. Burnside's succeeding to the command of the Army of the Potomac was retained by the latter as his chief of staff, participating in the battle of Fredericksburg; was in command of the Ninth Corps during its march to Vicksburg, and for a time of the left wing of Gen. Sherman's army; in command of a division of the Ninth Corps on Gen. Burnside's reassuming command, and engaged in Tennessee in siege of Knoxville, etc.; and in Richmond campaign of 1864, again attaining command of the Ninth Corps before Petersburg (Aug., 1864), which he retained till the end of the war. He received the brevets of colonel for gallantry at Jackson, of brigadier-general at Knoxville, and major-general at Fort Streetman, Virginia. Mustered out of volunteer service July, 1866, he resumed the duties of his corps. In 1864 he became a major of the Corps of Engineers, lieutenant-colonel in 1879, and colonel in 1884. During these years he was engaged upon boundary surveys, improvements of rivers and harbors, and works of fortification. From 1868 to 1887 he was senior assistant in the office of the chief of engineers, frequently acting as chief. He became superintendent of U. S. Military Academy July 1, 1887, and was retired from active service at his own request July 2, 1889.

Revised by JAMES MERCUR.

Parker, AMASA JUNIUS, LL. D. (of Hobart College): b. at Sharon, Conn., June 2, 1807; removed in 1816 to Greenville, N. Y., and graduated from Union College in 1825. He held many positions of public and private trust during his life; was a member of the Legislature in 1833; chosen a regent of the university in 1835; in Congress 1837-39; vice-chancellor and circuit judge 1844-47; and (under the new Constitution) judge of the Supreme Court 1847-55. He was one of the founders of the Albany Law School, and for twenty years one of its professors. His chief literary work was the publication of reports of criminal cases (6 vols., 1855-69), work in the preparation of the revised statutes of 1859, and editorial work upon the third edition of Reeve's *Law of Baron and Femme*. D. at Albany, May 13, 1890.

F. STURGES ALLEN.

Parker, EDWIN POND, D. D.: clergyman; b. at Castine, Me., Jan. 13, 1836; graduated at Bowdoin College 1856, and at Bangor Theological Seminary; has been pastor of the South Congregational church in Hartford, Conn., since 1860. Dr. Parker is the author of *Book of Praise*; *Sunday-school Songs*; *Christian Hymnal*; *Memorial of Horace Bushnell*; *The Ministry of Natural Beauty*. He has composed many hymn-tunes and several hymns, which have found acceptance. It was at his ordination that the question of continued probation after death first came into public discussion in the Congregational churches of New England. G. P. FISHER.

Parker, FOXHALL ALEXANDER: commodore; b. in New York city, Aug. 5, 1821; was appointed a midshipman in the navy Mar. 11, 1837; graduated from the Naval School at Philadelphia June 3, 1843; was commissioned lieutenant Sept. 21, 1850; served at the Washington navy-yard as executive officer 1861-62; appointed commander July 16, 1862; commanded the steam gunboat Mahaska (1862-63) in active service off Wilmington and Yorktown; commanded the Wabash off Charleston June to Sept., 1863; commanded the Potomac flotilla from Dec., 1863, until the close of the civil war; was promoted to a captaincy July, 1866; was chief of staff to the North Atlantic fleet 1872; appointed chief signal-officer of the navy July 1, 1873. Published *Fleet Tactics under Steam and Squadron Tactics under Steam* (1863); *The Naval Howitzer Afloat* (1865); and *The Naval Howitzer Ashore* (1866); all of which are text-books at the Naval Academy; also *Elia, or Spain Fifty Years Ago* (translated from the Spanish, 1866). He was one of the founders of the Naval Institute at Annapolis. In Dec., 1874, he was appointed chief of staff of the united fleets under command of Rear-Admiral Case which were assembled for instruction in tactics in the Florida waters; commanded navy-yard, Boston, 1877; superintendent Naval Academy, Annapolis, Md., from 1878 till his death, June 10, 1879.

Parker, HORATIO WILLIAM: composer and organist; b. at Auburndale, Mass., Sept. 15, 1863; studied in Boston and

Munich. His first important composition was the cantata *King Trojan* (1855), produced in Munich. He has also composed *The Kobolds*, a short cantata, and *Hora Nocturna*, a sacred cantata (1892) for the Church Choral Association of New York, besides much other music, sacred and secular. From 1885 to 1893 he was Professor of Music at the Cathedral School of St. Paul, Garden City, L. I., and organist of Holy Trinity church, New York; then became organist of Trinity church, Boston; was elected Professor of the Theory of Music at Yale University in 1894. D. E. HIRSH.

Parker, JOEL, LL. D.: lawyer; b. at Monmouth, N. J., Nov. 24, 1816; graduated at Princeton College in 1839; studied law and was admitted to the bar in 1842; was elected to the State Legislature in 1847; subsequently was county attorney. Upon the breaking out of the civil war he was made major-general of volunteers, and in 1862 was elected Governor of New Jersey for three years, and again elected in 1871. He was an associate justice of the Supreme Court of New Jersey. D. in Philadelphia, Pa., Jan. 2, 1888.

Parker, JOSEPH, D. D.: preacher and author; b. in Hexham, England, Apr. 9, 1830; educated privately and at University College, London; settled at Banbury in 1853; was pastor of Cavendish Chapel (Congregational), Manchester, 1858-69; of Poultry Chapel, London, 1869-93; and is now (1894) in charge of City Temple, High Holborn; visited the U. S. in 1888, and received the degree of D. D. from Chicago University. Author of *Ecce Deus* (1868); *The People's Bible* (vol. i., 1885); and other works, most of which have been reprinted in the U. S. Revised by G. P. FISHER.

Parker, MATTHEW, D. D.: archbishop; b. at Norwich, England, Aug. 6, 1504; educated at Corpus Christi College, Cambridge; took priests' orders 1527, the same year became M. A. and fellow of his college; chaplain to Anne Boleyn 1533; dean of Stoke Clare College, Suffolk, 1535; chaplain to Henry VIII. 1537; prebendary of Ely 1541; master of Corpus Christi College 1544; dean of Lincoln 1552; was deprived by Queen Mary 1553 for having married; appointed Archbishop of Canterbury in 1559 through the influence of Nicholas Bacon and Cecil, for Queen Elizabeth was at that time violently opposed to the marriage of the clergy. The Bishops' Bible was printed at his expense. Later he became an enemy of conventicles and of the non-conforming spirit. He published Anglo-Saxon and other early English chronicles, and collected a valuable library, which he bequeathed to Corpus Christi College, Cambridge. D. May 17, 1575. The Parker Society, named in his honor, published from 1841 to 1855 a series of fifty-five volumes of English ecclesiastical writings of the Elizabethan age.

Parker, PETER, M. D.: missionary and diplomat; b. at Framingham, Mass., June 18, 1804; graduated at Yale College 1831; studied theology and medicine at New Haven; went to Canton, China, as a missionary 1834; established a hospital; had great success both in surgery and medicine, and trained many Chinese students; returned to the U. S. 1840-42; became interpreter and secretary of legation to the American mission in China 1845, retaining charge of the hospital; again visited the U. S. 1855, but went to China the same year as commissioner with power to revise the treaty; finally returned to America in 1857, after which he resided at Washington, D. C.; was a regent of Smithsonian Institution, and filled other honorable scientific posts. D. at Washington, Jan. 10, 1888.

Parker, SAMUEL, D. D.: bishop; b. at Portsmouth, N. H., Aug. 28, 1744; graduated at Harvard 1764; was an instructor for nine years; ordained to the Anglican ministry 1774 by the Bishop of London; until 1779 assistant minister, and then rector, of Trinity church, Boston; conformed the Prayer-book services to the changed condition of civil affairs directly on the receipt in Boston of news of the signing of the Declaration of Independence; was an active promoter of a union between Bishop Seabury and the New England churches, and Bishops White and Provoost and the churches of the Middle and Southern States, which in 1789 united the Episcopal Church in the U. S.; in 1804 consecrated bishop of the Protestant Episcopal Church for the diocese of Massachusetts. D. at Boston, Dec. 6, 1804.

Parker, THEODORE: theological leader; b. at Lexington, Mass., Aug. 24, 1810; was a grandson of Capt. John Parker, who commanded the company of minutemen fired on by British troops at Lexington Apr. 19, 1775; studied Latin, Greek, and mental philosophy while working on the farm or in the tool-shop; taught school at the age of seventeen;

studied at Lexington Academy; entered Harvard College 1830, but did not pursue the regular course, being obliged to carry on his studies at home and teach private classes at Boston and Watertown; became proficient in many languages; entered the Cambridge Divinity School 1834, graduating 1836; was settled at West Roxbury as pastor of the Second (Unitarian) church June, 1837; soon arrived at religious views widely differing from those of conservative Unitarians, and became the leader of a school of theology which rejected as unhistorical many portions of the canonical Scriptures, renounced all belief in the supernatural, and exercised great freedom in the definition of the Christianity which he continued to profess; laid down the principles of his new transcendental system in a series of five lectures delivered at Boston in the autumn of 1841, published under the title *A Discourse of Matters Pertaining to Religion* (1842); followed in the autumn of 1842 by a series of six *Sermons for the Times*; wrote articles in *The Dial*; published a volume of *Critical and Miscellaneous Writings* (1843), and a translation of De Wette's *Introduction to the Old Testament* (2 vols., 1843); spent nearly two years (1843-44) traveling in Europe; returned to Boston in the autumn of 1844, when a controversy grew warm within the Unitarian denomination, arising from the act of several pastors of churches at Boston, who admitted him to their pulpits. As the result, Mr. Parker established an organization at Boston known as the Twenty-eighth Congregational Society (1846), which worshiped at the Melodeon, and subsequently for many years at the Music Hall, where his audiences were large and his teachings embraced a wide scope of subjects; founded and edited for three years the *Massachusetts Quarterly*; was earnestly opposed to the Mexican war, to slavery, and intemperance; was indicted in the U. S. court (June, 1854) for resistance to the Fugitive Slave Law in the case of Anthony Burns, the offense being an address at Faneuil Hall, but was never brought to trial; Jan., 1859, he was prostrated by an attack of bleeding at the lungs; visited the West Indies, where he wrote a small work entitled *Theodore Parker's Experience as a Minister*; proceeded thence to Europe; resided successively in Switzerland and at Rome 1860, obtaining no relief. He died at Florence, Italy, May 10, 1860, and was buried in the Protestant cemetery outside the walls. He bequeathed 13,000 volumes to the Boston Public Library. His complete works were edited by Frances Power Cobbe (12 vols., London, 1863-65) and by H. B. Fuller (10 vols., Boston, 1870); his *Life and Correspondence* was published by Rev. John Weiss (2 vols., New York, 1864); and his *Life* by Rev. O. B. Frothingham (New York, 1874). A French compendium, entitled *Théodore Parker, sa Vie et ses Œuvres* (1865), was prepared by Rev. Albert Réville. This has been translated (London, 1865). See *West Roxbury Sermons* (1892), with an introduction by Rev. S. J. Barrows and a biographical sketch by Frank B. Sanborn. Revised by J. W. CHADWICK.

Parker, WILLARD, M. D., LL. D.: surgeon; b. at Lyndeborough, Hillsborough co., N. H., Sept. 2, 1800; graduated at Harvard 1826; studied medicine and surgery under Prof. John C. Warren; became Professor of Anatomy in the Vermont Medical College, and also in that of Berkshire 1830; Professor of Surgery in the latter institution 1833, and at Cincinnati 1836; spent some time in the hospitals of Paris and London; was for thirty years (1839-69) Professor of Surgery in the New York College of Physicians and Surgeons, after which he exchanged into the chair of Clinical Surgery, which he held for many years. In 1854 he first described and reported cases of what is now known as malignant pustule. Dr. Parker became president of the New York State Inebriate Asylum at Binghamton in 1865; was the first to call attention to the phenomena of concussion of the nerves as distinguished from that of the nerve-centers, formerly erroneously considered identical with a state of inflammation, and made several important discoveries in practical surgery, including the operation of cystotomy for the relief of chronic cystitis, and that for the cure of abscess of the appendix vermiformis. D. in New York city, Apr. 25, 1884.

Parker, WILLIAM KITCHEN, F. R. S., F. Z. S., F. L. S.: anatomist; b. at Dogsthorpe, near Peterborough, England, June 23, 1823; d. July 3, 1890. He was educated at Charing Cross and King's College Hospitals, and from 1873 to 1883 was Hunterian professor at the Royal College of Surgeons, London. His attention was early given to the Foraminifera, concerning which he published about thirty-six

papers, mostly in conjunction with Prof. T. Rupert Jones and Dr. H. B. Brady. He subsequently devoted himself to the study of the vertebrate skeleton, and particularly to the development and morphology of the skull, and on these subjects published about sixty papers, many of them monographic in their character. He was a skilled dissector, an accurate observer, and a good draughtsman. Among Dr. Parker's principal papers are those *On the Osteology and Systematic Position of Balaniceps* (1860); *Palamedes* (1863); *Gallinaceous Birds and Tinamous* (1862-66); published in the *Transactions* of the Zoological Society of London a *Monograph on the Structure and Development of the Shoulder Girdle and Sternum in the Vertebrata* (1868); *The Skull of Batrachia* (1878); *Sturgeon* (1882); *Edentata* (1886); and *Insectivora* (1886), in the *Transactions* of the Royal Society of London. F. A. LUCAS.

Parkersburg: city; capital of Wood co., W. Va. (for location, see map of West Virginia, ref. 6-E); at the confluence of the Ohio and the Little Kanawha rivers; on the Balt. and O., the Balt. and O. S. W., and the Ohio River railways; 96 miles S. by W. of Wheeling. It is in a rich oil and natural-gas region; contains 12 churches, 6 public-school buildings, high school, a seminary, the Academy of the Visitation, U. S. Government building, 4 national banks with combined capital of \$636,000, and a monthly, 2 daily, and 2 weekly periodicals; and has the shops of the Ohio River Railroad, 5 oil-refineries, 5 machine-shops, 3 iron-foundries, 2 boiler-shops, lumber-mills, furniture-factory, and acid-works. The city has a water-system with sufficient pressure to render fire-engines unnecessary. The Ohio river is here crossed by a railway bridge over 1½ miles long, excluding approaches, which cost over \$1,000,000. Pop. (1880) 6,582; (1890) 8,408. The suburbs, really part of the city, have a population of about 4,000.

PROPRIETORS OF "STATE JOURNAL."

Parkes, Sir HARRY SMITH: diplomatist; b. near Walsall, Staffordshire, England, Feb. 28, 1828. Left an orphan in 1833 he became a charge of his kinsman, Rev. Charles Gutzlaff, Chinese missionary and scholar. He was a student-interpreter on the staff of Sir Henry Pottinger in the China war of 1842, served in various grades of the British consular service in the far East, and was commissioner when the British troops occupied Canton. Captured treacherously by the Chinese in 1860 when under a flag of truce, he was thrown into a dungeon and tortured. His indomitable resolution carried him safely through this cruel experience, and finally he was released, most of his companions having meanwhile perished. From 1865 to 1883 he occupied the post of minister at the Japanese court, and was much dreaded by that nation, whose history he helped to mould, his sympathies being entirely with the imperialists. Sir Harry was a diplomatist of the Palmerston school, and very popular with his fellow countrymen; he enjoys the reputation of being the "only foreigner whom the Japanese could not twist round their little finger." He was transferred to Peking in 1883; d. there, Mar. 22, 1885. See his *Life*, by Stanley Lane-Poole (1894). J. M. DIXON.

Parkesburg: borough; Chester co., Pa. (for location, see map of Pennsylvania, ref. 6-I); on the Penn. Railroad; 45 miles W. of Philadelphia. It is in an agricultural region, and contains 5 churches, 6 public schools, an academy, rolling-mill, steam flour and planing mills, and a weekly and a monthly periodical. Pop. (1880) 817; (1890) 1,514.

EDITOR OF "CHESTER COUNTY TIMES."

Parkhurst, CHARLES HENRY, D. D.: clergyman; b. at Framingham, Mass., Apr. 17, 1842; graduated at Amherst 1866; studied theology at Halle (1869-70) and Leipzig (1872-73), in Germany, having meanwhile taught (1870-71) in Wiliston Seminary, Easthampton, Mass.; was settled over the Congregational church in Lenox, Mass., 1874-80; in 1880 became pastor of the Madison Square Presbyterian church in New York city. In 1891 he became president of the Society for the Prevention of Crime, and soon after made the assertion that as the result of his own investigations he could prove that the New York police were the accomplices of the criminal classes, and that the corruption permeated the department of public justice. This led to an investigation by a committee of the State Legislature, a reorganization of the police department, and many reforms. He has published *Forms of the Latin Verb Illustrated by the Sanskrit* (Boston, 1870), and volumes of sermons under the titles *The Blind Man's Creed* (New York, 1883); *The Pattern in the Mount* (1885); and *Three Gates on a Side* (1891).

Parkinson, JOHN, known by the fantastic name of **Paradi'sus in So'le** (Park-in-sun): botanist; b. in London in 1567; was apothecary to James I. and *botanicus regius primarius* to Charles I. Author of *Paradisus Terrestris* (1629-56) and *Theatrum Botanicum* (1640). He is one of the best of the old herbalists, and is commemorated by Plumier's genus *Parkinsonia*, order *Leguminosæ*. The year of his death is not known.

Parkinson-Portescue, CHICHESTER SAMUEL: statesman; b. in 1823; graduated B. A. at Christ Church, Oxford University, in 1844; was elected a Liberal member of Parliament for the county of Louth in 1847; was a Lord of the Treasury 1854-55; Under-Secretary of State for the Colonies 1857-58 and 1859-65; was made Chief Secretary for Ireland Nov. 20, 1865, and again in Dec., 1868, having been sworn a privy counselor in 1864. In Dec., 1868, he was a member of Gladstone's cabinet, and Jan., 1871, president of the Board of Trade. He was created Baron Carlingford 1874: Lord Privy Seal in Gladstone's cabinet 1881-85; Lord President of the Council 1883-85.

Parkman, FRANCIS: historian; b. at Boston, Mass., Sept. 16, 1823; graduated at Harvard College in 1844, and from the Dane Law School in 1846; and in May, 1846, set out on a tour in the far West. The fruit of his travels was *The Oregon Trail*, which appeared in *The Knickerbocker Magazine* in 1847, and was republished in book form in 1849. His first historical work, *The Conspiracy of Pontiac*, appeared in 1851. This was followed by *Vassall Morton*, a novel (1856), published at a time when the author was suffering from a severe chronic disease, which postponed further literary work for several years. His principal work is *France and England in North America*, consisting of the following parts: *Pioneers of France in the New World* (1865); *The Jesuits of North America in the Seventeenth Century* (1867); *La Salle and the Discovery of the Great West* (1869); *The Old Régime in Canada* (1874); *Count Frontenac and New France under Louis XIV.* (1877); *Montcalm and Wolfe* (1884); and *A Half Century of Conflict* (1892). The whole work is one of immense research, perfect candor, and very rare ability. D. at Boston, Nov. 8, 1893.

Revised by F. M. COLBY.

Parley, PETER: See GOODRICH, SAMUEL GRISWOLD.

Parliament [(with spelling adapted to Mediæv. Lat.) from O. Fr. *parlement*, liter., a speaking, deriv. of *parler*, speak]: a deliberative assembly or legislative body. The term is chiefly restricted to the legislatures of Great Britain, the Dominion of Canada, New South Wales, and other British self-governing colonies. The constitution of the colonial governments is treated in the articles on the various colonies; only the British Parliament is discussed here. The origin of parliamentary government in England, like that of many other British institutions, is involved in much obscurity. There can, however, be no doubt that alike in Saxon and Norman times the English people had always some share in making the laws whereby they were governed. The Witenagemote (or assembly of the wise) of the Saxon period, and the Parliament (or free-speaking council), which is traceable both in etymology and function to Norman influence, were at once the outgrowth and the guardians of popular rights and liberties. It is true that the earlier councils and assemblies have left no record of their proceedings, and probably they met at irregular intervals, being in some measure dependent on the caprice or necessities of the monarch. The taxes and crown levies could only be raised through the sanction of the people themselves; and it is one of the oldest as well as one of the most imperishable traditions of British government that there ought to be no taxation without representation. Successive sovereigns after the Conquest (1066) had encroached upon popular prerogative, until, in the reign of King John, the evil culminated in practical absolutism on the part of the crown. The result was a violent recoil and a resolute demand for the restoration of baronial and popular rights, which led to the signing of the Great Charter (*MAGNA CHARTA*, *q. v.*) on the field of Runnymede (1215). The Great Charter contained no new idea touching rights and liberties, every one of its clauses embodying an English tradition. In truth, it was only a revival of the English constitution; and the provision for calling a parliament whenever money was wanted was one of the first principles of ancient English politics. Little is known of the manner in which the pledges of the sovereign were kept for half a century after the signing of *Magna Charta*, but writs are still extant which were issued in the

reign of Henry III. (1265) summoning the knights, citizens, and burgesses to meet in Parliament. The government was even more democratic during the Middle Ages than it subsequently became, for the nobles and commons met in the same chamber, debating and voting promiscuously. Historians have failed to discover the date at which the legislature was separated into two chambers, but the present arrangement was in force during the fifteenth century. Numerous changes, sometimes violent and at other times mild and gradual, have been made in the machinery of British parliamentary government, but certain great principles have survived all these transmutations. Parliament can best be considered under three heads: (I.) its constituents, (II.) its powers, and (III.) its forms.

I. *Of what does Parliament consist?*—The imperial Parliament consists of the monarch, the lords, and the commons. The three estates of the realm are the lords spiritual, the lords temporal, and the commons. The sovereign is the executive authority, and is charged with the duty of enforcing the will of Parliament; but in the matter of legislation the sovereign is no more than a constituent part of Parliament, acting in conjunction with the three estates of the realm. In ordinary times there can be no meeting of Parliament unless the monarch is present at the opening of it, either in person or by commissioners. We say "in ordinary times," for there have been exceptions to this rule. The Convention Parliament which restored Charles II. could not, in the nature of things, satisfy the above condition, but proceeded to do a supreme parliamentary act without any summons or sanction from the sovereign. Though Charles held himself to be king *de jure* before Parliament restored him, still he was sagacious enough not to insist upon his sovereign rights, which at the time a majority of the English people would have questioned. The self-constituted Parliament sat several months after the Restoration, and enacted laws which are still recognized as binding by English tribunals. Lest, however, the authority of this assembly should be questioned by the judges, an act was passed after the return of Charles, and signed by that monarch, confirming all that it had done. Such a precaution was generally held by lawyers to be superfluous, as the convention acted *ex necessitate rei*. Another departure from the rule laid down above occurred in 1688, when the two houses of Parliament met on the summons of the Prince of Orange and proceeded to dispose of the crown itself; but the events of that period constitute, by universal consent, a revolution. At the same time it is worthy of observation that even in disposing of the crown and kingdom by revolutionary force the English people have always kept as close to constitutional tradition as circumstances would permit.

The House of Lords in 1894 was constituted as follows:

<i>Lords Spiritual.</i>	
Archbishops (Canterbury and York).....	2
English bishops.....	24
<i>Lords Temporal.</i>	
Peers of the blood royal.....	6
Dukes.....	22
Marquises.....	22
Earls.....	120
Viscounts.....	26
Barons.....	310
Scotch representative peers.....	16
Irish representative peers.....	28
Total.....	576

Four Irish prelates sat in the House of Lords until 1869, when, under the provisions of the act for disestablishing the Irish Church, they became disqualified to sit. The last consecrated of the twenty-five diocesan English prelates, provided he holds one of the inferior sees, has no seat in the House of Lords, and the same disability applies to suffragan and coadjutor bishops. A bishop is not a peer, but is only a lord of Parliament in virtue of holding an imaginary barony under the Queen. In latter days there has been a steady diminution in the number of marquises, earls, and viscounts, but more than a corresponding increase in the number of barons. The creation of peerages is vested unreservedly in the crown, and it is well known that the House of Lords consented to the passing of the Reform Bill in 1832 because the king had given his consent to the creation of as many new peers as would have served to outvote the opponents of the bill. All peerages are hereditary, the

House of Lords having decided that a life-peer can not, as one of their number, discharge any legislative functions. The question was raised in 1858, when the Queen conferred on Sir James Parke a peerage "for and during the term of his natural life," under the title of Baron Wensleydale. Acting on the report of a committee, the House of Lords decided that it was not competent for him to take his seat in Parliament with such a patent of nobility. The Scottish representative peers are elected for one Parliament, the electors being those Scottish peers whose titles are older than the union of England and Scotland. The Irish representative peers sit for life, and are elected by the whole body of Irish peers, no matter from what period their titles date. The Queen can create only one Irish peerage for every three which become extinct. As there is a feeling that an Irish peer who is not a lord of Parliament is a political anomaly, the House of Lords has requested her Majesty to forego her right to issue patents of nobility of this class, and the Queen has signified her willingness to hold in abeyance that part of her prerogative. Provision was made in 1876 and modified in 1887 for four Lords of Appeal to be appointed for life on account of their eminent judicial attainments, and to sit in judicial cases appealed to the House of Lords.

The House of Commons has varied much in number of members. Under Edward I. there were two representatives for each of 37 counties and 166 boroughs, and under the Stuarts the house numbered usually about 500 members. The Reform Acts of 1832 and 1867-68 made extensive changes in the constituencies, the latter giving England and Wales 493 members, Scotland 60, and Ireland 103. By the Reform Act of 1884 and the Redistribution of Seats Act of 1885 the total number was raised to 670, as follows:

<i>England and Wales.</i>	
Members for counties.....	253
" " boroughs.....	237
" " universities.....	5—495
<i>Scotland.</i>	
Members for counties.....	39
" " boroughs.....	31
" " universities.....	2—72
<i>Ireland.</i>	
Members for counties.....	85
" " boroughs.....	16
" " universities.....	2—103
<i>United Kingdom. Total.....</i>	670

Certain persons are disqualified to become members of Parliament. Minors, lunatics, outlaws, and aliens are excluded; so also are the common-law judges, the clergy of the Established churches of England and Scotland, and Roman Catholic priests; likewise pensioners under the crown during pleasure or for a term of years, contractors with Government, members of the India Council, and peers of Parliament. By the act of 1858 property qualification was abolished. Prior to that date an estate of £600 a year was requisite in England and Ireland to qualify for a county, and £300 a year for a borough, except in the case of the eldest sons of peers and bishops. In Scotland and for the universities no property qualification was ever necessary. A member of the House of Commons can not resign his seat; but if he accept any office of profit under the crown, his seat is vacated *ipso facto*. When a member wishes to be relieved from parliamentary duties, he accepts the stewardship of the CHILTERN HUNDREDS (*q. v.*), or some one of certain other similar sinecures. Being, however, a place of *profit*, it furnishes a convenient back-door for wearied members to make their escape into the retirement of private life. Members of the House of Commons are now elected by secret ballot in all the constituencies of the United Kingdom, with the exception of the universities. No religious test whatsoever is imposed upon members, the only oath taken by them being the oath of allegiance. Previous to 1858, Jews were incapacitated to sit on account of the oath including the words "on the true faith of a Christian."

II. *The Powers of Parliament.*—The House of Lords has two functions, the legislative and the judicial. In legislation it acts in concert with the Queen and the Commons, the assent of all three being necessary to give validity to a bill, which then becomes an act of Parliament. Practically, the law lords alone sit in a judicial capacity, though every peer has a legal right to take part in trying appeals. The crimi-

nal cases which come before the House of Lords are those in which a person is impeached by the Commons, or those in which a true bill has been found by a grand jury against a peer of the realm. Peers can no longer vote by proxy in any case. Every peer, when dissatisfied with a decision of the House, has a right, with leave, to enter a protest on the journals. When sitting in his judicial capacity, he gives judgment on his honor and not on his oath; but when summoned as a witness in any cause, he must be sworn. All bills affecting the rights and privileges of peers must originate with the House of Lords, and they may not be amended, but may be rejected by the Commons. The House of Commons is vested with the right of imposing taxes and voting money for the public service. Until 1867 the Commons decided for themselves all questions touching the election of members, but since that date election petitions are tried by the common-law judges. Both branches of the legislature have certain privileges and powers for the protection of their own dignity, independence, and honor. At the beginning of every Parliament the Speaker of the House of Commons claims for the members, in presence of the Queen or her commissioners, freedom of speech and that the best construction shall be placed on all their words. To publish the debates of the House is a breach of privilege, but this rule has long been disregarded, though peccant publishers may still be summoned to the bar of the House to answer for their contumacy. Strangers are admitted to the House, but are not "seen" by the Speaker. For a long time, whenever a member called the Speaker's attention to the presence of strangers he immediately ordered the sergeant-at-arms to clear the House. During one session of Parliament strangers were thus "espied" in the gallery, the Prince of Wales being one of the number. The Speaker's attention being called to the fact, he had no alternative but to eject all, including the heir to the throne. The incident led to a modification in the rules of procedure, and the law now is, when strangers are "seen," a vote is taken at once, without debate, whether they shall be ordered to withdraw or not. Ladies are not admitted within the House, but a clumsy evasion of this rule is effected by permitting them to sit in a gallery behind a grating, whence they can see and hear without being seen themselves. These regulations, however, are of small account when compared with the vast prerogatives which Parliament claims as a legislature and as the grand inquest of the nation. It makes and unmakes laws, and is, in fact, superior to all human law; for in the constitution of the United Kingdom despotic power lies in Parliament, there being no remedy for that which Parliament does wrong except in the same or another Parliament, summoned by the crown and elected by the people. Any grievance which defies the ordinary remedies of law can be redressed by Parliament. It can determine the succession to the throne, and has done it. It can alter the established religion of the country, and can abolish an established Church altogether, as it has done in the case of Ireland. It can amend its own constitution, and can say how long a Parliament shall last. At present members are elected for seven years, but there was a time when each Parliament lasted only three years. It was a saying of Cecil that "England could only be ruined by a Parliament." That ruin could be brought about if it violated the fundamental maxims of its own constitution. One of these is that the people, whom it professes to represent, can be taxed only with their own consent. By attempting to defy this maxim in the case of the American colonies in the reign of George III, a rupture of the empire was brought about, and English colonies became independent commonwealths.

III. *The Forms of Parliament.*—Parliament assembles on the summons of the sovereign; and although the law provides that not more than an interval of three years shall elapse from the dissolution of one Parliament to the assembling of the next, the practice of voting money for the public service annually has rendered this statute superfluous, as the Government could not be carried on without an annual meeting of the House of Commons. Should the sovereign die between the dissolution of a Parliament and the issuing of writs for a new election, the old Parliament revives, and may continue to sit for a period not exceeding six months. At the beginning of each session the Queen states her reasons for convening the Lords and Commons, and gives an outline of the legislation contemplated by her ministers. This statement is known as "the speech from the throne," and is either delivered personally or by commissioners. Adjournment is decided by each House for it-

self, but prorogation and dissolution are the sole acts of the sovereign. Prior to the reign of William and Mary the sovereign determined the duration of a Parliament. By the triennial act (William and Mary) the duration was limited to three years, and by the septennial act (George I.), still in force, a Parliament expires at the end of seven years. The sovereign, however, usually puts an end to it by dissolution, and does not allow it to expire by efflux of time. When the estimates are laid before the House of Commons, a member may move and carry the reduction of a vote, but no additional grant of public money can be made without a recommendation from the Queen. A member of either House can not be questioned outside of Parliament for anything he has said in his place; but if he afterward publish his speech, he is liable to an action for libelous imputations, and is not protected by the privilege of his position as a member of Parliament. The persons of members are free from arrest in civil causes, but they may be adjudged bankrupts, and their goods are liable to distress on legal process, like those of private citizens. Every bill before it becomes an act must be read three times in each House, and also be reviewed clause by clause in a committee of the whole House or by a select committee. When a bill has passed both Houses, the sovereign's assent is given, usually by commission, the Commons being summoned to the bar of the House of Lords, with the Speaker at their head, to hear the announcement of the Queen's will. In the case of a public bill, the clerk of the Parliament reads its title and pronounces these words: "*La reigne le vult.*" When it is a private bill, the words are, "*Soit fait comme il est désiré.*" There are numerous forms and details touching the election of Speaker, mode of addressing the House, putting the question in the two Houses respectively, divisions, presenting of petitions, right of putting questions to cabinet ministers, conferences of the two Houses, powers of committees, and various other matters of procedure, of which the reader will find ample information in the works enumerated below. The power of the House of Commons has steadily increased during the nineteenth century, and in any serious conflict between the two Houses of Parliament the Lords invariably deem it prudent to give way. The House of Lords frequently rejects bills which have passed the Commons, such as the burial bills, the marriage with a deceased wife's sister bill, and the Home Rule Bill of 1893, but in no case does the upper chamber reject a measure which has obtained the unmistakable approval of the nation at a general election. The will of the people is paramount, in the long run, in all the departments of British legislation, and the friends of freedom desire that it should remain so for the future. The House of Lords acts as a conservative element of great power to prevent precipitate or imperfectly considered action; but, if the opinion of the people is clearly expressed, that opinion at once is decisive.

LITERATURE.—The following works are recommended to the reader as books of reference: *Rules, Orders, and Forms of Proceeding of the House of Commons relating to Public Business* (1874); *History of the House of Commons*, by W. C. Townsend (2 vols.); *How We are Governed*, by A. Fonblanque; *Constitutional History of England*, by Henry Hallam; *A Treatise upon the Law, Privileges, Proceedings, and Usage of Parliament*, by Sir Thomas Erskine May; *Essay on the Practice of the British Government*, by G. F. Leckie; *Essay on British Government*, by Francis Jeffrey; *History of the Anglo-Saxons*, by Sharon Turner; *The English Constitution*, by J. L. de Lolme, William Stubbs, and Thomas Erskine May. Of recent authorities the most important are Creasy, *Rise and Progress of the English Constitution*; Bagehot, *English Constitution*; Todd, *Parliamentary Government in England*; Taswell-Langmead, *English Constitutional History*; Hearn, *Government of England*; Cox, *Institutions of the English Government*; Ewald, *The Crown and its Advisers*; Palgrave, *The House of Commons*; and Gneist's *English Parliament*.

Revised by C. K. ADAMS.

Parliamentary Law: the law governing the proceedings of deliberative assemblies. Among English-speaking people it is derived from the practice of the English Parliament, which gradually solved the problem of how to conduct its proceedings so as to obtain the deliberate sense of the assembly with the least restraint and inconvenience to individual members—the object of all parliamentary rules. In the U. S. the old English parliamentary law has been gradually modified in practice, so as to be better adapted to

the people. New motions have been introduced and others so changed as to preserve only their old name; thus to *reconsider* is purely a new motion designed to counteract partially the evil incident to hasty action; while the previous question has so completely changed that in the U. S. it is demanded by those who intend to vote for it, while in Great Britain it is demanded by those who vote against it. As a result of this growth of parliamentary law there is a certain amount of confusion, the growth being more rapid in certain sections than in others. Thus in certain parts of the U. S. many still hold to the ruling that ordering the previous question cuts off pending amendments and brings the assembly to an immediate vote on the pending resolution. This was once sound parliamentary law, but has long ceased to be, the previous question in the U. S. being now merely a motion to stop debate and proceed to vote on the pending question, even though it be an amendment. The practice is not the same even in the two houses of Congress, motions being allowed in one that are prohibited in the other, and the order of precedence of other motions being different. To avoid confusion, every deliberative assembly should adopt some published work as its authority on all points of parliamentary law not covered by its own special rules. It will generally be found best to supplement the adopted authority by some rules adapted to meet the special wants of each separate organization. A large political convention, a small debating society, and a city council would need different rules to supplement the ordinary parliamentary law. If the U. S. House of Representatives had continued to be essentially a deliberative assembly, like the English House of Commons, with its presiding officer abstaining from partisanship, so as to retain the chair notwithstanding the change in the party in power, then the practice of Congress would determine the parliamentary law of the republic in all matters common to all deliberative bodies; but the lower house of Congress has almost ceased to be a deliberative assembly, placing in the chair the leader of the majority, and allowing him to appoint some sixty committees to whom are referred, without reading, the bills that are presented. Practically, legislation is done by committees, Congress, with few exceptions, merely formally adopting, without any real deliberation, what the committees recommend. As a general rule, however, parliamentary law in the U. S. is based upon the rules and practice of Congress, except where they are evidently not adapted to a *bona fide* deliberative assembly, when recourse must be had to the old common parliamentary law and the best practice of the numerous deliberative assemblies throughout the country. A careful examination of the following outline of parliamentary law as practiced in the U. S. will show that such law is not arbitrary, but is based upon well-defined principles, from which it varies only for good reasons.

Officers.—The necessary officers of a deliberative assembly are a presiding officer or chairman (variously called president, speaker, moderator, etc.), and a recording officer, usually known as secretary or clerk. It is the duty of the chairman to call the assembly to order; preside over the meetings; state every question coming properly before the assembly previous to recognizing a member to speak or make another motion; put to vote the questions before the assembly in their proper order; announce the business before the assembly in its order; enforce the rules; preserve order and decorum in the meeting; and decide all questions of order and practice, subject to an appeal by any two members. The chairman should rarely participate in the debate, as it diminishes the confidence of the assembly in his impartiality. He can vote whenever his vote would affect the result and whenever the vote is by ballot. It is the duty of the secretary to keep a record of the proceedings of the assembly, the extent of which record depends upon circumstances, but it should always include every resolution adopted, and the names of every member of every committee appointed. The official records and other documents of the assembly are in the custody of the secretary, but they are open to inspection by members, and the chairman may even direct certain ones to be turned over to a committee that needs them. The record of the proceedings, which is also known as the minutes of the meeting, should always be signed by the secretary, or, in his absence, by the secretary *pro tem*.

The Resolution or Motion.—Business is usually brought before the assembly originally in the form of a resolution which is offered by a member, who moves its adoption, or that it be agreed to. The question on its adoption is called the main or principal question. A resolution should always

begin with the words "*Resolved, That,*" When it is desired to give a reason for the resolution this reason should be placed in a paragraph preceding the resolution, called the preamble, which should begin with "Whereas" and end with "therefore," or "therefore, be it." The preamble, as well as the resolution proper, is included in the term resolution. Where a resolution can not be well expressed in one sentence, each sentence should be placed in a separate paragraph beginning "*Resolved, That,*" or the paragraphs after the first may begin thus: "1. That," "2. That." In order to offer a resolution it is necessary for the member to rise in his place and address the presiding officer by his proper title, preceded by Mr., if a man, and Madame, Mrs., or Miss, if a woman. The chairman then recognizes him, preferably by announcing his name, but commonly by merely bowing to him; in legislative bodies a member is recognized or referred to as the member from such and such a district. No member is entitled to make a motion or speak until recognized. It is customary to require important motions to be seconded in order to prevent wasting the time of the assembly on questions favored by only one member. It is not necessary to obtain the floor for this purpose, but any member in his seat can say, "I second the motion." In Congress such seconds are not required. The chair now clearly states the question before the assembly, after which he recognizes the mover of the motion as having the floor, if he claims it, and otherwise the member who first rises and addresses the chair.

Precedence.—During the consideration of a question it is not in order to introduce any other principal question, but it is allowable to make other motions that will aid in disposing of the main question, or that arise incidentally during the proceedings, or that relate to the enforcement of the rules, or to the privileges of the assembly or its members, or to closing the meeting, or to the time of the next meeting. The most common of these have the following order of precedence, any one being in order (except to amend) when one of lower rank is pending, and every one being out of order when one of higher rank is pending: To fix the time to which to adjourn, adjourn, orders of the day, lay on the table, previous question, postpone to a certain time, commit or refer, amend, and postpone indefinitely. Questions incidental to those before the assembly take precedence and must be decided first.

Debate.—Every motion is debatable, except such as from their nature or privilege can not be debated without injury to the business before the assembly. Debate can not be allowed on highly privileged motions, as to adjourn, or they could be used to prevent the assembly from transacting any business. A motion to close debate must necessarily be undebatable, or its very object could be defeated. The following motions can not be debated: Fix the time to which to adjourn; adjourn; for the orders of the day and questions relating to priority of business; appeal when previous question is pending or when relating to indecorum or to transgression of rules of speaking or to priority of business; objection to consideration of question; lay on the table or take from the table; previous question, and all motions extending, limiting, or closing debate or allowing one to continue speaking after being guilty of indecorum in debate; reconsider an undebatable question; question relating to suspending the rules, withdrawing a motion, or reading papers. Debate must be confined to the one question before the assembly at the time, other questions being discussed only so far as they have a bearing on the question immediately before the assembly, except that when the decision of the pending question finally disposes of the main question, then the latter is open to debate also. Thus the motion to postpone indefinitely, having the effect of rejecting the question, if carried, opens to debate the merits of the question it is proposed to postpone; but the motion to postpone to a certain time, if carried, does not finally dispose of the question, and therefore debate is limited to the propriety of the postponement. The common parliamentary law, and the rules of Congress till quite recently, made one exception to this principle, by making the motion to refer to a committee open the main question to debate, evidently on the ground that the discussion would aid the committee in understanding the views of the assembly. Under the House rules, however, it is rare that there is a motion or vote on referring anything to a committee, the reference being made by the chair without a vote as provided for by the rules, or as requested by the member introducing it; if a motion to refer is made it is now very properly undebat-

able. The common parliamentary law rule is better adapted to ordinary deliberative assemblies, for, if the motion to refer were undebatable, it would enable a bare majority immediately to suppress a question without debate by moving to refer it to an unfriendly committee. A motion to reconsider a debatable question or to rescind a vote opens for discussion the merits of the main question.

Debate can be closed or its limits diminished or increased by a two-thirds vote. The motions for these purposes are as follows: (a) The previous question, which cuts off debate and brings the assembly at once to a vote on the pending question, which, in case of the motions to commit or to amend, includes the question to be committed or amended, unless it is demanded simply on the motion to commit, or on the amendment, or on an amendment to the amendment; (b) a motion limiting debate as to the number and length of speeches, or specifying the time at which debate upon the question shall close; (c) a motion extending these limits in general or for a single speaker. Any of these motions may be applied to a single amendment, and, after it is voted on, the main question is still open for amendment and debate.

Amendments.—The assembly can modify the main question by adopting amendments, or it may be referred to a committee who can report amendments for adoption by the assembly. An amendment may be by adding or inserting, by striking out, by striking out and inserting, by substituting, or by dividing the question. An amendment may itself be amended, but not so as to alter its form, nor can any parliamentary motion be amended so as to become a motion of another form. Thus a motion to strike out can not be amended so as to become a motion to strike out and insert, nor can to postpone to a certain time be amended so as to become a motion to postpone indefinitely. An amendment of an amendment can not be amended. While an amendment is pending it is not in order to make another motion to amend the resolution, but after one amendment is disposed of another can be offered and so on without limit. In legislative bodies it is found best in addition to an amendment of the second order to permit an amendment in the nature of a substitute and one amendment to the latter, all to be pending at the same time. While this is useful in legislative and analogous bodies, it would merely produce confusion in ordinary deliberative assemblies. The following motions can not be amended: Adjourn (when unqualified), for the orders of the day, all incidental questions, lay on the table, the previous question, an amendment of an amendment, postpone indefinitely, and reconsider.

Postponing and Suppressing Questions.—Action upon a question may be deferred by postponing it to a certain time; or, if it is intended to reserve the power to take it up at any time, it should be laid on the table; or, if it is desired to set apart a particular time when it shall have special right of way, it should be made a special order for a certain time, which motion requires a two-thirds vote for its adoption. The assembly may suppress the question as follows: (a) When first introduced, before debate or action thereon, any member may, even while the mover has the floor, object to the introduction of the question, and if the objection is sustained by a two-thirds vote, the question is dismissed for that session, thus enabling the assembly to avoid having its time taken up with irrelevant or profitless questions. (b) After the question has been debated, the proper way to suppress the question is to vote it down or postpone it indefinitely, which has the same effect, except that if it fails the original question is not adopted as it would have been had the vote been taken on adopting the main question. Since to postpone indefinitely opens the main question to debate, when this motion is made with a view to suppressing the question immediately, it is necessary also to demand the previous question, just as it is when it is desired to bring the assembly to an immediate vote on the main question. (c) While the fundamental principles of parliamentary law require a two-thirds vote to suppress the question without free debate, yet in most cases it can be practically accomplished by a majority vote on the motion to lay the question on the table. In the U. S. Congress, where the calendar is so full and party lines strictly drawn, the most common method of killing a question is to lay it on the table. In voluntary organizations, where mutual good feeling and co-operation are desired, questions should not be suppressed without debate unless by a two-thirds vote, as described above, and the motion to lay on the table should be confined to its strict parliamentary use of laying aside a

question to be taken up at a more convenient time. Where it is desired to kill simply an amendment, it will not do to lay it on the table, as this carries with it the resolution also.

Reconsideration.—To protect the assembly from having questions reintroduced repeatedly at the same session, and yet to give reasonable freedom for correcting errors due to hasty action, parliamentary law in the U. S. provides that no principal question (resolution or report) or amendment that has been once acted upon shall be again taken up at that session except by a motion to reconsider or rescind; but the motion to adjourn can be renewed if there has been progress in debate or any business transacted, and, as a general rule, privileged, incidental, or subsidiary motions (excepting to suspend the rules for the same purpose, and for the orders of the day while the same principal question is pending) can be renewed if a motion has been made that alters the state of affairs. On the day a vote is taken, or on the next day if a meeting is held then, a member who voted on the prevailing side can move to reconsider the vote, and this motion can be made when any other question is before the assembly, or even when another member has the floor; but in such case it is only entered on the record to be called up afterward, as it can not interrupt pending business. After the motion has been made all action under the resolution is suspended until the reconsideration is disposed of. If the mover does not call up the motion within the time allowed for making it, then any one can call it up and have a vote taken. If the motion to reconsider is carried the question is in the same condition as immediately before the vote was taken, and therefore must be disposed of in the same way. Where the assembly regrets action that it has taken and it is too late to reconsider the vote, the proper way is to rescind the objectionable vote, which a majority can do.

Adoption of Motions.—A majority of the votes cast when a quorum is present is all that is necessary, in the absence of a special rule to the contrary, for the adoption of any motion (except those stated below) that does not suspend or change any rule or custom of deliberative bodies or of the assembly. A quorum, or the number that must be present in order that business may be transacted, is a majority of all the members of the organization where there is no number specified by rule, which should always be done. It is sometimes less than 1 per cent. of the members, as in the British House of Lords, where it is 3 out of about 450 members. The following motions come under the above exception, and require a two-thirds vote for their adoption: To amend or suspend the rules; to make a special order or take up a question out of its proper order; to object to the consideration of a question; to close or limit or extend the limits of debate; and the previous question. The right to introduce questions germane to the objects of the assembly, and discuss them before their final disposition, is inherent to the fundamental idea of a deliberative assembly; but these rights, like that of having the rules enforced, must yield to the convenience of an overwhelming majority. A two-thirds vote can not, however, suspend any article of the constitution or by-laws (unless they provide for such suspension of a specified by-law), nor can it suspend any right or privilege given to less than one-third of the members present, as otherwise the privilege would be of little value.

Committees.—If an assemblage is large, or even when small, if it has much business to transact, its work can be greatly expedited by having all questions first considered by committees, which may be standing (appointed for a term, as a year or session), or select (one for a special purpose), or committee of the whole (i. e. the whole assembly). The first member named on a standing or select committee, and in his absence the next, should act as chairman, unless the committee elect some one else, which it can do, if the chairman has not been appointed by the assembly. If the committee is one for action, it should be small and contain only friends of the object for which it was appointed; if for deliberation or investigation, it should be larger, and all sides should be fairly represented. In committee the chairman usually takes the most active part, members do not rise to speak, motions are not seconded, and in small committees they are not always made, but they should be voted upon; the chairman usually votes. A paper referred to a committee must be returned to the assembly intact, its amendments being written on another sheet. In such case the only report of the committee is a verbal one that the committee has instructed the members to submit certain amendments and move their adoption. The member who submits a written report from a committee should always move its

adoption. If the report is adopted, or accepted, or agreed to, the opinions and doings of the committee become the opinions and doings of the assembly. If the committee wishes action taken, it should close its report with recommending the adoption of certain resolutions, which should either accompany or form a part of the report. In the latter case the adoption of the report carries the resolution with it; in the former, instead of a motion to adopt the report, one is made to adopt the resolutions, and no further action is taken on the report. The committee is discharged without any formal vote when it has completed its work. When the assembly desires to consider a question with all the freedom of a committee, it resolves itself into a committee of the whole, to consider the particular question. The chairman calls some member to the chair, takes his place as a member of the committee, and the assembly proceeds to discuss and amend the resolution or matter before it. Every member can speak as many times as he can obtain the floor. No motions are in order except to amend and to adopt, and to rise and report, which is used instead of to adjourn. When the committee has risen and the presiding officer has resumed the chair, the chairman of the committee reports to the assembly as instructed by the committee. The assembly then acts upon this report as in the case of the report of any other committee.

HENRY M. ROBERT.

Par'ma: town, in the province of Parma, Italy; on the river Parma; about 12 miles S. of the Po and 79 miles S. E. by rail of Milan (see map of Italy, ref. 3-C). The town is circular in form, is surrounded by ramparts and bastions, and has a citadel built in 1591. The Via Emilia crosses it from E. to W. The streets are broad and in good condition, the squares large, and there is a public promenade near the citadel on the south side of the town, and a public park in the northwest angle. Among the public buildings is the Cathedral of the Assumption (Roman Byzantine, begun in 1060 and consecrated by Paschal II., 1106), which contains, among other superior works of art, many frescoes by Correggio, but much restored; the baptistery (begun in 1196), a fine specimen of Lombard architecture; the Church of S. Giovanni Evangelista, with frescoes by Correggio; the Madonna della Steccata, a church of the Renaissance, containing sepulchral monuments of the Farnese and Bourbon rulers of Parma and a celebrated picture by Mazzuoli. The municipal museum, the academy of fine arts, the school of design, and the Farnese theater are in the great building known as the Pilotta, which was intended to form a part of a colossal ducal palace never completed. The national theater was erected by Maria Louisa; the communal palace is a fine but unfinished structure. There is also a university founded in 1521, with (1891) 41 teachers and 276 students, and a royal public library with 213,995 volumes and 4,500 MSS. Parma, however, owes its chief attraction to the masterpieces of Correggio in the academy of fine arts, and to his well-preserved frescoes in the Camera di San Paolo. There are manufactures of pianos, silk, linen and cotton stuffs, leather, glass, crystal, earthenware, and cast-iron wares; and there is a considerable trade in grain, cattle, and dairy produce. The cheese called Parmesan is, however, now better made elsewhere. Parma, though lying in the old Etruscan territory, does not appear in history until the time of the Roman republic, being nearly destroyed by Mark Antony, it was partially rebuilt by the first Caesars, who gave it successively the names of *Julia* and *Augusta*. After suffering cruelly from the barbarians, it was again restored and rewalled by Theodoric. Narses took it and gave it the name of *Chrysopolis*, or the Golden City. Charlemagne made a bishop (it has been an episcopal see from very early Christian times) its temporal lord, with the title of count. After the death of Frederick Barbarossa (1190) Parma declared itself a republic; but in 1303 it became the prey of feudal lords. At last it fell into the hands of the popes, who retained possession of it (except during a short occupation by the French) until 1545, when Paul III. included it in the duchy which he conferred on his son Pier-Luigi Farnese. (See FARNESE.) The government of the Farnese dukes was generally popular with the middle and lower classes, but was not acceptable to the nobility, who conspired frequently against them. In 1701, the direct Farnese line being extinct, the duchy passed to the royal family of Spain. In 1802 the French took possession of it, and in 1814 it was conferred (Spain protesting) as a sovereign duchy on the ex-empress Maria Louisa. In 1817 this arrangement was confirmed, with the stipulation,

however, that the succession should fall on the Duke of Lucca, the rightful heir in the Spanish line. The duke was supported in a reactionary policy by Austria, and in 1848 he was compelled to fly from his dominions. In 1849 he was succeeded by his son Charles III., who was assassinated in 1854; and finally in 1860 the territory was annexed to the new kingdom of Italy. Pop. (1892) 51,500. The province has an area of 1,250 sq. miles. Pop. (1892) 272,040.

Revised by R. A. ROBERTS.

Parma, Dukes of: See FARNESI.

Parma, Duchy of: one of the political divisions of Italy previous to the formation of the Italian kingdom in 1860, embracing the present provinces of Parma and Piacenza.

Parmen'ides (in Gr. Παρμενίδης): son of Pyrrhus; the most notable of the philosophers of the Eleatic School; b. at Elea, a Phocæan colony situated in Lucania, about the year 519 B. C. (cf. Grote, *Hist. of Greece*, chap. lxviii.). He is said to have been the pupil of Xenophanes, founder of the Eleatic School (Aristotle, *Metaph.*, i., 5), and to have to a considerable extent adopted the mode of living of the Pythagoreans, with two of whom, Ameinias and Diocætes, he was very intimate. He took an active part in the government of his native city and drew up a code of laws, to which the Eleans annually swore to conform. He disseminated his philosophy both by teaching and writing. He appears to have attained a ripe old age, and, if we may believe Plato (*Parmenides*, 127 B.), to have become personally acquainted with Socrates.

Writings.—The only work of Parmenides known to the ancients was that bearing the general and oft-initiated title *On Nature* (Περὶ Φύσεως), written, according to the custom of the time, in dactylic hexameters. It was divided into three parts: 1, An introduction, describing in highly figurative language the manner in which the philosopher reached the citadel of truth; 2, a treatise *On Truth* (τὰ πρὸς Ἀληθείᾳ); and 3, a treatise *On Opinion* (τὰ πρὸς Δόξαν). The doctrines put in the mouth of Parmenides in the Platonic dialogue bearing his name are mostly the property of Plato, or of whoever was its author. The known extant fragments of Parmenides are comprised in something less than 160 hexameters. They are collected mainly from the writings of Plato, Aristotle, Clemens Alexandrinus, Sextus Empiricus, Plotinus, and Simplicius. There are editions of them by Brandis (1813), Karsten (1835), Mullach (1845; reprinted in the Didot *Fragmenta Philosophorum Græcorum*, Paris, 1860), and by Stein in *Symbolæ Philologorum Bonnensium* (1864-67), pp. 763-806. The best are those of Karsten and Stein. There is a translation into English hexameters of all the extant fragments, in the *Journal of Speculative Philosophy*, vol. vi. For bibliography, see Ueberweg, *History of Philosophy* (Eng. trans.), vol. i., p. 50.

Philosophy.—Parmenides was, with the exception perhaps of Heraclitus, the greatest of the pre-Socratic thinkers. The kernel of his thought is the notion of pure Being, which he identifies with pure Thinking, and labors to define by every means afforded by the undeveloped philosophic diction of his day. Pure Being, the common basis of finite existence and finite Thought, alone *is*. Non-Being and all the array of finite thoughts and things which its assumption entails are delusions, unavoidable perhaps for the uncultured mind, but transparent enough to the true thinker. Being is

Birthless and deathless.

Whole and only-begotten, and moveless and ever-enduring:
Never it was or shall be; but ~~the~~ all simultaneously now is,
One continuous one.

The philosophy of Parmenides largely affected all subsequent thought, and even so powerful a thinker as Aristotle could not shake off his cosmological ideas. Nowhere else have the rational and the sensuous been more clearly opposed. This is so true that some writers, notably Gladisch (*Die Eleaten und die Inder*), have endeavored to connect it with the Hindu philosophy. Cf. Aristotle, *Metaph.*, A. 5; Plotinus, *Enneads*, v., 1, 8; Buroi, *Dell' Essere e del Conoscere*; *Studi su Parmenide, Platone e Rossetti*; U. *Gesch. der Philos.*, vol. i.; Zeller, *Philos. der Griechen*, vol. i.; and Ueberweg and Schwegler. THOMAS DAVIDSON.

Parmigianino and Parmigiano: See MAZZUOLI.

Parnahyba, pār-nā-ee-bā (also written *Parnahiba*, *Parnaiba*, or *Paranahyba*): the name of two considerable rivers in Brazil: (1) One of the head streams of the PARANÁ (q. v.), separating Minas Geraes from Goyaz. (2) A river of Northern Brazil, separating the states of Piahy and Ma-

ranhão; flowing N. E. and entering the Atlantic near lat. 3° 15' S.; length about 850 miles (according to Pompeu, 1,000 miles). Its basin of 135,000 sq. miles embraces the whole of Piahy, in which it has many affluents, and about 20,000 sq. miles in Maranhão. It has few rapids, and during the annual floods canoes can ascend nearly to the head of the main river and tributaries; small steamers ascend regularly to São Pedro de Alcantara, about half way to the head, and most of the commerce of Piahy is by this route. Vessels drawing 11½ feet ascend to the town of Parnahyba, near the mouth of the river; it is the commercial center of Piahy.

HERBERT H. SMITH.

Parnassiens: name given to a group of French poets of the Second Empire, from the name of the volume, *Parnasse contemporain*, in which their first poems were collected in 1866. Their common qualities are a great and almost exclusive cultivation of the metrical form and the rejection of emotion in favor of plastic or pictorial subjects as poetic material.

A. G. C.

Parnas'sus (in Gr. Παρνασσός): a mountain of Greece in the district of Phocis, rising 8,068 feet above the level of the sea. Its three peaks are covered with snow for the greatest part of the year; its sides are covered with beautiful forests and abound in crags and caverns. In ancient times it was consecrated to Apollo and the Muses. Delphi, with its famous oracle and the Castalian fountain, was situated on its southwestern slope. The Corycian cavern, the abode of Pan and the Muses, was on its western slope, and on its highest top were celebrated the wild orgies of Dionysus.

Revised by J. R. S. STERRETT.

Par'nell: See CONGLETON, LORD.

Parnell, CHARLES STEWART: Irish party leader; b. at Avondale, County Wicklow, Ireland, in 1846; was educated at Cambridge, and entered Parliament in 1875 as a member for Meath. In 1877 he brought in the Irish Church Act Amendment Bill, the object of which was to facilitate the purchase of their holdings by the tenantry of the disestablished Irish Church; but the bill was thrown out by 150 to 110 votes. He then became the leader of the obstructionists in Parliament, and in 1879 he founded the Irish National Land League, whose purposes were, first, to bring about a reduction of rack-rents; and, secondly, to facilitate the obtaining of the ownership of the soil by the occupiers. From this time his fortunes are identified with the history of the Home Rule party, and for an account of the principal events of his political career see the articles HOME RULE and LAND LEAGUE. In the same year he visited the U. S. and lectured in all the large cities in order to raise funds for the new organization. In 1880 he was returned for three constituencies, Meath, Mayo, and Cork city, and chose to sit for the last, but in the same year informations were laid against him by the Irish attorney-general. The trial resulted in a disagreement of the jury, but, the Land League having been declared by the Government an illegal association, he was arrested and conveyed to Kilmainham jail. He was soon released, however, and in the session of 1883 he took a very active part in procuring the passage of the Arrears Act and the Tramways and Laborers Acts. The Land League was revived under the name of the National League, with Mr. Parnell at its head. He led the Irish parliamentary party in 1884-85, and afterward supported Gladstone's proposed Home Rule. He was often charged by his enemies with favoring and even abetting acts of violence on the part of the Irish tenantry, and in 1887 these charges took definite shape in a series of articles published by *The Times*, accusing him of complicity in crime and supporting the charge by the publication of certain letters purporting to have been written by him. These Parnell declared to be forgeries, and he was sustained in this statement by the finding of the so-called Parnell commission, appointed to investigate the matter. Parnell then brought suit for libel against *The Times*, and was awarded £5,000 damages. With this victory he reached the height of his influence, but in 1890 he was named co-respondent in the divorce suit of his friend, Capt. O'Shea, and proved in court to have been guilty of adultery with O'Shea's wife. Gladstone declared him unfit for the leadership of the Irish party, and he was advised to withdraw. He refused, and the result was a breach in the party, the majority choosing Justin McCarthy as their chief, the others, known as the Parnellites, adhering to their old leader. The latter made several bitter speeches against the Liberals, and threw himself into the contest with the McCarthyites in the North Kilkenny election, but the hos-

tility of the priesthood was added to the other opposing influences, and the Parnellites were defeated Dec. 22, 1890. In the following June he married Mrs. O'Shea. He continued to attend public meetings in Ireland, but his candidates were repeatedly defeated in the elections. At length his strength began to fail under these reverses and the constant attacks of his political opponents, and his death, which occurred at Brighton Oct. 6, 1891, was doubtless hastened by his misfortunes.

F. M. COLBY.

Parnell, THOMAS: poet; b. at Dublin, Ireland, in 1679; educated at Trinity College, Dublin; took orders in the Church of England 1700; became archdeacon of Clogher 1705, prebendary in the cathedral of Dublin 1713, and vicar of Finglass 1716; resided chiefly in England; assisted Pope in his translation of Homer, and wrote the *Life* of Homer prefixed to the *Iliad*. D. at Chester, July, 1717. Pope published in 1722 a volume of posthumous poems attributed to Parnell, the best of which was the *Hermit*. See the *Life*, by Goldsmith, in the Globe edition of Goldsmith's works (1881).

Revised by W. S. PERRY.

Parol, or Parole [from Fr. *parole*, word, promise: Ital. *parola*: O. Span. *paraula*: Portug. *palavra* (cf. Eng. *palaver*) < Lat. *para'bola*, parable, word = Gr. παραβολή, comparison]: literally, a word, word of mouth; in law, a term used generally to designate oral evidence as distinguished from written evidence (see EVIDENCE), but also to designate any contract or agreement, either oral or in writing, which is not under seal. Pleadings formerly when given *viva voce*, orally, in court were frequently termed the *parol*.

Paropam'isus, or the Paropamisan Mountains: in ancient geography, a name of somewhat uncertain significance, sometimes limited to the range which forms the northern boundary of Cabul, sometimes extended to the whole group connecting the Caucasus with the Himalaya, but generally corresponding to the modern Hindu-Kush.

Paroquet: See PARRAKEET.

Paros: island in the Ægean Sea, belonging to Greece; one of the Cyclades. It is a flattened mountain, about 36 miles in circumference and toward the center 2,450 feet in height. Well cultivated and naturally fertile, it suffers from scarcity of water. Some of its little harbors are deep and well sheltered. It exports honey and wax, but its most precious product by far is the Parian marble, famous from all antiquity for purity and whiteness. The Arundel or Oxford marbles, which give the Greek chronology from Cærops to Alexander, were discovered here in 1627. Pop. (1890) 3,048.

E. A. GROSVENOR.

Parot'id Gland [*parotid* is from Gr. παρά, beside + οὖς, ὠτός, ear]: the largest of the salivary glands, in man as well as in many other animals. In the human subject the parotid glands lie on the sides of the face, below and forward of the ear. Each gland weighs about 1 oz., and discharges its secretion by a duct 2½ inches long, called the duct of Steno, which opens on the inside of the cheek, opposite the second molar tooth of the upper jaw. The parotid secretion in man is less viscid than the saliva of the other glands, and differs somewhat in its composition, but its functional uses are essentially similar. The most important diseased condition of the parotid is MUMPS (*q. v.*).

Revised by W. PEPPER.

Parquet, JACQUES DIEL DU: See DIEL DU PARQUET.

Parr: the young of the salmon and trout, after it has passed the fry stage and before it has reached that of smolt. These stages appear to be of indefinite duration, varying according to the food-supply and other conditions. It was once thought that the parr (called also samlet, pisit, or brandling) was a distinct species of fish. All the salmon and trout pass through a parr stage, during which the body is marked by dark cross-bands. Revised by D. S. JORDAN.

Parr, CATHARINE: See CATHARINE PARR.

Parr, SAMUEL, LL. D.: clergyman and author; b. at Harrow-on-the-Hill, England, Jan. 15, 1747; studied two years at the University of Cambridge 1765-67; was assistant master of Harrow School 1767-72; kept a private school at Stanmore 1772-76; became head master of Colchester School 1776, of Norwich School 1778; took orders in the Church of England; became curate of Hythe 1778, rector of Asterby 1780, and perpetual curate of Hatton, Warwickshire, 1786, rector of Wadenhoe 1790, and of Graffnam 1802, and head chaplain to Queen Caroline 1820; prebendary of St. Paul's, London. Cambridge gave him an LL. D. in

1781. He resided from 1786 at Hatton, engaged in literary pursuits and the classical training of pupils; was a brilliant but overbearing and quarrelsome talker, an ardent Whig partisan, possessed an extensive knowledge of Latin literature, was regarded by many of his contemporaries as an intellectual prodigy, and came near receiving the bishopric of Gloucester. Posterity wonders at his contemporary fame, as he has left nothing to justify it. D. at Hatton, Mar. 6, 1825. See De Quincy's essay. Revised by S. M. JACKSON.

Parr, THOMAS, commonly known as **Old Parr**: said to have been born in the year 1483, at Winnington, Shropshire; was taken to London by the Earl of Arundel, Sept., 1635, and introduced at court as being 152 years old. A metrical narrative of his career was published at the same time by John Taylor, "the water poet," under the title *The Olde, Olde, Very Olde Man*, in which Parr was represented as having been born during the reign of Edward IV. and as having lived through the reigns of ten sovereigns. D. in London, Nov. 14, 1635. An autopsy was made by Dr. Harvey, and he was buried in Westminster Abbey, where a monument commemorates his alleged longevity. Thoms, in his *Human Longevity* (1873), tries to show that Parr was not more than 101 or 102 years old when he died. See LONGEVITY.

Parrakeet, or **Paroquet** [from Fr. *perroquet*, a parrot]: a popular name for numerous small parrots with rather long, wedge-shaped tails. While the word has no exact scientific meaning, it is simply used to distinguish those birds with wedge-shaped tails from the parrot, macaw, lory, and COCKATOO (q. v.), which, as a rule, are names applied to larger birds, usually with square tails. The ground-parrakeet (*Pezoporus formicatus*) and grass-parrakeet (*Melospittacus undulatus*) of Australia are familiar examples, and the species of the genera *Palaornis*, *Platycercus*, and *Nymphicus* are typical parrakeets. F. A. LUCAS.

Parrhasius (in Gr. Παρῆσιος): a Greek painter; b. in Ephesus; a contemporary and rival of Zeuxis. He flourished 400-380 B. C. While Zeuxis deceived the birds by his painted grapes, Parrhasius deceived Zeuxis himself by his painting of a curtain. See Reber, *History of Ancient Art* (New York, 1887, p. 373, ff.). J. R. S. S.

Par'ride [Mod. Lat., named from *Parra*, the typical genus, from Lat. *parra*, barn-owl]: a family of birds (also called *Jacaniæ*) containing the jacanas (see JACANA), distinguished by long legs and enormous toes. In form they resemble rails and coots; the bill is elongated, rather slender; the nostrils longitudinally oval, near the middle of the bill, and in long grooves; the wings large and pointed; the legs long and provided with transverse scales, which extend on the tibiae as well as tarsi; claws very long, nearly straight, or even somewhat curved upward. The family is represented by a small number of tropical birds of doubtful affinities, some authors placing them near the plovers, and others with the *Rallidæ*. Species of *Parra* are found in South America, Africa, Asia, and Australia; the single representative of *Hydrophasianus* in India. Revised by F. A. LUCAS.

Parris, SAMUEL: clergyman; b. in London, England, 1653; emigrated to Massachusetts in youth; studied at Harvard, but did not graduate; was for a time a merchant at Boston; became minister of a church in that part of Salem now called Danvers 1689; obtained notoriety through the great delusion called Salem witchcraft, which originated in his family, his daughter and niece having accused an Indian slave from the West Indies of bewitching them. He was active in prosecuting those who were apprehended, and after the delusion was over his church brought charges against him. He acknowledged his error, but in 1696 was dismissed and left the place. Subsequently he preached in Stow, Concord, and other towns. D. at Sudbury, Mass., Feb. 27, 1720.

Parrot: a common name for any member of the order *Psittaci*; in a restricted popular sense it is applied to the moderate-sized species with square tails, such as the gray African parrot (*Psittacus erithracus*) and the Mexican yellow-headed parrot (*Amazona leucollaris*). The large species, with long, pointed tails are termed macaws, the smaller *parrakeets* or *lories*, the large, crested, square-tailed species are known as cockatoos. Parrots are readily distinguished by their stout, hooked bills, which are hinged upon the cranium; by their short legs and rough feet, and by having the outer toe turned backward. They range in size from the great macaws to the little *Nasiterna*, scarcely

larger than a sparrow. There are more than 350 species, found most abundantly in the tropics, but also, as in Australia and New Zealand, occurring in the temperate zone. One small species (*Cyanoramphus erythrotis*) inhabits Macquaries island in 50° S. lat. America has the most species, 150; Australia is richest in peculiar genera; no parrots are found in Europe, and they are not common in Africa or Asia. Many species are very gaudily colored, bright green being a common hue, while red, blue, and yellow are frequent. The most delicately colored forms are among the lories of the Australian region. Their food consists largely of fruit, but they also eat nuts, seeds, and buds, while a few eat insects and occasionally flesh. They breed in hollow trees, holes in rocks, and deserted buildings. The eggs are smooth, white, and rounded, most commonly two in number. Notwithstanding the fact that their voice is naturally loud and harsh, many can be taught to articulate words. The well-known African gray and Mexican "yellow head" are among the best talkers. A single species, the Carolina parrakeet (*Conurus carolinensis*), occurs within the limits of the U. S., and this is threatened with extermination. It is about 12 or 13 inches long, half of this being due to the long tail; the prevailing color is green; the head is yellow and the cheeks are red. The technical characters are given under PSITTACI. See also COCKATOO, MACAW, PARRAKEET, and OWL-PARROT. F. A. LUCAS.

Parrot-fish: a name applied to many fishes of the families Labridæ and Scaridæ (q. v.).

Parrott, ROBERT PARKER: inventor; b. at Lee, N. H., Oct. 5, 1804; graduated at the U. S. Military Academy 1824; entered the army as second lieutenant of artillery, remaining, however, at the academy as assistant professor until 1829; was transferred to the ordnance corps in 1836, in which year he resigned and became superintendent of the West Point iron and cannon foundry, Cold Spring, N. Y.; was judge of court of common pleas, Putnam County, 1843-47; and was the inventor of the system of rifled guns bearing his name, and of their projectiles. (See ARTILLERY.) D. at Cold Spring, N. Y., Dec. 24, 1877.

Revised by JAMES MERCUR.

Parry: See FENCING.

Parry, CHARLES CHRISTOPHER, M. D.: botanist; b. at Admington, Worcestershire, England, Aug. 28, 1823; removed to the U. S. in 1832; graduated at Union College, and in 1846 removed to Davenport, Ia., where he practiced medicine for several years, and studied the flora of the adjacent region. He was botanist to David Dale Owen's geological survey of the Northwest (1848), botanist to the Mexican boundary survey (1849-52), botanist to the Pacific Railroad survey of the 35th parallel (1867), botanist of the Department of Agriculture (1869-71). In 1861, 1862, 1864, and again in 1872 and 1873 he collected extensively in the Rocky Mountains, and later in Utah, Texas, and California. Among his publications are *Botanical Observations in Western Wyoming*, etc. (1874); *Botanical Observations in Southern Utah* (1875); *Revision of the United States Pacific Coast Species of Arctostaphylos* (1883); *Revision of the Genus Chorianthe* (1884); *The North American Genus Ceanothus* (1888). D. at Davenport, Ia., Feb. 20, 1890.

CHARLES E. BESSEY.

Parry, CHARLES HUBERT HASTINGS: composer; b. in England, Feb. 27, 1848; graduated at Oxford 1870; received Mus. Bac. degree from Oxford 1867, and Mus. Doc. from Cambridge in 1883 and from Oxford in 1884. He has composed largely for orchestral instruments, both solo and concerted; also *Judith*, *Job*, and *King Saul* oratorios; music to *The Birds* of Aristophanes, *Prometheus Unbound* of Shelley, *De Profundis* for a twelve-part chorus, *Ode on St. Cecilia's Day*, *Blest Pair of Sirens*, *Funeral Ode*, *The Glories of our Blood and State*, *L'Allegro*, *The Lullabies*, and other odes and cantatas. Much of his music was composed for the various English musical festivals. D. E. H.

Parry, Sir WILLIAM EDWARD: Arctic explorer; b. at Bath, England, Dec. 19, 1790; entered the navy 1803; was engaged in the naval service on the American coast during the war of 1812; was a member of Sir John Ross's Arctic expedition 1818; commanded another expedition 1819-20, with which he penetrated farther W. within the Arctic Circle than any previous explorer, thereby gaining a reward of £5,000 offered by Parliament; made other expeditions 1821-23, and in 1827 set out in boats that could be fitted to sledges from North Spitzbergen and attained the highest

north (82° 45' N. lat.) ever reached until Markham (1876) beat it. He was knighted 1829; became rear-admiral 1852; governor of Greenwich Hospital 1853; and died at Ems, Germany, July 8, 1855. He wrote several volumes, the most important being his *Journal of a Second Voyage for the Discovery of the Northwest Passage* (1824), and *Narrative of the Attempt to reach the North Pole in Boats* (1828).

Revised by C. C. ADAMS.

Parry Sound: chief town of the provisional district of Parry Sound, Ontario, Canada; at the eastern extremity of Parry Sound, an inlet of Georgian Bay; 70 miles N. E. of Collingwood, and the western terminus of the Canada Atlantic Railway (for location, see map of Ontario, ref. 2-D). Pop. (1891) 1,982.

Parsees, or Parsis (plur. of *Par'see*, or *Parsi* = Hind. and Pers. *pārsī*, Persian, fire-worshiper; cf. Eng. *Persian*): the name generally employed to designate the modern followers of Zoroaster. The Parsis form a small community, now living chiefly in Bombay, or still scattered here and there in Persia, their original home. They are the descendants of the early Persian race, and their name is derived from the province of Pars, or Fars, broadly employed for Persia in general. With the Arab invasion and conquest of Persia, and Caliph Omar's victory over Yazdegard in the battle of Nahavand (A. D. 641), the Sassanian monarchy fell, and the power of Zoroastrianism that had swayed Iran for centuries was crushed before the faith of Islam. Most of the Zoroastrians accepted the creed of Mohammed; only a small number clung to the national religion, and these were subjected to severe persecution. The Mohammedans called them *Guebres*, infidels, and allowed them to settle only in the poorest districts of the country around Yezd and Kirmān. A godly number, in order to avoid persecution, sought refuge in exile, and emigrated to the west coast of India, settling among other places at Navsari, Surat, Ahmedabad, and especially in Bombay. Those who remained in Persia suffered much oppression at the hands of the fanatical Mohammedans; they sank into poverty and decreased in numbers. They number only 7,000 or 8,000, but they are much respected on account of their honesty. Those, on the contrary, who went to India prospered much, though at one time they, too, were exposed to persecution by the Mohammedans. They number about 90,000; among them are some of the wealthiest merchants of Bombay.

In consequence of their emigration from Persia and their contact with the Hindus, certain of the ideas and observances of the Parsis in India underwent some changes which gave rise to schismatic tendencies and to religious factions among themselves; but with the establishment of reform associations the Indian Parsis have remained in close touch with their persecuted Persian brethren, and do all that is possible to alleviate their oppressed condition. Among the numerous striking religious practices for which the Parsi faith is peculiar is the strange custom of exposing the dead to be devoured by vultures on the "towers of silence." The Parsis, it may be added, strenuously object to the misleading designation "fire-worship," which is sometimes given their religion. In their daily life they have an acknowledged reputation for uprightness, high-mindedness, and morality, for benevolence and generosity, and furthermore for exceedingly keen business instincts. They form in general a community which, though small, is highly respected, and which is especially well disposed to European civilization. See *AVESTA* and *ZOROASTER*, and consult Dosabhai Framji Karaka's *History of the Parsis* (2 vols., London, 1884).

Revised by A. V. WILLIAMS JACKSON.

Parsley [M. Eng. *perseley*, *persil*, from O. Fr. *persil*: Span. *perejil* < Lat. *petroselinum* = Gr. *πετροσέλινον*, rock-parsley; *πέτρα*, rock + *σέλινον*, parsley (whence Eng. *celery*): *Petroselinum sativum*, a biennial umbelliferous herb cultivated in gardens. There are several varieties. The leaves of most are used in garnishing meats. Others are sometimes cultivated for the rich white root, which resembles the parsnip. The root of common parsley has medicinal qualities.

Revised by L. H. BAILEY.

Parsnip, formerly often written **Pastnip** [M. Eng. *parsnepe*, viâ O. Fr. from Lat. *pastinaca*, parsnip, deriv. of *pastinum*, a kind of dible. The Eng. form has perhaps been influenced by *turnip*]; an umbelliferous plant (*Pastinaca sativa*), usually biennial, found wild in Southern and Central Europe, in England, and in the southern parts of Russian Asia. There is a considerable difference between the wild and the cultivated parsnip, the root of the latter

being larger, without branches, softer, and more fleshy. It succeeds best in light rich soil. The Guernsey parsnip has a root 4 feet long; the Dutch, only from 20 to 30 inches. To many this root is a great relish; the Romans cultivated it carefully and appreciated it much. To others, however, it is distasteful on account of its sweetness. As fodder, though not much used, it possesses value for some kinds of stock. The wild parsnip has an acrid taste, and sometimes malignant consequences when eaten; the cultivated assumes the same acrid taste when it begins to grow in spring. There are only three or four important named varieties in cultivation in the U. S.

Revised by L. H. BAILEY.

Parson, or Rector and Vicar: in English ecclesiastical law, strictly, a parish priest of the established church in England, who, in addition to his spiritual functions, has the legal ownership and possession of all the temporal rights belonging to the parochial church. He is called parson (a variant form of *person*, Lat. *persona*) because by his person the church is represented, and he is in himself a corporation sole, in order to protect the rights of the church, which he personates by a perpetual succession. The word parson, at first used only in the sense above noted, gradually came to signify any incumbent of a benefice who officiated in place of the parson (as noted below), and is now popularly used to signify any clergyman or person authorized by ecclesiastical authority to preach. In the technical sense, instead of the term parson, the word *rector* (that is the person who has the direction of the affairs of the church) is now more commonly used.

The parson or rector, as distinguished from other parish priests, is a kind of life-tenant, having a freehold ownership of the church, the parsonage, the glebe, the tithes, and all the parochial dues; and he may commit certain kinds of waste, and must repair and insure the property. In the early history of the English Church these temporalities were sometimes perpetually annexed to, and held by, some spiritual corporation, in which case they were said to be *appropriated*. The corporation then became the parson of the parochial church, and was bound to provide for the performance of the ecclesiastical services of the church. Later on these church temporalities were in some cases granted to laymen (*lay parsons*), in which cases they are (according to some authorities) properly said to be *impropriated*. This distinction between *impropriate* and *appropriate* is probably without basis, the words having probably been originally used, as often now, interchangeably. Probably, however, in the case of appropriated benefices, the parson appropriate, or appropriator, was required to depute or appoint some one to perform the ecclesiastical duties of the church. This deputy was called the vicar (i. e. agent or deputy), and originally was little more than the stipendiary curate of the present day. His stipend was entirely in the discretion of the appropriator, and he was removable at pleasure. By statute, however (4 Henry IV., c. 12), it was required that a secular ecclesiastic should be appointed; that he should be canonically instituted and inducted; that his office should be perpetual; and that he should be sufficiently endowed. His endowment now consists generally of the small tithes, and of a portion of the glebe, or the land belonging to the parsonage. The principal distinction between a rector and a vicar now is that the rector has the sole right to all ecclesiastical dues within his parish. Where the incumbencies were not endowed under the statute above mentioned they were called *perpetual curacies*, and the incumbent appointed to perform the ecclesiastical duties a *perpetual curate*. Since 1868 (by virtue of 31 and 32 Vict., c. 117) the incumbent of the church of every parish, or parish for ecclesiastical purposes, not being a rectory, who is authorized to publish banns and to solemnize marriages, churchings, and baptism in such church, and receive the fees for his own use, is for the purpose of style and designation, but not for any other purpose, deemed and styled a vicar, and his benefice a vicarage.

In order that a person may become a parson or a vicar he must be in holy orders (that is, a consecrated priest in accordance with the rights of the established church), be presented to the living by its patron, be instituted into the spiritual cure by the bishop, and be inducted into the possession of the church and other temporalities of the parish. His principal duties are to care for the church property, answer the questions of the bishop, perform divine services, administer the sacraments, solemnize marriage, churchings, and baptism, and officiate at burials of the dead. He has

complete control over the organist, the choir, and the bell-ringer. He is responsible for all that his curate or that other clergymen may do in his church with his sanction or permission. For further information, see Phillimore's *Ecclesiastical Law*; Cripp's *Law of the Clergy*; Whitehead's *Church Law*; T. Eustace Smith's *Summary of the Law and Practice of the Ecclesiastical Courts*. F. STURGES ALLEN.

Parson-bird: a characteristic bird of New Zealand (*Prothemadera nova-zelandica*). Its glossy black coat and a tuft of white feathers on either side of the throat suggest the garb of a clergyman.

Parsons: city; Labette co., Kan. (for location, see map of Kansas, ref. 8-J); on the Kan. City, Ft. Scott and Mem. and the Mo., Kan. and Tex. railways; 32 miles N. E. of Independence, 48 miles S. S. W. of Fort Scott. It is an agricultural and manufacturing center, contains the general offices of the railway companies, railway car-works and machine-shops, a foundry, and furniture and other factories, and has a national bank with capital of \$50,000, a State bank with capital of \$50,000, a public library (founded 1880), and 2 daily and 5 weekly newspapers. Pop. (1880) 4,199; (1890) 6,736; (1895) 7,573. EDITOR OF "SUN."

Parsons, or Parsons, ROBERT: ecclesiastic; b. at Nether Stowey, Somersetshire, England, June 24, 1546; educated at St. Mary's Hall and at Balliol College, Oxford, where he graduated 1568, and became dean; left Oxford in 1574, in consequence of his conversion to Roman Catholicism; resided for a time in the Netherlands; studied medicine and law at the University of Padua; entered the Society of Jesuits at Rome July, 1575; studied divinity in the Jesuits' College at Rome; took orders as a priest; was sent by Pope Gregory XIII. to England, along with Edmund Campion and other Jesuits, July, 1580, to attempt the conversion of that kingdom to Roman Catholicism; traveled in disguise among his coreligionists; became the object of energetic measures on the part of the English Government; escaped to the Continent 1581; opened a seminary for English youth at Eu in Normandy 1584; became rector of the English college at Rome and provincial of the English missions; communicated with James VI. of Scotland in behalf of his mother, Mary, Queen of Scots, then awaiting execution, and visited in her behalf the courts of France, Spain, and Portugal; founded seminaries for English Roman Catholics at Valladolid, San Lucar, Seville, and Lisbon, and at St.-Omer, France, 1593; became a second time rector of the English College at Rome (1598-1610), and resisted all attempts to make him a cardinal after the death of Cardinal Allen. D. at Rome, Apr. 18, 1610. He was the author of several treatises in favor of the doctrines of the Church of Rome, which appeared in London under assumed names, among which were *A Brief Discourse* (1584); *The Christian Directory* (1583-91); *A Conference about the Next Succession to the Crown of England* (1594); and *A Treatise of the Three Conversions of England* (1603-04). For issuing the first and the third of these works the printers were hanged and quartered, and it was made high treason to own a copy of the latter book, which advocated the claims of the Infanta of Spain to the English throne. Gibbon attributed his youthful conversion to Roman Catholicism to the writings of Parsons, who was a man of brilliant talents and a vigorous writer, industrious, prudent, and zealous. He possessed much influence at the court of Spain, and was more dreaded by the English court than any other ecclesiastic. See Dodd's *Church History of England* and Foley's *Records of the English Province of the Society of Jesus*.

Revised by J. J. KEANE.

Parsons, SAMUEL, HOLDEN: soldier and jurist; b. at Lyme, Conn., May 14, 1737; graduated at Harvard 1756; studied law at Lyme in the office of his uncle, Gov. Matthew Griswold; was admitted to the bar 1759; was representative in the Legislature many years in succession from 1762; became king's attorney 1774, when he removed to New London; was a member of the Connecticut committee of correspondence 1775, in which year he took command of the Sixth Connecticut Regiment at the siege of Boston; took part in the battle of Long Island; was chosen by Congress brigadier-general Aug. 9, 1776; succeeded Putnam in command of the Connecticut line 1779; became major-general Oct. 23, 1780; practiced law at Middletown after the peace; was commissioner to treat with the Miami Indians 1785; member of the Connecticut convention for the ratification of the Constitution of the U. S. Jan., 1788; was appointed by Washington first judge of the Northwest Territory; was

commissioner of Connecticut to purchase from the Wyandot Indians the tract in Northeastern Ohio known as the Connecticut or Western Reserve 1789; settled near the Ohio river; published a paper on the antiquities of the Western States in the *Transactions of the American Academy* (vol. ii.); was drowned in the rapids of the Big Beaver river, Ohio, Nov. 17, 1789.

Parsons, THEOPHILUS, LL. D.: jurist; son of Rev. Moses Parsons; b. at Byfield, Mass., Feb. 24, 1750; graduated at Harvard 1769; taught school at Falmouth, Mass. (now Portland, Me.); was admitted to the bar there 1774; returned to Byfield in consequence of the destruction of Falmouth by a British squadron in Oct., 1775, and began legal practice at Newburyport in 1777. He was a member of the patriotic association called the "Essex Junto," and author of the famous pamphlet known as the *Essex Result* (1778), which contributed largely to the defeat of the State constitution then proposed by the Legislature, and the establishment of the prevailing New England conservative school of constitutional doctrine; was a member of the convention held in 1779 which framed a new constitution, and of the convention of 1788 for the ratification of the Federal Constitution. Although not active in public affairs, he was several times elected to the State Legislature. He removed to Boston in 1800, and became in 1806 chief justice of the Supreme Judicial Court, which post he held until his death, in Boston, Oct. 30, 1813. His decisions, which fill vols. ii. to x. of the Massachusetts *Reports*, have given him a vast legal reputation. He was a man of a remarkable memory, a versatile mind, an exact student, and exhibited a universal readiness in his practice of law. See *Memoir of Chief Justice Theophilus Parsons*, by his son, Theophilus Parsons (Boston, 1859). Revised by F. STURGES ALLEN.

Parsons, THEOPHILUS, LL. D.: jurist; son of the eminent jurist of the same name; b. at Newburyport, Mass., May 17, 1797; graduated at Harvard 1815; studied law in the office of Judge William Prescott; visited Europe; practiced some years at the bar at Taunton, and afterward at Boston; was a frequent contributor to *The North American Review* and other magazines and periodicals; founded the *United States Literary Gazette*; published three volumes of *Essays* in support of the doctrines of the Swedenborgian or New Jerusalem Church; became in 1847 Dane Professor of Law at Harvard Law School; was author of some fifteen volumes of legal treatises on the laws of contracts, mercantile business, shipping and admiralty, notes and bills of exchange, marine insurance; *Treatise on the Law of Contracts* (1853; 5th ed. 1864); *Elements of Mercantile Law* (1856); *The Laws of Business* (1857); *Treatise on Maritime Law* (1859); *Treatise on the Law of Promissory Notes and Bills of Exchange* (1860); *Laws of Partnership* (1867); *Treatise on Marine Insurance* (1875); *The Political, Personal, and Property Rights of a Citizen of the United States* (1875), etc. He also wrote a *Memoir of Chief Justice Theophilus Parsons* (1859); several theological works; *Essays* (1845); *Deus Homo* (1867); *The Infinite and the Finite* (1872); *Outlines of the Religion and Philosophy of Swedenborg*, and other religious works. D. at Cambridge, Mass., Jan. 26, 1882. Revised by F. STURGES ALLEN.

Partan'na: town of Italy; in the province of Trapani, Sicily; on a mountain-slope 1,250 feet above sea-level; 19 miles S. E. of Trapani (see map of Italy, ref. 9-E). It commands a fine view of the Mediterranean and of the beautiful plain between Cape Lilibeo and the promontory of Sciacca. The Chiesa Madre contains some noticeable works of art. This town was originally a Greek colony, and terra-cotta vases of Greek workmanship are frequently disinterred in the vicinity. The Saracens erected three castles here, the ruins of which still exist. In the revolution of 1860 Partanna furnished important assistance to Garibaldi. Pop. 13,144.

Parthe'nios: Greek elegiac poet of Nicæa in Bithynia; went to Rome about 72 B. C. and taught Vergil Greek at Naples. His poems, two of which were imitated in the extant Latin poems *Moretum* and *Ciris*, have perished, and the only production of his that has survived is a collection of doleful love stories (*περί ἐρωτικῶν παθημάτων*), a practical manual of themes for elegies prepared for the benefit of Cornelius Gallus, the Roman poet. Ed. by Westermann in his *Μυθολογία* (1843). B. L. G.

Parthenogen'esis [Gr. *παρθένος*, virgin + *γένεσις*, production]: that type of reproduction where unfertilized eggs de-

velop into adults. It occurs in various groups of invertebrates, especially in land and fresh-water forms which are exposed to seasonal changes. Instances are most numerous among the Rotifers, the lower Crustacea, and insects. In some Crustacea it is almost the rule, and in the Phyllopod *Apus* males are so rare that for many years they were not known to exist. Parthenogenesis may occur occasionally in forms like butterflies and silkworms, when sexual reproduction is the rule, or it may occur as a normal condition in the production of one sex, as among the honey-bees, where the drones are developed from non-fertilized eggs, the workers and queens being developed from impregnated ova. In some of the lower Crustacea (*Ostracodes*, *Cladocera*) parthenogenetic and normal generations alternate according to the season. In these the two types of eggs differ considerably in appearance. Among the plant-lice (Aphides) parthenogenetic reproduction prevails during the warmer months, the females producing eggs which develop, without fertilization, inside the mother, the young being born alive. In the autumn true males and females appear, and fertilized eggs are laid which carry the species through the winter months. Here the normal females differ from the parthenogenetic ones, since the latter possess wings and lack those organs necessary for copulation. A last type to be mentioned are certain paedogenetic flies, in which not the adult but the larva or pupa produces parthenogenetic eggs.

An explanation of parthenogenesis which shall fulfill all conditions is yet to be given. The latest and most nearly satisfactory is that of Weismann. Normal eggs in their maturation throw off two polar globules (see EMBRYOLOGY), but apparently, in at least some instances, parthenogenetic eggs throw off but one. The second globule is hence assumed to be equivalent in some respects to the male element (spermatozoon), and since it is retained in the egg, no addition of outside material is necessary. The whole subject is, however, obscure. The reader is referred to von Siebold, *Parthenogenesis* (London, 1857), and Weismann, *Essays on Heredity*. J. S. KINGSLEY.

Par'thenon [= Lat. = Gr. *παρθενών*, deriv. of *παρθένος*, a virgin, an especial epithet of Athene]: a temple of Athena Parthenos at Athens. It was built by Pericles about 438 B. C. The architects were Ictinus and Callicrates, and a part of the sculptured decorations are thought to have been from the hand of Phidias. It stands upon the Acropolis. It is of the Doric order, built of Pentelic marble, is 228 feet long and 101 feet wide. It is generally believed that it was painted within and without. There were 46 columns in its peristyle, 8 at each end and 17 on each side, reckoning the corner columns twice. It stood almost entire until 1687, when, during a siege by the Venetians, a large part of the central portion was destroyed by the explosion of some gunpowder stored in it by the Turks. It is regarded as the finest production of Greek architecture. The statues from the pediments, so far as preserved, many of the metopes, and a large part of the frieze on the outer wall of the cella were taken by Lord Elgin, and are among the chief treasures of the British Museum. See ARCHITECTURE and ATHENS.

Revised by RUSSELL STURGIS.

Par'thia: an ancient territory of Western Asia; situated S. E. of the Caspian Sea, corresponding nearly to the modern Persian province of Khorassan. It was wholly mountainous and inhabited by a rough, wild, and warlike people of Scythian descent, famous for their horsemanship and skill with the bow. Agriculture and trade they despised; war was their only occupation. They belonged successively to the Assyrian, Persian, Macedonian, and Syrian empires, but in 250 B. C. they established an independent kingdom under Arsaces, whose dynasty, the Arsacidae, ruled till 226 A. D. and formed a vast empire, extending from the Euphrates to the Indus. The Romans attacked them several times, but without success; but Artabanus IV. was killed in 226 A. D. in a rebellion, and the dynasty of the Arsacidae was followed by that of the Sassanidae, a Persian family. The Persian influence now became the ruling one in Asia till the Mohammedan conquest, 651 A. D.

Participle [through the Fr. *participe* from Lat. *participium*, a deriv. of *particeps*, sharing, participating; *pars*, part + *ca'pere*, take. The Lat. word is merely a translation of the Gr. *μετοχή*, deriv. of *μετέχειν*, to share; *μετά*, among + *ἔχω*, have]: an adjective verbal; an adjective formation, closely attached to the verb, and sharing with it meaning, the government of cases, and tense. In the parent Indo-European the boundary-line between participles and adjectives

was less clearly fixed than it appears in the separate languages. The participle had not become an established part of the mechanism of the parent speech. Indo-European adjective suffixes have therefore been employed to form participles in these languages; thus *-to-*, *-no-* (*-ono-*), *-io-*, *-teuo-*, *-lo-*, *-ent-*, *-meno-*. Of these the English uses three: (1) *-to-*, which forms the past passive participle of the regular or weak verbs, as in *tamed*: Germ. *ge-zähmt*: Goth. *ga-tamida* < Indo-Europ. *domatō-s* > Sanskr. *dami-tā*: Lat. *domitus*. Three forms of the suffix appear, as in *blesséd*, *loved*, *blest*. (2) *-ono-*, which forms the past passive participles of the irregular or strong verbs, as in *given*: Germ. *gegeben*: Goth. *gibans*; cf. Germ. *ge-worden*, Goth. *waúrþans*, Sanskr. *vayrtānd-s*. The prefix *ga-* (*ge-*, *gi-*) which commonly attached itself as a characteristic of past participles in Teutonic survives in English only in traces in a few archaizing words, like *yclept*. In German the compound verbs with inseparable prefix omit the *ge*, as *erfunden*, *verschunden*. Relics of old participles with omitted *ge-* are also found in *können*, *lassen*, etc., e. g. in *hat singen können*, *hat kommen lassen*. (3) *-ent-* (*-nt-*), which forms the present active participles, like *loving*, *singing*. This ending (M. Eng. *singinge*) succeeded to O. Eng. *-ende* in late Middle English, and soon caused confusion with the substantives in *-ing* (O. Eng. *-ung*, *-ing*), like *learning* (O. Eng. *leornung*). The original ending appears in *bearing*: Germ. *gebärend*: Goth. *bairands*; Sanskr. *bhārant*: Gr. *φέρων* (*-οντ-*): Lat. *ferens*. The present participle in English may be used passively, as in *The house was building*, but the necessity of avoiding the ambiguity involved in cases like *The boy was whipping*, for *being whipped*, is bringing into standard use the substitute *is being built*. BENJ. IDE WHEELER.

Partinico, päär-tee'nē-ko, or **Partenico**: town; in the province of Palermo, Sicily; about 17 miles W. of the city of Palermo (see map of Italy, ref. 9-E). It is situated in a wide valley, and is surrounded by calcareous mountains rising in the form of isolated pyramids. The vine and the olive thrive in this region, and the inhabitants are chiefly occupied with the manufacture and sale of wine and oil. Pop. 21,000.

Partition: See JOINT OWNERSHIP.

Partnership [deriv. of *partner* (by anal. of *part*) for *partnerer*, from O. Fr. *parsonnier*, liter., portioner, deriv. of *parson*, portion < Lat. *partitio*, division]: "the relation which subsists between persons carrying on a business in common with a view of profit." (British Partnership Act, 1890, § 1.) The English law of partnership is modern—the product mainly of the nineteenth century. Blackstone barely refers to it. The earliest treatise on the subject was published in 1794 by W. Watson, who asserts that "the true use of partnership was discovered" during Elizabeth's reign. In the early English digests partnership cases are presented under the titles *Merchants* or *Lex Mercatoria*; and very naturally, as the decisions are rested on the customs of merchants. (*Jeffreys vs. Small*, 1 Vernon 217, A. D. 1683.) Although our law of partnership had its origin in mercantile customs, its development has been seriously affected by common-law rules, which have been applied in some instances by the courts with unfortunate results.

Nature of Partnership.—The mercantile conception of a partnership is that of an entity distinct from the partners. This view has been championed by distinguished judges in England and the U. S. Chief Justice Hornblower, in *Curtis vs. Hollingshead* (2 Green, N. J. Law, at p. 410), declares, "A partnership is considered in law as an artificial person, or being, distinct from the individuals composing it." Master of the Rolls Jessell, in *Pooley vs. Driver* (5 Chancery Division, at p. 476), asserts: "Everybody knows that partnership is a sort of agency, but a very peculiar one. You can not grasp the notion of agency, properly speaking, unless you grasp the notion of the existence of the firm as a separate entity from the existence of the partners." Similar but more guarded statements of the same doctrine are found in *Bank of Buffalo vs. Thompson* (121 N. Y. 280) and in *Meehan vs. Valentine* (145 U. S. 611). On the other hand, the mercantile view has been expressly, almost contemptuously, repudiated by other judges. In *Hallowell vs. Blackstone Bank* (154 Mass. 359) Justice Holmes says: "Cory on accounts and Lindley on partnership have made it popular to refer to a mercantile distinction between the firm and its members; but we have no doubt that our merchants are perfectly aware that claims against their firms are claims against them." Lord Justice Kay (*In re Beauchamp Brothers* (1894), 1

Queen's Bench, at p. 7), referring to counsel's argument that a partnership is an entity, asserts, "It is no such thing, and the rules do not mean anything of the kind." Had the courts accepted and consistently enforced the mercantile conception of a partnership, this branch of the law would have been much simplified and improved. While they have not adopted it, they have established certain doctrines, as will appear from our subsequent discussion, which fully recognize its soundness. The Partnership Act of 1890 declares, "In Scotland a firm is a legal person distinct from the partners of whom it is composed."

At common law any number of persons may unite in a partnership. This is sometimes modified by statute, as by the Companies Act, 1862 (25 and 26 Vict., c. 89), which limits the members of a banking partnership to ten, and those of a partnership for any other purpose to twenty persons. In the absence of prohibitory legislation, a partnership may divide its capital into transferable shares (see JOINT-STOCK COMPANY), and thus enable any of its members to dispose of their interests to strangers without dissolving the firm. The shares in mining partnerships are thus transferable, by mercantile custom. In the normal partnership, however, *delectus personarum* is a fundamental rule; each partner has the right to choose his associates, and no one can become a member of the firm without the consent of every member. This relation is presumed to be founded on personal confidence between the partners, for the incapacity or dishonesty of any one may inflict irreparable injury upon his associates.

How Created.—A true partnership originates in an agreement of the partners. It follows that the members of a firm must possess contractual capacity (see ALEX, CONTRACT, CORPORATION, INFANTS, and MARRIED WOMEN), and that if the partnership be illegal it has no legally enforceable rights against third persons, nor have its members any against each other. Persons may enter into an association by agreement without becoming partners. Their association, to be a partnership, must be organized to carry on a business with a view of profit. Hence a social club, or a charitable organization, or a political committee, or an association formed to open and grade a street, or to resist the claims of a particular patentee or to build a meeting-house which is to be the property of the associates in the proportion of their payments, or to buy and divide lands, or to cultivate a farm on shares, or to engage in the production of articles which are to be divided among the associates, is not a partnership. In neither of these cases is a business carried on in common with a view of profit. It must be admitted that the term business is somewhat vague, and that judicial definitions of it are not harmonious. The tendency of modern decisions, however, is fairly expressed in the Partnership Act, which defines the expression as including "every trade, occupation, or profession."

While an agreement between persons is necessary to institute the relation of partnership, such agreement need not declare expressly their intention to become partners. On the other hand, it may call them partners without creating a partnership. (*Livingston vs. Lynch*, 4 Johnson's Chancery, at pp. 592-593.) Whether this relationship has been instituted is in each case a question of intention, to be determined as a fact from all the language and acts of the parties. It is not essential that they should plan actually to become partners. They may have been ignorant of the law, and unconscious of the legal results of their conduct; or they may have tried to evade the law by giving to the transaction the appearance of a loan of money, or the use of property or personal services, on the part of one or more of the associates to his fellows, while securing to such one or more all of the advantages of a partnership; yet if they have carried on intentionally a business in common with a view of profit, they are partners. While the business must be carried on in common, it is not necessary that each partner engage in the management. It is enough that it be carried on in his behalf as a common proprietor. Nor is it essential that each partner should share in the losses of the business. One or more may be guaranteed against loss by his copartners.

That the intention of the contracting associates to carry on a business in common with a view of profit is the true test of a partnership, has not always been recognized by the courts. In England, until the decision of the House of Lords in *Cox vs. Hickman* (8 House of Lords Cases 268, A. D. 1860), it was generally understood that participation in the profits, or at least in the net profits of a business, constituted one a partner. "He who takes a moiety of all profits," it

was said, "shall by operation of law be made liable to losses, if losses arise, upon the principle that by taking a part of the profits he takes from the creditors a part of the fund which is the proper security to them for the payment of their debts." (*Waugh vs. Carver*, 2 H. Blackstone 235, A. D. 1793.) Various exceptions were established from time to time, and in *Cox vs. Hickman* the House of Lords declared that this doctrine was not a part of the law of England: that "the real ground of the liability" of a partner "is that the trade has been carried on by persons on his behalf"; that in determining whether it so has been carried on, participation in the profits is an important but not a decisive fact; that the question is to be answered in accordance with the terms of the contract between the parties. The principles of this decision have been followed by the English courts in subsequent cases, and are now a part of the statute law of Britain. *Cox vs. Hickman* had been anticipated by several State decisions (e. g., *Loomis vs. Marshall*, 12 Conn. 69, and *Polk vs. Buchanan*, 5 Sneed (Tenn.) 721), and its doctrine is enforced by most of the courts in the U. S. Even the New York court of appeals, while professing still the form of the older English doctrine, has discarded its substance. In a recent decision, after restating the old rule and the grounds upon which it was based, the court said: "Exceptions to the rule are, however, found in cases where a share in profits is contracted to be paid as a measure of compensation to employees, for services rendered in the business, or for the use of moneys loaned in aid of the enterprise; but where the agreement extends beyond this, and provides for a proprietary interest in the profits as a compensation for moneys advanced and time and services bestowed as a principal in its prosecution, we think that the rule still requires such party to be held as a partner." *Hackett vs. Stanley*, 115 N. Y. 625.

The partnership contract sometimes provides that the interest of a partner in case of his death shall remain in the business until a certain date. Such a provision does not give to the executor a right to enter the firm, nor does it subject him to the liabilities of a partner. Where the contract provides that the executor shall be admitted to the firm, it does not compel him to enter the partnership; but if he does, he becomes personally liable for the firm debts, and is entitled to indemnity to the extent of the share of the estate embarked by the will in the business, and no further. *Wild vs. Davenport*, 48 N. J. Law 129.

Quasi-partnership.—There is some judicial authority and an abundance of judicial dicta for the proposition that a partnership may exist as to third persons, where there is none between the parties, but it has been rejected by the great majority of courts as indefensible. Its unsoundness was never exposed more clearly than by Baron Bramwell in *Bullen vs. Sharp* (Law Reports, 1 Common Pleas 86): "Partnership means a certain relation between two parties. How, then, can it be correct to say that A and B are not in partnership as between themselves; they have not held themselves out as being so, and yet a third person has a right to say they are so as relates to him? That must mean *inter se*; for partnership is a relation *inter se*, and the words can not be used except to signify that relation. A is not the agent of B; B has never held him out as such; yet C is entitled, as between himself and B, to say that A is the agent of B! Why is he so entitled if the fact is not so, and B has not so represented?" According to the prevailing view, then, there is no true partnership as to third persons where there is none between the parties; but the parties, by holding themselves out to third persons as partners, may subject themselves to a partnership liability to such persons. This holding out may be by express statement or by conduct. One who asserts that he is a member of a firm, or who knowingly suffers himself to be represented as a member, is liable as a partner to those who give credit to the firm on the strength of such assertion or representation. It is often said that one who holds himself out to the world as a partner is liable as such to every one who deals with the firm, whether the holding out was known to the third person or not; and there is some judicial authority for this doctrine based upon considerations of public policy. (*Poillon vs. Seear*, 61 N. Y. 456; *Borthett vs. Raymond*, 139 N. Y. 275.) The better view, however, is that the liability of a "holding out" or quasi-partner rests upon the principle of estoppel, which is that one who has induced another to believe in and act upon the existence of a particular state of facts can not be heard, as against that other, to deny the truth of those facts. *Thompson vs. Bank*, 111 U. S. 530.

Title to Partnership Property.—In dealing with this branch of the subject the courts have been forced to accept, to a greater or less extent, the mercantile idea of a partnership. Personalty may be transferred to or by the firm in the firm name, and title thereto is in the firm and not in its members as individuals. A chattel mortgage on firm property by one partner to secure his separate debt, or the levy of an execution thereon, issued on a separate judgment, does not subject it to a lien as against the firm or its creditors. All that is encumbered in either case is the debtor partner's share. This is not the interest of a tenant in common, for the transfer of a partner's share gets no title to an undivided share of any chattel; he obtains only a chose in action, a right to an account, and to any surplus of proceeds which may belong to the debtor partner on account of the property mortgaged or levied on, after the payment of firm debts and the adjustment of the equities between the partners. It is not the interest of a joint tenant, for the full legal and equitable title does not survive as between partners.

The tendency of modern decisions is to treat firm real estate as partnership stock or personalty, so far as the rules of conveyancing and of the recording acts will permit. In Britain this doctrine has been carried to its logical conclusion. The Partnership Act provides: "Where land or any heritable interest therein has become partnership property, it shall, unless the contrary intention appears, be treated as between the partners (including the representatives of a deceased partner), and also as between the heirs of a deceased partner and his executors or administrators, as personal or movable and not real or heritable estate" (§ 22). Sir Frederick Pollock has expressed the belief that this rule was well settled before the statute, and may safely be accepted in other common-law jurisdictions. However, the doctrine which prevails in most of the U. S. does not sustain fully his view. It treats partnership realty as converted into personalty only for the purposes of paying partnership liabilities. The surplus retains all the incidents of real estate. For example, a deceased partner's share passes to the heir and not the personal representative, and is subject to dower.

The deed of real estate to a firm should contain the individual names of the partners and the firm name. If the firm name is employed as that of the grantee, the effect of the deed will vary with the jurisdiction. In some States it will operate not as a conveyance, but as a contract to convey. In others it will pass the legal title to any of the partners whose names appear in the firm appellation, but if this does not contain the name of a member, the deed will be inoperative, and the grantor will retain the legal title in trust for the firm. In still others it will pass the legal title to the persons composing the firm at the time of the transfer. Wherever firm real estate stands in the name of a partner, the equitable title is in the firm, and he may be compelled to deal with it as firm property. While he holds the legal title a purchaser for value from him without notice of the partnership's rights may get good title. In case he disposes of the property to such a purchaser, and reinvests the proceeds in other lands, these become firm property.

A Partner's Powers.—Each partner is a general agent of the firm, and therefore has full authority to do any act which is necessary to the transaction of the firm's business in the way in which it is usually carried on. Whether an act in question is within the scope of the partner's apparent authority is "to be determined by the nature of the business and by the practice of persons engaged in it." The authority of partners in a trading firm is much more extensive than that of non-trading partners. In case of the latter—such as lawyers, farmers, mine or quarry owners, hotel-keepers, theater-managers—a partner has apparent authority to sell any of the personal chattels of the firm, or to purchase for it any chattels ordinarily used in its business, or to receive payment and give receipts and releases of debts, or to engage servants for the business. A member of a trading firm has apparent authority to do any of these acts, and also to bind his firm by negotiable paper, by borrowing money on the firm's credit, and by pledging its property as security therefor. He has not apparent authority to bind his firm by a sealed instrument, for the firm has no seal; nor to make a general assignment of firm property for the benefit of creditors, since this necessarily puts an end to the firm's business; nor submit a firm claim to arbitration; nor to make the firm a surety for third persons, unless the usage of the firm or of others engaged in the like business warrants such an act; nor to change in any ma-

terial respect the business of the partnership. The ordinary authority of a member in either a trading or non-trading firm may be limited by an agreement of the partners, which is communicated to those dealing with the firm. As a partner is the general agent of the firm, his admissions and declarations relating to the affairs of the partnership and in the ordinary course of its business are its admissions and declarations. His representations as to the existence of a firm, or as to his authority to bind it, are clearly not within this rule. Whether a partner's authority to bind the firm by admissions and declarations concerning partnership transactions continues after dissolution, is a question upon which the courts differ. One line of decisions, following a leading English case (*Wood vs. Braddick*, 1 Taunton 104, A. D. 1808), holds that it does, while the opposite doctrine is maintained by decisions as numerous and respectable which follow a leading New York case. (*Hackley vs. Patrick*, 3 Johnson 536, A. D. 1808.) The former seems to be the sounder view. The courts have also disagreed as to the power of a partner to waive the statute of limitations after dissolution; but the weight of argument and authority is against his possession of it. "Notice to any partner, who habitually acts in the partnership business, of any matter relating to partnership affairs, operates as notice to the firm, except in the case of a fraud on the firm committed by or with the consent of that partner." Partnership Act, § 16.

Liability of Partners.—The members of a firm are jointly liable for all its contract obligations. Such has been always the prevailing doctrine in the U. S., except as modified by statute; but in England, until the decision of *Kendall vs. Hamilton* (4 Appeal Cases 504, A. D. 1879), it was understood that the liability was joint and several in equity. Several liability is still the rule in Scotland (Partnership Act, § 9), and in the U. S., as well as in Britain, the estate of a deceased partner is severally liable for partnership obligations. In most of the U. S., however, a firm creditor is not allowed to proceed against the estate of a deceased partner, unless the firm and the surviving partner are insolvent. The liability of partners for the torts of one or more within the scope of a partner's apparent authority is joint and several.

Although, as a rule, the liability of partners is joint, a judgment in an action against all is enforceable at law against the property of the firm or against that of any member at the creditor's option, as the entire fortune of each partner is liable for firm debts.

Duties of Partners.—Because of the power which the law gives to each partner, it requires him to exercise it with the utmost good faith. He is bound to render true accounts and full information of all partnership affairs. If, without his partners' consent, he derives any benefit from any firm transaction, or from any use by him of the property, name, or business connection of the partnership, this belongs to the firm; and he is not allowed, without his partners' consent, to carry on any competing business. It is the duty of the minority of a firm to acquiesce in the decision of the majority where differences arise as to ordinary matters connected with the partnership business, but not in a decision which works any change in the nature of the business, or in the membership of the firm. Each member is bound to devote his time and energies to the affairs of the firm without special remuneration. Of course these duties may be, and often are, varied by the agreement of the parties.

Dissolution and its Consequences.—A partnership may be dissolved by the agreement of the parties, by the operation of law, or by the decree of a court. The dissolution may be expressly provided for in the partnership contract, or the agreement of the parties may be inferred from the circumstances of the case. If the partnership is for a single adventure, it terminates with the close of that adventure. If it is organized to carry on a business for an undefined time, it is a partnership at will, terminable by notice from either partner. Where it is entered into for a fixed term, the better doctrine seems to be that it can not be dissolved by the mere act of one single partner, although there is considerable authority in the U. S. for the view that it can. (See *Solomon vs. Kirkwood*, 55 Mich. 256.) The happening of any event which makes the business of a firm unlawful, or the partnership relation between its members unlawful, works its dissolution by the operation of law, as does the death or the bankruptcy of any partner in the absence of an agreement to the contrary. A court may decree the dissolution of a firm because of the insanity or permanent incapacity of a partner, or because a member other than the one

suings has been guilty of serious misconduct, or because the circumstances of the case show that a decree of dissolution will be just and equitable.

Unless the dissolution is produced by operation of law, it is important that notice thereof be given, or the retiring partners may be made liable for the debts of the new business. Actual notice must be given to those who have dealt with the old firm, but no particular form is required, while notice by publication in a newspaper of general circulation in the vicinity is sufficient as to all others. It is the legal duty of all members to concur in such notification.

After a firm is dissolved, the authority of each partner, unless bankrupt, and his partnership rights and obligations continue for the purposes of winding up the firm's affairs only. All executory contracts of the partnership are to be performed; its assets, including the good will of the business, are to be converted into cash and to be applied first to the payment of firm creditors, next to the payment of advances, if any, by the respective partners, then to the payment of the capital furnished by each partner, and the residue is to be divided among the partners in the proportion in which profits are divisible. In the absence of an agreement on the subject, profits are divisible equally between the partners, and not in proportion to their contributions of capital. The losses of a partnership business are payable first out of the profits, next out of capital, and then by the various partners in the proportion in which profits are divisible. In case any of the partners are wholly insolvent, the losses are to be borne ratably by the others.

The position of a surviving partner has been rendered anomalous by the failure of the courts to accept the entity idea of a partnership. He holds the legal title to the firm personality. If sued on a separate debt, he can set off a firm claim; and if he sues on a firm credit his separate indebtedness may set off against it. He can make a general assignment of firm property for the benefit of firm creditors with preferences. Yet he has not a joint tenant's benefit of survivorship. He is bound to a partner's good faith in disposing of the firm property and in distributing it to firm creditors and to the representatives of deceased members. In Britain, however, this duty does not amount to a trust, and a deceased partner's representative has not the rights of a *cestui que trust* in the firm property; his claim is only "a debt accruing at the date of the death"; "there is nothing fiduciary between the surviving partner and the dead partner's representative, except that they may respectively sue each other in equity." (Partnership Act, § 43; *Knox vs. Gye*, Law Reports, 5 House of Lords 656.) The prevailing view in the U. S. is somewhat different. It is fairly indicated in *Preston vs. Fitch* (137 N. Y., at pp. 56-58), where it is said that "the property of a late firm comes to the surviving partner impressed with a certain kind of a trust, founded upon his duty to dispose of or realize upon such assets, and therefrom to pay the debts of the late firm, and to pay over the share of any balance to the estate of the deceased partner." The exact nature of this trust and the respective legal rights of the survivor and of the deceased partner's estate remain quite indefinite; and it is impossible to deduce from the decisions, even within a single jurisdiction, a body of consistent rules upon this topic.

We have seen that a firm creditor may enforce at law his judgment against the firm property or that of any partner. In case of the death of a partner, or of the insolvency or bankruptcy of a firm or any of its members, and of the administration of the partnership and individual estates, a different rule obtains, except in a few jurisdictions (e. g. Connecticut, Louisiana, South Carolina, Vermont, Virginia), and firm property is applied first to firm debts, while the separate property of each partner is applied first to his individual debts, any surplus from either estate being carried to the other. This rule was adopted in early bankruptcy cases as "a sort of rough code of justice," and has been adhered to as a matter of convenience, although at variance with the mercantile system of settling accounts, and open to severe criticism. A joint and several obligation of the partners, incurred in the firm business, or an obligation upon which the firm and its members, or any of them, are successively liable, as a note made by the firm and indorsed by the partners individually, is entitled to share in each estate until paid in full. As a rule, the firm can not prove against the estate of one of its partners in competition with his separate creditors, nor can a partner prove against the firm estate or the estate of any copartner in competition with firm creditors. An exception is made in case the property of the

firm has been fraudulently converted by a partner, or that of a partner has been so converted by the firm without consent or subsequent ratification, and in Britain in the case of debts accruing between distinct trades carried on respectively by the firm and by a partner.

Limited Partnership.—New York, first of the common-law States, adopted this institution in 1822, borrowing many of its features from the *société en commandite* of the French law. Later in the same year Connecticut introduced it into her legal system, and these two statutes have formed the models for legislation upon this subject by most of the U. S. Several attempts have been made to introduce it into Britain, but without success. Limited partnership statutes, it is judicially declared, have two main objects: (1) To enable capitalists, without incurring the risks of general partners, to invest money, and thus promote trade, and to help those who have not sufficient wealth to carry on business ventures for which they have the requisite integrity and capacity; (2) to protect those dealing with the firm. The leading characteristics of this system are: (1) The publication of the names of the general and those of the special partners, of the amount of capital, of the nature and location of the business, and of the date of its commencement and termination; (2) the actual contribution of the avowed capital; (3) the protection of this partnership fund from secret and improper diminution for the benefit of the special partner or favored creditors. A limited partnership must contain one or more general partners, who have the authority and are subject to the liabilities of common-law partners; while the special partners are prohibited from taking part in the active management of the business, and are not liable for its obligations beyond the amount of their capital. Such a partnership can be organized only by complying strictly with all the substantial requirements of the statute. An honest intention to comply with its terms will not suffice, and a firm which has failed to conform to the statutory provisions is a general partnership with all its common-law liabilities. Although this institution was borrowed from the civil law, the courts have resorted rarely to civil-law authorities when dealing with questions relating to it, but have applied to them, so far as possible, the common-law rules. At first they were disposed to give to limited partnership statutes a very strict construction in favor of firm creditors, but at present they look upon this legislation "as serving a purpose consistent with the public welfare, and entitled to a reasonable construction for the protection of special partners as well as for that of others." (*Fifth Avenue Bank vs. Colgate*, 120 New York 381.) For the special rules governing the formation of limited partnerships, their renewal, the conduct of their business, and their dissolution, the statutes of each jurisdiction should be consulted.

Standard treatises on the subject of this article are those of Bates and of Troubat on *Limited Partnership*; of Bates, Lindley, Parsons, and Story on *Partnership*. A valuable collection of cases on partnership has been published by Prof. Ames.

FRANCIS M. BURDICK.

Parton, JAMES: author; b. at Canterbury, England, Feb. 9, 1822; was taken to New York when five years of age; educated in an academy at White Plains, where he became a teacher at the age of nineteen; subsequently taught school in Philadelphia and New York; was for some years assistant editor of *The Home Journal*; was a prolific and successful author, chiefly in the field of biography, and a popular lecturer upon literary, social, and political topics; in 1856 married the well-known story-writer "Fanny Fern"; resided in New York until Mar., 1875, when he became a resident of Newburyport, Mass. Among his works are *Biographies* of Horace Greeley (1855; new ed. 1868), Aaron Burr (1857; new ed. 2 vols., 1864), Andrew Jackson (3 vols., 1860), Benjamin Franklin (2 vols., 1864), Thomas Jefferson (1874), and Voltaire (1881); *Humorous Poetry of the English Language* (1857); *People's Book of Biography* (1868); *Smoking and Drinking* (1868); *Famous Americans of Recent Times* (1870); *Topics of the Time* (1871); *Triumphs of Enterprise* (1871); *Words of Washington* (1872); *Caricatures of the Times and Lands* (New York, 1875); *Cyclopedia of Industry* (1884; 2d series 1891). D. at Newburyport, Oct. 17, 1891.

Revised by H. A. BEERS.

Parton, SARAH PAYSON (Willis): story-writer; wife of James Parton and sister of Nathaniel P. Willis; b. at Portland, Me., July 7, 1811; married Charles H. Eldredge, of Boston, a bank cashier, on whose death she resorted to literature as a means of subsistence; obtained great success by her

short humorous essays entitled *Fern Leaves from Fanny's Portfolio* (2 vols., 1853-54); *Little Ferns for Fanny's Little Friends* (1853); wrote regularly for many years for *The New York Ledger*; issued several volumes of collected articles, and was author of two novels, *Ruth Hall* and *Rose Clark*. D. in New York, Oct. 10, 1872. See *Fanny Fern: a Memorial Volume, containing her Select Writings and a Memoir*, by James Parton (1873). Revised by H. A. BEERS.

Part-ownership: a species of title to personal property which is employed mainly in the case of SHIPPING (*q. v.*). It is distinguished from joint tenancy by the absence of survivorship, from tenancy in common by the absence of the right to force a severance of the various owners' interests, and from partnership title by the fact that each person interested owns an undivided share of a chattel instead of a share in the business. Part-owners do not constitute a business entity, and are not, like partners, agents by reason of their business relations. In order to subject his associates to any obligation, or their interests in the common property to any lien, a part owner must obtain from them the authority therefor in fact; he possesses none by operation of law.

FRANCIS M. BURDICK.

Partridge [M. Eng. *partriche*, from O. Fr. *pertris*, *perdrix*; Ital. *perdice*, *pernice*; Span. Portug. *perdiz* < Lat. *perdix* = Gr. *πέριδος*, connected, either as a derivative or an assimilation (folk-etym.), with *πέριδομαι*: a name applied to various medium-sized game birds of the grouse family (*Tetraonidae*). In England the partridge is *Perdix cinerea*, a bird about a foot long, of a delicate mottled gray. The



The common partridge of Europe.

red-legged partridge (*Caccabis rubra*) of Europe is slightly larger and more handsome. In the northern parts of the U. S. the name is given to the ruffed grouse (*Bonasa umbellus*), while in the southern this bird is known as the pheasant and the term partridge bestowed upon the quail, or bobwhite (*Colinus virginianus*). Finally, sportsmen in Australia have dubbed the true quail (*Turnix*) partridge, and in South America given the name to some of the larger tinamous, birds of a totally different group. F. A. LUCAS.

Partridge, ALDEN, A. M.: soldier; b. in Norwich, Vt., about 1785; graduated at the U. S. Military Academy Oct. 30, 1806, when he was appointed first lieutenant of engineers; captain 1810; was retained at the academy as Assistant Professor of Mathematics until Apr., 1813, when he was appointed Professor, and in Sept., 1813, Professor of Engineering; commanded at West Point Jan., 1815, Nov., 1816, and Jan. to July, 1817; resigned Apr., 1818, and in 1819 was appointed principal of the surveying party to determine the northwest boundary of the U. S. In 1820 he founded a military school at Norwich, Vt., subsequently incorporated in the Norwich University, of which he was appointed president. He also established military schools in New Hampshire, Connecticut, Delaware, Pennsylvania, and Virginia, and delivered lectures on military matters throughout the U. S. He was appointed surveyor-general of Vermont 1822, and was a member of the Vermont Legislature 1833-34 and 1839. D. at Norwich, Vt., Jan. 17, 1854.

Revised by JAMES MERCUR.

Partridgeberry, or Checkerberry: the common name of a trailing evergreen herb, *Mitchella repens*, belonging to the Madder family (*q. v.*); found in the U. S., Canada, Mexico, and some parts of South America. It bears a red fruit, about the size of a whortleberry, which remains on the stem all winter. The wintergreen (*Gaultheria procumbens* of the Heath family) is sometimes, but incorrectly, called partridgeberry or checkerberry.

Revised by CHARLES E. BESSEY.

Partridge-wood: a name applied in commerce and the arts to several handsome tropical woods used for veneering and for making small ornamental wares. It is more generally given to the wood of *Andira inermis*, a leguminous tree of the West Indies and South America. This wood is hard, and in Brazil is used in ship-building.

Party Wall: as commonly understood, a wall which stands on the line between two adjoining lots of land belonging to different owners, and in which both proprietors have common rights and a common use. Provided such common rights exist, it is not, however, essential that the wall stand on the line between the adjoining lots in order to have the character of a party wall. It may have that character though it stands wholly on the land of one proprietor (see Metropolitan Building Act, 18 and 19 Vict., ch. 122), and under some circumstances even where the wall does not abut on the line. (*Rogers vs. Sinsheimer*, 50 N. Y. 646.) In the common case, where the wall rests on both lots, the adjoining proprietors are, by the English common law, regarded as tenants in common of the wall, and probably, for the time being at least, of the land on which it stands; and the rights and obligations of the parties are such as pertain to that relation. (See JOINT OWNERSHIP.) In the U. S., however, each of the adjoining owners retains the fee of the portion of the wall which rests upon his own soil and has an easement of user and support in the portion resting on the soil of his neighbor. From these principles are derived a number of special rules in respect to the use and maintenance of the wall, its repair, additions to its height, its rebuilding when necessary, etc., which differ in some important particulars from those which regulate the relations of the parties under the English doctrine. In England (so far at least as the London metropolitan district is concerned) and in several of the U. S. the mutual rights and obligations of the parties are carefully regulated by statute. The special rules above referred to will be found set forth at length in Washburne on *Easements and Servitudes* and in the *American and English Encyclopedia of Law*, title *Party Walls*.

GEORGE W. KIRCHWEY.

Pārvati [= Sanskr. *Pārvatī*, liter., *femin. of pārvata*, belonging to or coming from a mountain; so called because originally a personification of the mountain stream *Durgā*, flowing from (i. e. born of) the mountain *Himavant*]: a female divinity of the ancient Hindu pantheon, the consort of Siva. See HINDUISM.

Parvin, THEOPHILUS, A. M., M. D., LL. D.: obstetrician; b. in Buenos Ayres, Argentine Republic, Jan. 9, 1829; received his literary education at Lafayette College and at the State University of Indiana, where he graduated in 1847; graduated M. D. from the University of Pennsylvania in 1852; the following year began to practice medicine in Indianapolis; was Professor of Obstetrics in the Medical College of Ohio, in the medical department of the University of Louisville, in the Medical College of Indiana, and in the Jefferson Medical College, Philadelphia, where he now holds that chair. He has been president of the Indiana State Medical Society, of the Association of American Medical Journalists, of the American Academy of Medicine, of the American Medical Association, and of the American Gynecological Society. His principal work is *The Science and Art of Obstetrics* (Philadelphia, 1886). He also edited *Winckel on Diseases of Women*.

S. T. ARMSTRONG.

Pasadena: city; Los Angeles co., Cal. (for location, see map of California, ref. 12-F); on the Los Angeles Terminal and the Southern Pac. railways; 9 miles N. E. of Los Angeles. It is at the foot of the Sierra Madre Mountains, at an elevation of 850 feet above sea-level, and is in the beautiful San Gabriel valley, noted for its orange and lemon groves and the cultivation of smaller fruit. The city is largely a residential place, and its unsurpassed climate and attractive scenery have given it wide repute as a winter resort. There are 9 grammar schools, a high school, the Throop Polytechnic Institute, the only institution of its

kind on the Pacific coast, 2 private preparatory schools, several kindergartens and other private schools, a public library, 2 national banks with combined capital of \$200,000, a State bank with capital of \$50,000, and a daily and 2 weekly newspapers. The Mount Lowe Railway ascends the Sierra Madre Mountains here. Pop. (1880) 391; (1890) 4,882; (1894) estimated, 10,000. EDITOR OF "EVENING STAR."

Pascagou'la River: a stream formed in Greene co., Miss., by the union of Chickasawha and Leaf rivers. It flows S. into Pascagoula Bay, a beautiful arm of the Mississippi Sound. The river sometimes floods its valley at high water. It is navigated by small steamboats. Much timber is cut in its pine forests for the New Orleans market.

Pascal', BLAISE: mathematician and moralist; b. at Clermont-Ferrand, Auvergne, France, June 19, 1623. He was a precocious child, and in 1631 his father removed to Paris the better to care for his education. At the age of twelve he rediscovered by himself elementary geometry, which he had not been allowed to study; at seventeen his treatise on *Conic Sections* made him celebrated; at nineteen he made a calculating-machine to aid his father, who had removed to Rouen to take an office in the treasury department. These mathematical studies he followed up with valuable investigations in physics, on the weight of the atmosphere. When little over twenty he came under the influence of the Jansenist writers of Port-Royal, and gave himself up to fervent piety; but the severity of his study had undermined his health; his physician forbade him all work, and recommended the diversions of society. For a time these diversions, in a group of rather gay epicureans, absorbed him; but the entrance of his sister into Port Royal, his narrow escape from death in an accident at the bridge of Neuilly, and other events, brought him back to his former religious fervor, and he retired to Port-Royal. Though he returned from time to time to mathematical studies, developing the calculus of probabilities, and giving a solution of the problem of the cycloid (*Traité général de la Roulette*, 1659), his main interest was henceforth fixed on questions of morals, philosophy, and religion. He spent his last years, broken in health and wracked with pain, in the practice of a severe asceticism. D. Aug. 19, 1662. His two great works are the *Lettres provinciales* and the *Pensées*. The former was written in defense of his friend, Antoine Arnauld, who, involved in the Jansenist controversy, was the central object of the Jesuits' attack on Port-Royal. The first four letters are limited to a defense of Arnauld on the points at issue; but the remaining fourteen are a vigorous and eloquent attack upon the moral and religious principles and practices of the Jesuits. The *Lettres provinciales* were intended to carry the cause before the bar of public opinion, and the qualities of style, grace and clear precision, incisive wit, delicate and biting irony, intense earnestness, rising to indignant eloquence, caught the popular attention. In them French prose revealed a new power, and they are of the first importance in the development of French prose style. In their first separate and fugitive appearance (1656-57), and in the collected edition prepared by Nicole, they had an immense circulation, and they have been reprinted in a vast number and variety of editions. The other great work of Pascal, the *Pensées*, consists of the fragmentary materials of a projected *Apologie de la religion catholique*, which his health did not allow him to finish; they are "thoughts," single reflections or aphorisms, often of remarkable depth, of a soul that felt keenly the intellectual difficulties, and at the same time the imperious need of a firm religious faith. The minor works of Pascal comprise a *Discours sur les passions de l'amour*, *L'Esprit géométrique*, *L'Art de persuader*, three *Discours sur la condition des grands*, *Préface pour demander le bon usage des maladies*, and a few letters. An excellent edition, with a *Life* and notes, is that of E. Havet (2 vols., Paris, 1882). Cf. Sainte-Beuve, *Port-Royal*, liv. iii. The best English translation of Pascal's *Thoughts* is by C. Kegan Paul (London, 1885); latest translation of the *Provincial Letters* 1889.

A. G. CANFIELD.

Pas'chal I.: pope; b. at Rome; became abbot of St. Stephanus; succeeded Stephen IV. in 817; crowned Lothaire as emperor 823. D. Feb. 10, 824. — **PASCHAL II.** (*Raniero*), b. at Bleda, Italy, about 1050; was a Cluniac monk; became a cardinal-priest, and in 1099 succeeded Urban II.; was involved in life-long contests with the Henrys (IV. and V.) of Germany concerning investitures. Henry V. kept the pope in prison for some time. Similar troubles with Henry I. of

England were settled by compromise, by which Henry kept the substance of his former rights, but made unimportant concessions to the pope, and like concessions were made by the King of France. D. Jan. 21, 1118.

Paschal I.: antipope; a Roman archdeacon; elected pope by a faction of the Roman people and supported by the exarch of Ravenna in 687 A.D. Theodorus II., antipope, was chosen by another faction, but Sergius I. was declared the true successor of Conon, the deceased pope. Paschal was imprisoned as a simoniac and pronounced a magician. D. in 694. — **PASCHAL III.**, antipope (*Giniberto Crema*); b. in Lombardy; became in 1155 a cardinal-deacon, and in 1164 was declared pope by Frederick Barbarossa, whose partisan he was. D. at Rome, Sept. 20, 1168.

Pasco: See CERRO DE PASCO.

Pas-de-Calais, paa'de-kā'lā': department of France, formed out of the provinces of Artois and Picardy; bordering N. and W. on the Strait of Dover and the English Channel; area, 2,551 sq. miles. A range of low hills, rich in coal, iron ore, marble, and slate, traverses the department, ending in Cape Gris-Nez, and forming for a distance of several miles along the coast a row of cliffs similar to those on the opposite English coast. On both sides of this range of hills the ground is low, with a very fertile soil, except along the coast, which generally is marshy or sandy. Its agriculture and manufactures are in a very advanced state. Wheat, hemp, and fruits are largely cultivated; iron-foundries, glass-works, tanneries, mills, and beetroot-sugar factories are in operation, and important fisheries along the coast are carried on, especially in the neighborhood of Boulogne. Pop. (1891) 874,364.

Revised by R. A. ROBERTS.

Pa'sha, Pa'cha, or Ba'shaw [from Turk. *bash*, head, or from Persian *pa*, foot + *shāh*, king, the foot of the king]: an honorary Turkish title; originally given to princes of the blood, and afterward to persons honored with high official functions. The title is now, as a mark of favor, sometimes conferred on persons holding no office. Pashas are of three classes, the symbol of their rank being formerly one, two, or three horsetails, which were carried before them on state occasions. A district or province governed by a pasha is called a pashalik. The male members of the reigning house, with the exception of the sultan, are called effendi. E. A. G.

Pasht: See BUBASTIS.

Pasini, paa-see'nē, ALBERTO: genre-painter; b. at Busseto, near Parma, Italy, in 1820; pupil of Eugenio Ciceri, E. Isabey, and Théodore Rousseau; was awarded third-class medal, Paris Salon, 1859; second-class 1863; medal of honor, Paris Exposition, 1878; officer Legion of Honor 1878. His subjects are chiefly scenes in Turkey and other Oriental countries, and his pictures are notable for skillful painting and rich effects of color. His *Entrance to a Mosque* is in the Wolfe collection, Metropolitan Museum, New York. His studio is in Paris, but he spends much of his time in the East.

WILLIAM A. COFFIN.

Pasiph'æ (in Gr. *Πασίφα*): in Grecian myth, the daughter of Helios, wife of Minos, King of Crète. Minos, when seeking to become king, thought to strengthen his claim on the throne by the assertion that the gods would grant whatever request he might make. In proof thereof he prayed to Poseidon to send him a bull from the depths of the sea for the alleged purpose of sacrificing him to Poseidon. Poseidon sent the bull, and the astonished Cretans made Minos king, but Minos kept the miraculous bull, and in his stead offered in sacrifice to Poseidon a less magnificent animal from his own herd. Enraged at the perfidy of Minos, Poseidon made the bull insane and caused Queen Pasiphæ to fall desperately in love with him. With the help of Dædalus Pasiphæ succeeded in holding intercourse with the bull, and the result of this union was the MINOTAUR (*q. v.*).

J. R. S. STERRETT.

Pas'kevitch, IVAN FEDOROVITCH: field-marshal; Count of Erivan, Prince of Warsaw; b. at Poltava, Russia, May 19, 1782; was educated as a page at the court of Paul I. at St. Petersburg; entered the army in 1800; distinguished himself in the campaigns against Napoleon, and was made a general in 1814; conducted in 1826 the expedition against Persia, and took Erivan; commanded in 1829 a Russian army in Asia against the Turks, and captured Erzeroum; suppressed in 1831 the revolution in Poland, compelled Warsaw to capitulate, and was appointed viceroy. As such he governed with severity, but with justice; the principles

he held were detested by the Poles, but not the man. In 1849 he led the Russian armies into Hungary and quelled the revolution, and in 1854 he commanded the Russian army on the Danube against the Turks. This time, however, he met with nothing but defeat and repulses. He resigned and retired to Warsaw. D. at Warsaw, Feb. 1, 1856.

Paso del Norte: See EL PASO, TEXAS.

Paso del Norte, now called *Condado Juarez*: See JUAREZ.

Paspatis, ALEXANDER GEORGE, M. D., LL. D.: philologist and historian; b. in the island of Scio in the Ægean Sea, 1814. Seized during the massacre of 1822, he was sold as a slave at Smyrna. Set free by his purchaser, he was taken by a philanthropist to the U. S., and graduated at Amherst College in 1831. He studied medicine at the universities of Paris and Pisa (1834-39); practiced his profession at Constantinople (1840-78); then removing to Athens was professor in the university and president of the leading Athenian literary and philanthropic societies. D. Dec. 24, 1891. Well versed in sixteen languages, he published principally in English, French, and Greek. His chief publications are *Ἡ πόμνημα περὶ τοῦ Γραϊκοῦ Νοσοκομείου τῶν Ἑπτὰ Πύργων* (1862); *Études sur les Tchinghianais ou Bohémiens de l'Empire Ottoman* (1870); *Βυζαντινὰ Μελέται* (1877); *The English Version of the Revised New Testament* (1882); *Τὰ Βυζαντινὰ Ἀνάκτωρα καὶ τὰ περί Ἀντῶν Ἱδρύματα* (1885); *Χιανὸν Γλωσσάριον* (1888); *Πολιτοικία καὶ Ἀλυσίς τῆς Κωνσταντινουπόλεως ὑπὸ τῶν Τούρκων* (1890). He left unfinished, though almost complete, *Τὸ Γλωσσάριον τῶν Ἑλληνικῶν Διαλέκτων* and *Ἡ Κατάκτησις τῆς Πελοποννήσου*. E. A. GROSVENOR.

Pasque Flower [i. e. Easter flower. See PASSOVER]: a name given to a ranunculaceous herb of Europe and Asia (*Anemone pulsatilla*), and also to some other species of *Pulsatilla*. They are spring-blooming plants, with poisonous and medicinal qualities. See the article AXEMONE.

Pasquinade: an anonymous attack, of a witty or sarcastic character. The name is derived from a certain mutilated marble statue, or group, in Rome, placed at the corner of the Palazzo Braschi (the present ministry of the interior), upon which ever since the fifteenth century it has been the custom to paste such attacks. This torso, which really represents Menelaus with the body of Patroclus, looking for, succor in the midst of the battle, is popularly called *Pasquino*, as it is said, from a certain cobbler (or tailor, according to Castelvetro) of the end of the fifteenth century, Antonio Pasquino by name, at whose shop, close by the present situation of the fragment, idlers used to gather and make jests on passers-by and on the events of the time. It was the custom to frame the so-called *pasquinade*, or *pasquinades*, in the form of questions or answers directed to another famous statue, called Marforio, situated in the Via di Marforio, opposite the Mamertine prison. This latter statue, a colossal river-god, probably the Rhine or Danube, is now placed in the middle of the court (*cortile*) on the ground floor of the Capitoline Museum. A. R. MARSH.

Passaglia, πᾶς-σαλ'γιά, CARLO: theologian; b. near Lucca, Italy, Mar. 2, 1812; was educated in Rome, entered the Society of Jesus, and was appointed Professor of Theology in the Sapienza in Rome. He was considered one of the most learned theologians of Italy, and was very popular on account of the enthusiasm with which he embraced the liberal policy of Pius IX.; but in 1861 he had to flee in disguise from Rome, having published his *Pro causa Italica ad episcopos Italianos*, in which he declared that the temporal power of the pope was unnecessary, and exhorted Pius IX. to sacrifice his secular power for the unity of Italy. He was immediately appointed Professor of Moral Philosophy at the University of Turin, and continued his polemics against the pope in a series of brilliantly written pamphlets. In 1863 he was elected a member of the Italian parliament, and openly reproached the Government for cowardice on account of the continued occupation of Rome by the French. Among his works are a treatise on eternal punishment and a criticism of Renan's *Vie de Jésus*. D. in Turin, Mar. 14, 1887.

Passaic: city (formerly known as Acquackanonk); Passaic co., N. J.; on the Passaic river, and the Erie, the Del., Lack. and W., and Susquehanna railways; 5 miles S. E. of Paterson, the county-seat, 12 miles N. W. of New York city (for location, see map of New Jersey, ref. 2-E) It has gas and electric light plants, 3 electric street-railways, system of water-works supplied from above the Passaic falls, 4 miles

distant, 24 churches, 6 public-school buildings, public-school property valued at over \$120,000, free public library, a national bank with capital of \$100,000, 3 incorporated banks, and 2 daily and 5 weekly newspapers. The industrial establishments include dye and print works, rubber-works, 2 woolen-factories, worsted-mill, satin-mill, 2 bleacheries, 2 planing-mills, 2 brick-yards, extensive vineyards, large winery, and chemical-works. The city has a picturesque and healthful location, and contains the residences of many New York business men. Pop. (1880) 6,532; (1890) 13,028; (1895) 17,894. EDITOR OF "NEWS."

Passaic River: a stream which rises in Morris co., N. J., and after a tortuous course of 100 miles flows into Newark Bay, 3 miles from Newark. It is navigable for 13 miles. At Paterson it has a remarkable fall of 72 feet, affording a very valuable water-power.

Passaquoddy Bay: an inlet of the Atlantic Ocean, forming part of the boundary between Maine and New Brunswick. It abounds in good and deep harbors and in fine views. Picturesque islands are numerous and the fisheries are important. Its tides average 25 feet in rise. It receives the noble estuary of the St. Croix.

Passau, pas'sow: town of Bavaria; at the confluence of the Ilz, Inn, and Danube; 72 miles by rail S. E. of Ratisbon (see map of German Empire, ref. 6-G). It consists of three different parts, built on the wooded hills between the rivers and defended by two fortresses and eight detached forts. It has several fine buildings, breweries, distilleries, manufactures of tobacco, leather, porcelain, metal-ware and mirrors, and a considerable trade in iron, timber, wheat, and Passau crucibles. The town grew up round an ancient Roman camp, and in 739 was made the seat of a bishopric founded by St. Boniface. By the treaty signed here in 1552 by Charles V. and the allied Protestant princes religious liberty was conferred on the Protestants of Germany. The cathedral and a great part of the town were destroyed by fire in 1662. It was annexed to Bavaria in 1805. Pop. (1890) 16,633. REVIDED BY R. A. ROBERTS.

Passavant', JOHANN DAVID: art critic; b. at Frankfort-on-the-Main, Germany, Sept. 18, 1787; studied the art of painting in Paris and Rome, but devoted himself subsequently to the theoretical and critical treatment of the art, and became inspector of the Stidel Museum in his native city, where he died Aug. 12, 1861. He wrote *Rafael von Urbino und sein Vater Giovanni Santo* (3 vols., 1839-58); *Die christliche Kunst in Spanien* (1853); *Le Peintre-Graveur* (6 vols., 1860-64).

Passavant, WILLIAM ALFRED, D. D.: philanthropist; b. of Huguenot ancestry at Zelenople, Butler co., Pa., Oct. 9, 1821; graduated at Jefferson College, Canonsburg, 1840, and at Lutheran Theological Seminary, Gettysburg, 1842; was pastor at Baltimore, Md., 1842-44, and at Pittsburg, Pa., 1844-55. After 1855 his life was devoted to the service of various benevolent institutions, founded by his instrumentality. He founded successively hospitals in Pittsburg (1849), Milwaukee (1864), Chicago, and Jacksonville, Ill., and orphanages at Zelenople and Rochester, Pa., and Mt. Vernon, N. Y., besides being closely identified with the beginning of the orphanages at Germantown, Pa., and Boston, Mass. With a layman, A. Louis Thiel, he founded in 1870 Thiel College, Greenville, Pa. In 1891 he established the Lutheran Theological Seminary in Chicago. For these institutions it is estimated that he secured during his lifetime over \$1,000,000. He was the first to introduce the order of deaconesses into the U. S. He was editor of *The Missionary*, Pittsburg, from 1845 until, in 1861, it was united with *The Lutheran*, Philadelphia, of which he was for many years coeditor. In 1880 he founded at Pittsburg *The Workman*, which was still in his care at his death June 3, 1894. He was the founder of the Pittsburg Synod, and the great organizer of the missionary work in the Americanized portion of the Lutheran Church. He was one of the founders of the Emigrant House and Mission in New York, and of the General Council of the Lutheran Church in America. He had superior gifts as a preacher, but they were subordinated to his special calling as an organizer of Church work. H. E. JACOBS.

Passavant, WILLIAM ALFRED, JR.: clergyman; b. at Pittsburg, Pa., Jan. 23, 1857; educated at Western University, Pittsburg, Muhlenberg College and Theological Seminary, Philadelphia; entered the ministry 1879; was pastor at Baden, Pa., and Pittsburg (East End). Editor of *The Work-*

man, with his father, 1881-86. In 1887 he became sole editor of *The Workman*, and in 1889 superintendent of English Home Missions of the General Council. Upon his father's death, in 1894, he succeeded him as director of benevolent institutions and editor. H. E. JACOBS.

Pass Christian: town: Harrison co., Miss. (for location, see map of Mississippi, ref. 9-II); on Mississippi Sound, and the Louisv. and Nashv. Railroad; 58 miles E. N. E. of New Orleans, 82 miles W. S. W. of Mobile. It is the largest health resort on the Gulf coast, and has a water frontage of 6 miles, along which is a broad shell-paved avenue lying under the shade of magnificent live-oaks and lofty magnolias. Projecting into the sound are numerous fishing and promenade piers, dotted with picturesque pagodas. The average winter temperature is 60° F., and the prevailing winter breezes are from the southwest across the Gulf of Mexico. The town has four large hotels and many boarding-houses and tasteful cottages, and is in an agricultural and stock-raising region. Resident pop. (1880) 1,410; (1890) 1,705.

Passenger-pigeon: a wild pigeon (*Ectopistes migratorius*) of Central and Eastern North America, deriving its name from its long migrations in search of food. The body is about 8 inches in length, and the tail is the same length. The bird is slaty blue above, shaded with olive gray on the back and wings, pale-purplish chestnut below, changing into white on the belly, iridescent on the sides of the neck. It builds a flimsy nest in trees and bushes, and lays one white egg, sometimes two. The passenger-pigeon feeds on various seeds, but is specially fond of acorns, beech-nuts, and rice. It is gregarious and formerly occurred in vast flocks, sometimes numbering millions. Owing to continued persecution on its breeding-grounds, where thousands were taken in nets, these enormous flocks are no longer found, and in the greater part of its natural habitat the bird has been practically exterminated. F. A. LUCAS.

Passerat, pás's'raa', JEAN: Latinist and poet; b. at Troyes, France, in 1534. He led a rather unsettled life till 1569, when he went to Paris and found a protector in Henri de Mesme. He succeeded Ramus at the Collège de France, where he attracted many pupils. He wrote commentaries on Catullus, Tibullus, and Propertius, composed epigrams in Latin and French, and poems distinguished by alert grace, gay wit, and *esprit gaulois*, and was one of the chief authors of the *Satire Ménippée*, a satire on the Ligue. D. Sept. 12, 1602. His works were edited by P. Blanchemain (Paris, 1881). A. G. CANFIELD.

Passeres [Mod. Lat. (plur.), from Lat. *passer*, a typical perching bird]: name applied to a group of birds containing the typical song-birds, or perching birds, variously considered as an order, sub-order, or even as of lower value. Besides other technical characters, they have an agnathognathus palate, the deep plantar tendons free, manubrium Y-shaped, and tarsus with four to six tendinal perforations. There are, except in one genus, four toes, on the same level, and the fourth is never turned backward. The group includes something like 5,000 species, and is the equivalent of Huxley's *Coracomorphæ*; it comprises the Clamatores and Oscines (q. v.), and corresponds pretty nearly to the Insectores of other authors. F. A. LUCAS.

Passion-flower: a name in its widest sense applicable to nearly all the species of *Passiflora*, the principal genus and type of the family *Passifloraceæ*, mostly climbing plants of tropical America, and a few other ornamental species in common cultivation. The name is derived from the fancied resemblance of the various parts of the flower to the means of our Lord's passion and death; the nails, the crown of thorns, the five wounds, and even the hammer and the cross itself, having been identified in the blossom. There are nearly 150 species of true passion-flower. Some of these bear edible fruits (called *granadilla*); many have active medicinal powers, and many others are cultivated in greenhouses for their beautiful flowers. Of these the best-known is the *Passiflora carulea*, a native of Brazil. The U. S. has about ten native species, of which *P. incarnata* is showy, and the best known. Its fruit, called May-pop, is eaten in the Southern States. Revised by L. H. BAILEY.

Passion-flower Family: the *Passifloraceæ*, a small group (250 species) of dicotyledonous trees, shrubs, and herbs, natives for the most part of tropical and sub-tropical regions, especially of the New World. The flowers, which are usually showy, have a superior compound ovary, three-lobed style, five stamens, five petals, and five sepals, the

perianth segments often being united (gamosepalous or gamopetalous). Many species of the principal genus, *Passiflora*, are climbers, and are grown for ornamental purposes. Their beautiful flowers have a remarkable structure; the shallow calyx-tube bears the petals and a "crown" consisting of several concentric series of colored filaments, surrounding a columnar extension of the receptacle on which are borne first the stamens, and still higher the ovary with its three spreading styles. CHARLES E. BESSEY.

Passionists, Congregation of the: a religious congregation in the Roman Catholic Church, founded at Ovado, Piedmont, in 1720 by Paul of the Cross (1694-1775). It was confirmed by Benedict XIV. in 1741 and 1746, and by Pius VI. in 1775. A congregation of women was added before the founder's death. The Passionists are numerous in the U. S. and Europe. They practice many austerities, and devote themselves to local missions and the work of preaching. The mother-house is on the Celian Hill in Rome. See *History of Religious Orders*, by Rev. C. W. Currier (1894), p. 463. Revised by J. J. KEANE.

Passion-plays: SEE MIRACLE-PLAYS and ORIB AMMERGAT.

Passion-tide: a name given to the last two weeks of Lent, the first week of which is Passion Week and the last HOLY WEEK (q. v.); but popularly, Holy Week is called Passion Week also.

Passive State (or Passivity) of Metals: terms applied by chemists to certain phenomena having a very wide range, and as yet very inadequately investigated, which do not all seem likely to be referred ultimately to the same cause. It is found that a number of the metals which are acted on and dissolved with energy by certain acids and other chemical solvents may under special circumstances become what is called "passive," the action of the acid or other agent being totally suspended, and the metal remaining immersed therein often with a clean, brilliant metallic surface, and having lost entirely the power to decompose the liquid. Strong nitric acid is the solvent that has been best investigated in this relation, though many other agents behave similarly. Kcir first observed the phenomenon in the case of iron immersed in strong nitric acid and solution of nitrate of silver, and Schönbein, Faraday, and Herschel have been among its most distinguished investigators. Iron is made passive toward nitric acid of density = 1.2 to 1.35 by a number of different methods. A wire heated at one end till enfilmed with black ferroso-feric oxide becomes passive, not only where heated, but for a certain distance beyond, showing that it is not the film which merely protects mechanically. If first dipped in fuming nitric acid or in a mixture of weaker acid with oil of vitriol, it becomes passive toward the weaker acid itself. Contact of an iron wire which is being powerfully acted on with another wire in the passive state, or with a platinum or gold wire, will often instantly transform the first wire to the passive condition. An iron wire which is made the positive pole of a voltaic circuit, the negative pole being platinum, becomes passive, and remains so when the current ceases. All the phenomena of passivity are usually referred to voltaic action, but it is as yet doubtful whether they are all of this nature; and it must be stated that little or no progress has yet been made toward a clear understanding of their causes. Revised by IRA REMSEN.

Passover [transl. of Heb. *pesach*, passover, Easter (liter., a passing over, deriv. of *pāsach*, pass over), whence Gr. *πάσχα*, whence Lat. *pas'cha*, whence O. Eng. *pascha* > Eng. *pasch*; cf. *paschal*]: the first and the greatest of the three annual festivals of the Jews; instituted by Moses in commemoration of the deliverance of the Israelites from Egyptian bondage, and celebrated from the 15th to the 21st day of Nisan, both inclusive, thus falling between our March and April, at the time of the first full moon in the spring. The first and the last day of the festival were kept holy and observed by abstaining from all work, by prayers, hymns, thanksgivings, and other ceremonies, and during the whole period the bread was eaten without leaven, whence the name of the Feast of Unleavened Bread. On the evening of the 14th the Passover lamb was killed by the head of the family. The animal should be one year old, male, without blemish, and it should be roasted entire, with unbroken bones, and consumed entirely in one meal. The blood was sprinkled on the doorsill in commemoration of the night preceding the exodus from Egypt, when the angel went through the country and slew all the first-born, but passed

over the houses of the Israelites. The fat pieces were burned on the altar as a sacrifice, and the family, clad in traveling garb, gathered to partake of the roasted lamb, with prayers and hymns. On account of some uncertainty with respect to the fixing of the new moon by the Sanhedrin at Jerusalem, the Jews who lived in foreign countries in "exile" were ordered to celebrate all their festivals on two successive days—a law which is still in force among the orthodox. At present, however, the Passover feast has generally simply the character of a hallowed family feast among the Jews; but as the death and resurrection of Christ coincided with the celebration of the Passover, many of the symbols, commemorations, and ceremonies of this Jewish festival passed into the Christian Easter feast, receiving a broader and more ideal signification. For an interesting account of the Samaritan Passover, still observed on Mt. Gerizim, see John Mills's *Three Months' Residence at Nablus* (1864). For modern Jewish practice, see Edersheim, *Home and Synagogue of the Modern Jew*, and Bodenschatz, *Kirchliche Verfassung der Juden*. Revised by S. M. JACKSON.

Pas'sow, FRANZ LUDWIG KARL FRIEDRICH: philologist; b. at Ludwigslust, Germany, Sept. 20, 1786; was educated at Gotha and Leipzig; became in 1807 Greek professor at Weimar; was 1810–14 director of the Conradinum at Jenkau near Dantzic; became in 1815 Professor of Ancient Literature in the University of Breslau; in 1829 became also director of the academic museum of art. D. at Breslau, Mar. 11, 1833. He published texts and translations of *Perseus* (1809); *Museus* (1810); *Longus* (1811); author of *Turnizel* (Breslau, 1818); an admirable Greek-German lexicon (Leipzig, 1819–24; 4th ed. 1831); *Grundzüge der griechischen und römischen Literatur und Kunstgeschichte* (Berlin, 1816; 2d ed. 1829); and *Opuscula Academica* (edited by Bach, Leipzig, 1835). See Wachler, *Passows Leben und Briefe* (Breslau, 1839).

Pas'ta, GIUDITTA NIGRI: opera-singer; b. at Saronno, near Milan, Italy, Apr. 9, 1798, of Jewish parentage; received her musical education in the Conservatory of Milan; made her *début* as a singer in 1815 on the minor stages of Leghorn and Parma; sang in 1816 in Paris and London without producing any great impression; returned to Italy and appeared with better success in Venice and Milan in 1819. Her great career began at Verona during the congress of 1822. In the following years she sang with great success in Paris and London, and subsequently in Naples, where Pacini wrote his *Niobe* for her, and in Milan, where Bellini composed his *Norma* and *La Sonnambula* for her. Her last engagement was at St. Petersburg in 1840. D. at her villa on Lake Como, Apr. 1, 1865. Revised by B. B. VALENTINE.

Pas'tel [= Fr. from Ital. *pastello*, liter., a small loaf, pasty, dimin. of *pasto*, food < Lat. *pas-tus*, deriv. of *pas-cere*, *pastum*, feed]: a colored crayon made of pipeclay or other opaque material mixed with gum-water and some pigment. Pastel pictures are executed on roughened paper and parchment, and the color is generally worked on with the finger. This kind of picture has to be protected by glass, as every touch mars the surface.

Pasteur, LOUIS, D. Sc.: chemist and biologist; b. at Dôle, department of Jura, France, Dec. 27, 1822; studied physical sciences, especially chemistry, graduating D. Sc. from the École Normale in 1847, and was appointed professor in 1848 at Dijon, in 1849 at Strassburg, in 1854 at Lille, in 1857 at Paris, where he was director of the École Normale; in 1863 Professor of Geology, Physics, and Chemistry at the École des Beaux-Arts, and in 1867 Professor of Chemistry at the Sorbonne. Besides a number of essays in *Annales de Chimie*, he wrote *Nouvel Exemple de Fermentation* (1863); *Études sur le Vin* (1866); *Études sur le Vinaigre* (1868); *Études sur la Maladie des Vers de Soie* (1870); *Les Microbes* (1878). Several of his chemical works received prizes, and in 1874 the French Government gave him a pension, increasing it the following year, in consideration of his services to science and industry. In 1884 he laid before the Institute a method of curing or preventing HYDROPHOBIA (*q. v.*) by inoculating with the poisonous virus in an attenuated form, and the commission of investigation declared the method efficacious. (See *Louis Pasteur: his Life and Labors*, 1885.) The Pasteur Institute, at Paris, was formally opened Nov. 14, 1888, in the presence of President Carnot and other distinguished persons. Pasteur was a member of many foreign and domestic scientific societies, and had been decorated by most of the European governments. D. Sept. 28, 1895. Revised by S. T. ARMSTRONG.

Pasteurized Milk: See MILK.

Pas'to: a town in the southern part of the department of Cauca, Colombia; on a high plateau at the foot of the volcano of Pasto; about 50 miles from the boundary of Ecuador; 8,650 feet above sea-level (see map of South America, ref. 3-B). Pop. about 10,000. It is one of the oldest towns of the republic (founded 1539), is beautifully situated, has a healthful and cool climate, and is the center of a wheat-growing and grazing district; there is an active trade with Ecuador. Pasto is a bishop's see. It was an important Spanish stronghold during the war for independence. In 1834 it was destroyed by an earthquake. The volcano of Pasto, or La Galera, is the culminating point (13,990 feet) of the "knot" whence the three cordilleras of the Colombian Andes diverge. It is frequently in eruption. H. H. S.

Pastor [Mod. Lat., from Lat. *pas-tor*, herdsman, shepherd, deriv. of *pas-cere*, *pas-tum*, feed, pasture]: a genus of star-



The rose-colored pastor.

lings, having representatives in Europe and the Old World tropical regions. They are extremely useful as destroyers of insects, but sometimes are destructive to small fruits. *P. roseus*, the rose-colored pastor of Europe, is a handsome bird, a good singer, and a favorite cage-bird.

Pastoral Poetry: poetry which affects the matter or manner of rustic life, not for the purposes of accurate, even though sympathetic, description, but as a purely artistic device for conveying the interests and emotions of the poet himself, and of the society, not rural, in which he lives. The pastoral forms are many—idyls, eclogues, plays, or romances, in which the leading rôles are given to shepherds, shepherdesses, or other country folk, all bearing this generic name. Contradictory though it appear at first sight, the pastoral has historically been one of the most elaborate and artificial of all literary varieties, and has generally been produced only in societies that had reached an advanced stage of refinement. This by no means implies, however, as has sometimes been said, that it is the natural expression of luxurious and corrupt manners and morals, or that it always indicates in both poet and audience the lassitude and the disenchantment with real life which mark culture over-ripe and turning to decay.

The beginning of the pastoral, as we know it, is to be found in the *Idyls* of THEOCRITUS (*q. v.*), who seems indeed to have been himself the literary inventor of it. Not that he had not, probably, much upon which to base the new form. There is a tradition from his own time that bucolic songs in dialogue had a religious origin, and were connected either with the cult of Artemis (cf. the ancient note *περὶ τῆς εὐπρέπειας τῶν Βουκολικῶν* given in the editions of the poet) or with the sorrows of Daphnis (cf. *Ælian, Var. Hist.*, x., 18). That there is some truth in this is made more probable by the fact that the famous Indian pastoral-drama the *Gita-govinda* of Jayadeva deals with a religious theme—the love of Krishna, in guise of a shepherd, for the fair shepherdess Râdhâ. None the less, Theocritus has the honor of having first seen the literary possibilities of the genre, and, above all, of having used pastoral dialogue as a veil for his own sentiments and those of other real persons in the refined society in which he lived. This was the one original invention of the Alexandrian period of Greek literature, and it deservedly proved an immense success.

The Greek followers of Theocritus are not many nor very

important. The best known are Bion and Moschus, poets of the same school; and Longus (*q. v.*), whose date is uncertain, but whose *Daphnis and Chloë*, a prose romance, represents a stage of development of the pastoral removed by centuries from its origin. Far more important for literary history is the fact that the pastoral was taken up by Roman writers, and thus acclimated in Western Europe. Vergil seems to have been the first to write Latin idyls (*ecloga*, as he called them), and he remains the chief pastoral poet of Rome. The pastoral idea, however, already began to transcend the narrow limits of the idyl proper, and to appear in various guises. Horace, Catullus, and Tibullus all show the influence of it; and toward the end of the empire, as in Ausonius and Claudian, it is a permanent motive in poetry. Even in the Latin poetry of the Middle Ages it is to be found, as in the work of Alcuin and other writers of Charlemagne's court.

In the twelfth and thirteenth centuries, a new and apparently independent stream added itself to the current of the classic pastoral tradition. This was the period when the courtly and chivalric poetry, both lyric and narrative, of the Middle Ages fully effloresced; and among the numerous poetic forms then invented and widely used appears the pastoral lyric, called in French *pastourelle*, in Provençal *pastorela* or *pastorela*. Similar forms are to be found in almost all the Romance literatures of the time, and it is very difficult to say whether they reproduce with some exactness veritable popular songs, or are really, as they seem to be, completely artificial in character. At any rate, there can be no doubt of their wide popularity.

It was in Italy that the fusion was to come between these pastorals and the older classical ones, and it was in Italy, also, that the great extension of the pastoral to romances and dramas, as well as idyls, was to take place. The first notable examples of imitation of the classic idyl by Italians are the *ecloga* that have come down to us, purporting to have passed between Dante and a certain Giovanni del Virgilio, teacher of grammar at Bologna. Whether the attribution be just or not, there is no doubt that these date from the first quarter of the fourteenth century. As was to be expected, the humanistic revival of classical studies that begins with Petrarch greatly helped the spread of the *ecloga*. The twelve poems of Petrarch's own *Carminum bucolicum* are the beginning of a long series of imitations, many of them remarkably beautiful, of the pastoral manner of Vergil. In Boccaccio, the friend and coadjutor of Petrarch in humanism, but in whom the mediæval poet and story-teller was much stronger, we have the beginning of the amplification of the pastoral, of which mention has been made. Naturally, he tried his hand, though with poor success, at the Latin *ecloga* (in his *Bucolicum*); but in his Italian pastorals, both in prose and in verse, we have an important addition to the imaginative forms of European literature. These pastorals are all of them directly or indirectly connected with Boccaccio's life at Naples and his love for Maria, natural daughter of King Robert ("Fiammetta"). The circumstances of this passion made it all the more natural for the poet to veil his account of it in pastoral allegory, as he does in his prose *Fiammetta* and *Ninfale d'Ameto* (the latter interspersed with songs), and his *Ninfale fiesolano* in *ottava rima*.

The example of Boccaccio proved fruitful. As the Renaissance advanced, as the knowledge of first the Latin then the Greek classics extended itself, Italian poets and romancers inclined more and more to strive for an ideal beauty remote from the uglinesses of real life, such as could be found only in the idyllic world of Theocritus, Vergil, and Longus. There is no stranger or more interesting phenomenon in the history of human culture than this growth in the fifteenth and sixteenth centuries of the dream of a primitive and unspoiled time, an Arcadia—a golden, Saturnian age, as Vergil had called it. Imaginations turned eagerly to those classics that were thought to have depicted such a world; and it is deeply significant that of all the Greek poets, Theocritus should have been the first to be printed (1481). It will be impossible here to mention even a tithe of the works, whether in Latin or Italian, that belong to this tendency. We can dwell in passing only on those that mark the perfection of the chief pastoral forms. Of these, two in particular, the romance and the drama, had a remarkable vogue both in and out of Italy.

The pure pastoral romance may be said to have reached its final stage in the *Arcadia* of the Neapolitan Sannazaro (1453–1530). Written in alternate prose and verse, this work

contains within itself all the elements that had been tending to unite themselves in one artistic whole. Everywhere in it appear reminiscences of the classics, everywhere idyllic dreams. The influence of Boccaccio is strong, love of nature and of the rustic life of the fair country about Naples gives romantic charm, and finally the poet has known how to make the whole alive with a certain veiled, but none the less certainly personal, feeling. It is no wonder that the *Arcadia* swiftly made its way throughout Europe, and initiated a new style in all the chief literatures.

The rise of the pastoral drama was somewhat later than that of the romance. Apparently its origin is to be sought in the amœbaic recitation of Latin and Italian *eclogues* of which we hear in the fifteenth century. The Italian drama, as a whole, however, did not till this time free itself from its religious associations; and it is interesting to find that the first wholly secular play, Politian's *Orfeo* (recited at Mantua in July, 1471), is to all intents and purposes a pastoral. Through the sixteenth century we can follow the series of dramatic *eclogues* and pastoral dramas until at the end we have those ultimate specimens of the *genre*—Tasso's *Aminta* (written in 1573) and Guarini's *Pastor Fido* (1st ed. 1590).

During the sixteenth century all Europe was feeling the influence of the Italian Renaissance, and it is not surprising to find that the pastoral in all its forms was speedily imitated in every cultivated literature. We see this first perhaps in the Spanish Peninsula, where very early in the century we find Juan de la Encina and his school writing pastoral plays, *eclogas* as they call them. A little later the Portuguese Christóvam Falcão and Bernardino Ribeiro give great popularity both to the *ecloga* proper and to the pastoral romance; and soon their countryman Montemayor, though he wrote in Spanish, produced in his *Diana Enamorada* a pastoral tale that speedily became known all over the Continent. From this on the literature of the Spanish *Siglo de Oro* is filled with the Arcadian ideal and its pastoral expression.

In France much the same thing happened, though not so early or so completely as in Spain and Portugal. Perhaps the more purely French allegorism of the Middle Ages—that of the *Roman de la Rose*, for example—which had by no means died out even in Marot's time, prevented somewhat the acceptance of the pastoral allegory. Still the Pléiade began to devote itself somewhat to the cultivation of the latter, and in the *Bergeries* of Remi Belleau (1565–72) we have direct imitation of Sannazaro's *Arcadia*. Amyot's translation of the *Daphnis and Chloë* of Longus (1559) also did much to diffuse a taste for the pastoral romance. The results of these influences appear later in the great series of romances, half pastoral, half chivalrous, initiated by the *Astrée* of Honoré d'Urfé (1567–1625). They appear also still later in the well-known masquerading of the regency and the reign of Louis XV., and in the paintings of Watteau.

England, even more completely than France, made welcome the pastoral motive. During the sixteenth century, as is well known, both Italian and Spanish books were eagerly read in England; and Sir Philip Sidney, in his *Arcadia*, shows familiarity not only with Sannazaro, but also with Montemayor and Ribeiro, to say nothing of the French. So deeply was the fancy of the English touched by the Arcadian ideal that it became a permanent element in the work of almost all the great Elizabethans. We can mention only by way of illustration Spenser's *Shepherd's Calendar*, Shakspeare's *As You Like It*, Fletcher's *Faithful Shepherdess*, and the *Masques* of Ben Jonson and his group. Milton still felt deeply the charm of the pastoral form, as his *Comus* and *Lycidas* show. It had not wholly evaporated in the early eighteenth century, as is proved by Shenstone's *Pastoral Ballads*; and even Allan Ramsay's *Gentle Shepherd* (1725), which initiates the true English description of nature and rural life as they really are, is not without reminiscences of an earlier pastoral time when poets dreamed of rustic loves and joys rather than inquired into them.

And now finally we must speak briefly of the diffusion of the pastoral in Germany. Here it was from France, rather than directly from Italy, that the form made its appearance. The *Hercynia* of Opitz, published in 1622, is mentioned as the first veritable example; and this was inspired by d'Urfé and by that insignificant work, *Les Bergeries*, of Racan. Throughout the seventeenth and early eighteenth centuries the German pastoral flourished wondrously, though with

the charm mostly lost and the allegory terribly exaggerated. Not till 1754 did what may be called a classical work appear—Gessner's *Daphnis*, followed two years later by his famous *Idyllen*. The fame of these echoed even beyond the limits of Germany, and within those limits they had many imitators. Two great examples of the form must further be mentioned, though in both the invading realism of the nineteenth century makes itself harmfully felt. These are the *Luise* of Johann Heinrich Voss, published in 1795, and the better-known poem which it inspired, Goethe's *Hermann und Dorothea*, published in 1797.

The nineteenth century has not tolerated the pastoral. Here and there a poet has given something of idyllic charm to his description of country scenes; here and there a novelist in revolt against convention has sought relief in an impossible rustic world (e. g. George Sand in *La Mare au Diable* and other novels); but the day of the old gracious pastoral dream is for the mass of writers and of men past.

There exists as yet no general work on the history of the pastoral.

A. R. MARSH.

Patago'nia [from Span. *patagón*, a large foot, in allusion to gigantic footprints said to have been found by the first discoverers]: a name originally applied to all the southern part of South America, with a vague limit northward, about lat. 38°, or 39° S.; it is still used for convenience, but is generally restricted to the portion E. of the Andes and S. of the Rio Negro, forming the Argentine territories of NEUQUÉN, RIO NEGRO, CHUBUT, and SANTA CRUZ (qq. v.), with a small strip at the southern end belonging to Chili. Generally speaking, the surface of this region consists of plateaus which form a series of terraces from the eastern slope of the Andes to the sea; much of the soil is arid, composed of sand, shingle, or boulders, and impregnated with salts; but portions are suitable for grazing, and some of the valleys of the Andes and near the coast are well adapted for wheat-growing. The climate is dry, and during the summer months (November to April) warm, but subject to violent winds; the winters, especially in the southern part, are cold and are ushered in by storms. Settlements are rapidly springing up near the coast; the interior is inhabited only by wandering Indians, now greatly reduced in number. These Indians are of several tribes, classed together as Patagonians, but called Tehuelches or Southern People by the Araucanians; they are unusually tall (many of the men being over 6 feet in height), but the descriptions of giants given by old explorers were probably exaggerated. They number about 20,000, and most of them are now more or less friendly to the whites. Patagonia, as originally defined (including the narrow strip W. of the Andes), was practically abandoned to the Indians until about 1860. It was nominally attached to the viceroyalty of La Plata or Buenos Ayres, and the whole of it was claimed, after the revolution, by the Argentine Confederation. The Chilean settlements, as they were extended southward, encroached on the western slope, and gave rise to many disputes. In 1881 all the strip W. of the summits of the Andes, together with the borders of the strait of Magellan, was definitely given up to Chili; it now constitutes the province of Llanquihue and the territory of Magallanes; area, 83,115 sq. miles, and an estimated population of about 85,000. The other portion, which is now incorporated into Argentina, and is divided into five territories, has an area of 268,000 sq. miles and a population of about 100,000. See Darwin's *Voyage of a Naturalist*; Lady Florence Dixie, *Across Patagonia* (1880); Fontana, *Exploración en la Patagonia Austral* (in *Boletín del Instituto geográfico Argentino*, 1886), and many recent papers in the same bulletins; also, Hudson, *Idle Days in Patagonia* (1893).

HERBERT H. SMITH.

Pataps'co River: a stream which rises in Carroll co., Md.; flows 80 miles S. and S. E., and enters Chesapeake Bay by a fine estuary, on which stands Baltimore. In its upper course it is very rapid, affording much water-power. Its estuary admits first-class ships.

Patchogue, pa-chōg': village (incorporated in 1893); Suffolk co., N. Y. (for location, see map of New York, ref. 8-D), on the Long Island Railroad; 53 miles E. of New York city; near Blue Point, on Great South Bay. It is the chief harbor for the fishing and oyster boats of the bay, has a beautiful lake at each extremity, and is one of the most popular places of resort on the Long Island coast. There are several hotels and boarding-houses, good dock facilities, a union free school, 5 churches, a State bank with capital of \$75,000, and 2 weekly newspapers. The industries comprise fishing and oystering,

and the manufacture of lace, paper, and brass goods. Pop. (1894) estimated, 4,500.

JOHN M. PRICE.

Patchou'li, or **Patchouly** [= Fr., from East Indian name]: an odoriferous labiate plant (*Pogostemon patchouli*) of Southern Asia. It is extensively used in perfumery and against the ravages of clothes-moths. India ink and India shawls derive their peculiar odor from this plant. The Orientals use it for stuffing mattresses and to ward off contagion and vermin. They also mix it with tobacco for smoking. It grows to a height of 2 or 3 feet, bears spikes of densely whorled small flowers, and ovate leaves 2 or 3 inches long.

Patel'la, or **Knee-pan** [*patella* = Lat. kneepan, liter., a small pan, dimin. of *pa'tena*, pan, dish, deriv. of *pa'te're*, lie or spread open]: a probably sesamoid bone found in the tendon of the quadriceps extensor muscle of the thigh, just anterior to the knee-joint. It develops from one or two centers. It does not begin to form until the child is from three to six years of age.

Patents [deriv. of *patent* in *letters patent*, i. e. letters open to the perusal of all, from Lat. *pa'tens*, pres. partic. of *pa'te're*, lie open]: letters issued by a government granting to inventors the exclusive use of their inventions for definite periods.

I. *Their History*.—The practice of thus inciting inventors to improvements in arts and industries is of remote origin. So far as concerns modern jurisprudence, however, it was first adopted by the English, and the common law gave to the king the power of granting such privileges; but this power was abused, and patents were granted not only to projectors who deserved them, but to favorites and venal speculators, who thus obtained monopolies of the traffic in many of the necessities of life and not a few of its conveniences, the right to which had existed in the public from time immemorial. The term *patent* was thus early applied indiscriminately to the rightful privileges by which inventors were rewarded for creating new and valuable improvements which had never belonged to the people, because they had never before existed, and to the wrongful monopolies, like those for the sale of salt, currants, vinegar, potash, pilchards, and many other articles, the right to traffic in which had always and undeniably belonged to the public. It was the latter class of patents, the wrongful monopolies, that constituted the inciting cause of the Great Revolution. And the same enactment, the famous Statute of Monopolies, that swept away the arbitrary and unconstitutional power of the British kings excepted from its operation the patents granted to inventors. As this statute did not establish, but confirmed, the practice of thus encouraging improvements in the useful arts, such practice may be traced unbroken from the complex systems of statute jurisprudence and equity practice of fifty-eight nationalities, states, and colonies to-day back to the time when Edward III. issued the first recorded patent to "two friars and two aldermen" for an alleged discovery of the philosopher's stone; but the separation of patents for new inventions, rightfully granted to those who added to the wealth of their country by increasing its industrial resources, from the wrongful monopolies that crushed the people was a matter of slow growth. It may be said to have taken first positive and decided form in a hot debate in Parliament on Nov. 20, 1601, in the reign of Elizabeth, and it ended only with the dethronement of the Stuarts; but the Statute of Monopolies in 1623 (21 James I.), although it did not end the struggle, defined and made clear the principles of the common law. For by this last "the crown, as the patron of science and art and guardian of the common weal, had power to grant many privileges," even "although, *primâ facie*, as it was said, they appear to be against the common right; the consideration was the invention of a new manufacture or the introduction of a new trade; the grant could only be by charter or letters patent, and the term of privilege was to be reasonable." (See *Coryton on Patents*, p. 27.) The earliest form of these privileges was that of "conducting exclusively new trades, or dealing in objects of commerce *hitherto unknown*, as a reward and encouragement to parties introducing them." The common-law granting of patents has, it may be remarked, an apt illustration in the Scottish practice, for in Scotland, up to 1852, patents were issued to inventors in the total absence of a statute on the subject.

The earlier patents were based upon the condition that the invention be *worked* within the realm, this *working* being the consideration paid by the patentee for the protec-

tion afforded. In some cases a tax or a portion of the profits was paid to the crown—the former still a feature of the British patent laws, from which it has passed to those of France and Belgium; but the secret of the invention was not required to be revealed until after the expiration of the patent. From this it resulted that the inventor frequently succeeded in keeping his invention from the public even after the expiration of the term, and hence the *making known* of the invention became, subsequently, an essential part of the consideration for which the patent was issued. To this end it was at a very early date required as a preliminary to the issue of a patent that the inventor should place on record a description of his invention so “full, clear, and exact” that any one skilled in the art could proceed to put it in practice, and so definite in its statements as clearly to distinguish between what is new and what is old. The development of the patent law has been coincident with that development of the industries which has been due for the most part to the law itself. The earliest triumphs of modern invention, Watt’s steam-engine, Arkwright’s spinning-machinery, Cort’s puddling process, Dudley iron manufacture, furnished in the litigation of the patents thereon the established precedents upon which the decisions of courts in patent cases all over the world are based. Previous to 1852 the British patent law related only to England. Scotland, as previously remarked, granted patents under the common law; Ireland had a separate patent law so costly and imperfect that many British inventors lost their inventions in the latter island before they could patent them there. In 1852 this was remedied by the law still in force, which embraces in one patent “England, Scotland, Ireland, the principality of Wales, the Isle of Man, and Berwick-upon-Tweed.” The British patent law has from the beginning placed the introducer of a new improvement on the same footing as an original inventor. It requires no preliminary examination to determine the question of novelty, and declares a patent invalid if the invention has been previously publicly known in the realm. Prior to the Patents, Designs, and Trade-marks Act of 1883 the initial expense of obtaining a British patent was onerous, but this has been practically reduced to one-third of the former expense by the act just mentioned. Renewal fees, payable before the expiration of the fourth year of the term of the patent, and annually thereafter, are required to keep the patent alive. In lieu of these the renewal fees may be paid in two lump sums, one before the end of the fourth and the other before the end of the eighth year of the term, at the option of the patentee.

The patent system of Great Britain was the parent stem from which all others have sprung. In 1641 the general court of Massachusetts granted a ten years’ patent to Samuel Winslow for a process of making salt. In 1672 the printed statutes of Connecticut provided that “there shall be no monopolies granted among us but of such new inventions as shall be judged profitable and for the benefit of the country, and for such time as the general court shall judge meet.” Massachusetts and Connecticut were pioneers in transplanting the British system, although similar examples are found in the other colonies (or States) up to the time when the first U. S. patent law, the act of 1790, came into force.

The statute of 1790 provided for the granting of letters patent on “any useful art, manufacture, engine, machine, or device, or any improvement therein, not before known or used.” The petition for the grant was to the Secretary of State, the Secretary of War, and the Attorney-General. The patent was issued on the approval of these officials or any two of them. The description of the invention was certified by the Attorney-General, and the President caused the great seal of the U. S. to be affixed on the issue of the patent. The term of the patent was for “any term not exceeding fourteen years” in the discretion of the aforementioned members of the cabinet. Although discretionary power was vested in these last, no preliminary examination to determine actual patentability was, in practice, instituted by the act. Provision was duly made for punishing infringers, the English idea of patentable novelty substantially adopted, and a schedule of Government fees, that, exclusive of 10 cents per 100 words for copying specification on filing same, amounted to \$3.70. A patent could be issued “to any person,” no distinction between citizens and foreigners being made. In 1793 a new statute was passed, repealing that of 1790, although retaining much of its substance. This act of 1793 restricted the grant of patents to citizens of the

U. S.; provided that the petition should be to the Secretary of State; that owners of patents from any State should be incapable of holding a patent from the U. S. except on condition of relinquishing the State patent; that interfering applications should be decided by arbitrators; that patents obtained “surreptitiously or upon false suggestion” could be declared void on motion made and proof produced before the U. S. district court of the district wherein the patentee resided, if made within three years from the date of the patent, but not afterward; and provided further that the Government fee paid by applicant for a patent be \$30. This act of 1793 also provided that infringers should pay at least triple damages to the patentee. In 1794 a supplement permitted parties to suits set aside, suspended, or abated by the act of 1793 to revive them. During the following forty years various amendments were made to the patent laws, and in 1833 all previous statutes on this subject were repealed. The act of 1833, while retaining many features of the old law, introduced many changes. It attached to the department of state “an office to be denominated the Patent Office, the chief officer of which shall be called the commissioner of patents.” This law was the first to institute the system of preliminary examinations to determine the patentability of inventions before issue of patents thereon, and from the single examiner appointed under it has come the immense staff of examiners and the complicated system of examinations, appeals, etc., that now obtains, and which, while undoubtedly productive of much good, has just as undoubtedly been the means of robbing many a poor inventor of the rights that belonged to him in justice, equity, and law. This statute provided a board of appeal, to which appeal could be had from adverse decisions of the examiner and commissioner. Aliens resident in the U. S. for one year, and who had made declaration of intention to become citizens, were allowed to take out patents for the same fees as citizens; but for a subject of the King of Great Britain, the fee was \$500, and for all other foreigners \$300. This law provided also for the filing of caveats on partially perfected inventions, confirmed the right of reissue, fixed the standard of damages in infringement cases at the actual damages, except where exemplary damages were held by the court to be warranted, and in such cases limited the award to three times the actual damage; and placed the power of extending patents for an additional term of seven years after the expiration of the original fourteen in the hands of a board composed of the commissioner of patents, the Secretary of State, and solicitor of the treasury. From 1836 to 1873 the patent laws were frequently amended. In the latter year they were codified in title 60, chapter i., of the U. S. Revised Statutes, in which form, with a few amendments, they still remain. Some of the important provisions of this statute are the extension of the term of patents from fourteen to seventeen years; the abrogation of extensions of patents granted since Mar. 2, 1861, by the commissioner; the compulsory attendance of witnesses in patent cases; the establishment of a board of examiners-in-chief, intermediate between the examiners and the commissioner, to hear appeals from the decisions of the former; the repeal of the provision permitting withdrawal of two-thirds of the fee in case of rejection, and the sweeping away of all distinctions between citizens and foreigners in the granting of patents. It caused a decided advance in the utility of the patent office by providing for the printing of all patents as fast as issued. Brief abstracts, together with decisions of the courts in patent cases, decisions of the commissioner, etc., are published weekly in the official gazette.

II. *The Law relating to Patents.* Patent laws are laws which prescribe under what formalities and conditions patents may be granted, and provide for enforcing the protection which the patent grants. A patent to a first inventor is not, as is often erroneously supposed, a grant of right to the *invention*. It is merely a grant of right to *protection* in the exclusive use of the invention. An inventor has a right to use his invention without a patent. The grant of protection to an inventor in the exclusive use of his invention for a limited time is so well founded in justice and public policy that, although not of remote origin, it has been adopted by all civilized nations. In many dependencies, having no patent laws of their own, inventions receive the protection of the patent laws of the mother-country. Thus, for instance, a patent granted in Spain protects the invention in Cuba and the Philippines, and in nearly all of them the protection is granted to the first inventor. In Great Britain it is granted to the first introducer of the

invention, whether he be the inventor or an importer of the invention. In most countries this protection is granted on condition of a forfeiture of the right unless the invention be put into use by the patentee within a specified time. The length of time for which the protection is granted in different countries varies from three to twenty-one years, but is generally limited to the shortest term during which protection, if any, has been previously granted for the same invention in any other country. The authority for the patent laws in the U. S. is the clause in the Constitution which declares that Congress shall have power "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." In consequence of this delegation of power by the several States, legislation on the subject of patents for new inventions belongs especially to Congress, and by such legislation jurisdiction for the administration of the patent laws belongs to the Federal courts.

For what Subjects-matter Patents may be Granted.—The act now in force provides "that any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the duty required by law and other due proceedings had, obtain a patent therefor." It will be noticed that, by the language of the Constitution, Congress was given power to secure to inventors the exclusive right to their "discoveries," while the statute purports to secure what has been "invented or discovered." As the statute puts "invented or discovered" in the alternative, thereby indicating that Congress understood those terms to refer to different things or to things of different origin, it appears as if Congress had exceeded its authority in providing protection for *inventions* as well as for *discoveries*. Notwithstanding this disjunctive use in the statute of the terms "invented" or "discovered," the courts have held that, with reference to patentable subjects-matter, *discovery* is synonymous with *invention*, and such, from previous adjudications which had taken place in England, was well understood to be the import of those terms at the time of the adoption of the Constitution of the U. S., and the verbal discrepancy has been disregarded to effectuate the known intent of the organic law. It will be noticed that only four classes of patentable subjects-matter are mentioned in the U. S. statute; but these are sufficient to comprehend patentable improvements of any kind. In the English law only one was mentioned, being "manufacture," but the courts of England by construction give that one term sufficient scope to embrace all kinds of patentable subjects-matter. As used in the statute, the term "machine" includes all kinds of mechanism, whether machines proper or apparatus which have a mode of operation in working out or producing a result. The term "manufacture," according to the patent laws of the U. S., includes all kinds of useful articles which are made, except machines and compositions of matter, such, for example, as fabrics, tools, implements, wearing apparel, household furniture, etc. The designation "composition of matter" includes all kinds of mixture or compounds of substances, such as medicines, articles of food and drink, perfumeries, paints, dyes, etc. The term "art" comprehends all methods and processes which may consist of modes of procedure with or without new ingredients or materials. It is often difficult to determine to which of the four classes of subjects-matter mentioned in the statute an invention belongs, and it frequently happens that an inventor is entitled to separate patents for three kinds of subject-matter, all having reference to the same production: for the article itself, the method of producing it, and the machinery used therein.

To whom Patents may be Granted.—Patents are granted to original and first inventors. This is subject to the qualification that a foreign inventor who has not made his invention known in the U. S. will not be permitted to step into the place of an inventor who, in the U. S., has *bona fide* made the invention. Patents may be applied for and obtained by the executors and administrators of inventors. An inventor may assign his invention and may have a patent issue to the assignee. An invention by joint inventors must be patented to both.

What constitutes Patentable Inventions.—The mere conception of an idea is not patentable. An invention to be patentable must be capable of use without the addition of further invention or the necessity of further experiment apart from the exercise of mere workshop skill. It must be so matured that the means of producing the result can be accurately and fully set forth. When the invention consists of a process or of a composition of matter, it is not necessary, in order to entitle its author to a patent, that he should understand the rationale of the chemical changes involved. He has brought such an invention to a patentable condition when he has ascertained what articles are to be used and how they are to be used to produce the desired result. Some inventions are new in kind, while others are only new as improvements on something which in kind had prior existence. The former are patentable much more broadly than the latter. When an invention consists of doing by a machine what had previously been done by hand only, or had never been done at all, it is new in kind. The first sewing-machine and the first recording telegraph are instances of inventions which were new in kind. To give an invention patentable novelty it is immaterial whether it was the result of much or little research or labor. An invention or discovery made by accident is none the less patentable. New combinations of either new or old elements are patentable, but a combination of old elements, to be patentable, must produce some new result due to the co-operative or reciprocal action of the combined parts. The mere addition of one old device to another, each producing its own result in such manner that their combination produces those same two results and no other, is not patentable, and is not invention, this being commonly designated as an aggregation merely, and owing its origin to workshop skill or judgment as distinguished from the exercise of the inventive faculty. Any part in a machine which does not participate in the mode of operation of the machine is regarded as a dead part. Nearly all patents on machinery are for combinations of parts some or all of which are old. When a single part or any combination of parts less than the combination of the whole is new, then such part or such sub-combination of parts is patentable, as well as the entire combination, and they can be patented by separate claims in one patent or by a plurality of patents. Although an invention, to be patentable, must, with the exception mentioned, be new and useful, it does not follow that all new and useful productions are patentable. There are many things which, though both new and useful, are not patentable. Any change which was so obvious as to exclude the possibility of the exercise of the inventive faculties being necessary to produce it is not the subject of a patent. Any improvement which is merely the result of mechanical skill or superior workmanship is not patentable. A new discovery of a law of nature or of an abstract principle is not patentable. A discovery consisting of the adoption of a known equivalent of what was already in use is not patentable; such, for illustration, as the removal from a machine of one of the elements which it has in combination with other elements, and the substitution in its place of another known element possessing only the same function and performing only the same office in the combination as did the part for which it was substituted. In a process or composition of matter the substitution of one known chemical agent for another having only the same function is not patentable. Combinations in mechanism consisting of a mere assemblage of old parts, each part possessing only the same function and performing only the same office in the combination as it did out of it, and none of the parts co-operating with the others to produce any new or improved result, are not patentable combinations, but in judgment of law are mere aggregations of old elements. A new use of an old thing, called a double use, is not patentable; that is to say, if a machine or an instrument be known and used for one purpose, a discovery that it can be used to advantage for another purpose, accompanied by an actual application of it unchanged to such new purpose, is not patentable, but in such cases a very slight adaptation of it for the new use will render it patentable. This exclusion of a new use of an old thing from patentability is for the reason that when an invention is made, its author, having created it, is entitled to all its attributes, whether discovered by him or by any one else subsequently to his invention; and when that right passes from him to the public, it becomes vested with the same right. Anything which is injurious to public health, to good morals, or public policy is not patentable.

Utility.—Although the statute requires the invention to be useful, yet no particular degree of utility is necessary to render an invention patentable. It need not be more useful than what was previously known for the same purpose. The requirements of the law are answered so far as utility is concerned if the invention be not absolutely frivolous or injurious to the public.

How an Inventor may Lose his Right to a Patent.—An inventor who has acquired a right to a patent may lose it in two ways: 1. By neglecting to apply for a patent for more than two years after the invention has been put into public use or on sale. The "public use" mentioned in the statute is not limited to a continuous public use for more than two years, but comprehends also a single instance of such use more than two years before the application for a patent. Public use has been judicially defined to be a use in public. The loss of an inventor's right to a patent by neglecting to apply for it for more than two years after the invention has been either used in public or put on sale is in the nature of a forfeiture of his right, and does not depend upon his intention. Nor is the lapse prevented by ignorance on his part of such public use. The contrary was held for many years, but a recent decision of the U. S. Supreme Court has reversed the former practice. A patent expires with the expiration of the term of a foreign patent previously obtained on the same invention, but not with the lapse of the former patent from non-payment of the taxes or the non-working of the invention required by the patent laws of various countries. 2. An inventor may so deal with his invention as to create an abandonment or dedication of it to the public at any time. This he may do either by express declaration or by his silence while with his knowledge its use is generally adopted by others. Such a surrender of an inventor's right is a matter of intention on his part, but intention may be inferred from existing facts. Delay alone to apply for a patent, no matter for how long, will not constitute abandonment, but unreasonable delay, associated with the fact of the same invention being originated by another and patented or put into general use by him, will constitute abandonment. Hence if a person unreasonably neglects to apply for a patent after completing his invention, he does so at the peril of losing his right. The issue of a patent is no guaranty to its owner of the right which it purports to secure. A patent is only *prima facie* evidence of such right. It gives to its owner a right of action against infringers of the patent, and authorizes him to contest his right to the thing patented. Proof against a patent at any time during its term, in a suit brought for an infringement, that the patentee was not the first inventor of the thing patented, or that its subject-matter was not patentable, or that the inventor lost his right by forfeiture or abandonment, or any other fact against the validity of the patent, will invalidate the patent. When an invention has been previously patented in a foreign country, the U. S. patent will expire with the term of the foreign patent, or, if there be more than one, with that having the shortest term. If an inventor disclaims a part of his invention in his original application, he will be precluded from claiming it afterward. If an inventor has neglected to claim the whole of his invention he must file his application for reissue with due diligence—ordinarily, within two years—or he loses the right to receive a claim commensurate with the actual invention, there being, however, some exceptions to this rule. Certain irregularities in the proceedings incident to obtaining a patent may restrict the scope of the grant or even invalidate the grant.

How Patents are Obtained.—Patents are obtained by applications in the form of petitions to the commissioner of patents, accompanied by a description, including drawings. Models may be demanded by the Patent Office, but for several years past have not often been required. When the invention is of a composition of matter, specimens may in like manner be required by the commissioner. The commissioner of patents is the head of the Patent Office, and has a corps of assistants called examiners, among whom the different patentable subjects-matter are divided, and whose duty it is to examine applications to ascertain whether the papers are in proper form and whether the invention described therein is, so far as they can ascertain, new and useful. On the commissioner receiving an application for a patent, he refers it to the proper primary examiner for his examination into the state of the art to which the invention appertains, and for his report of the result of his examination to the commissioner. If no reason is found against granting

the patent, it is allowed and issued. If any cause is found by the examiner against the grant, it in such case is reported to the applicant; and if he can by explanation or argument remove the objection, the patent will still be issued, otherwise it will be refused by the primary examiner. From the decision of the primary examiner an appeal lies to a board of three examiners, designated examiners-in-chief. From a decision of the board of examiners-in-chief an appeal lies to the commissioner of patents, and from his decision an appeal lies to the Supreme Court of the District of Columbia. When an application is made for a patent which in the opinion of the commissioner would interfere with any pending application or with any existing patent, notice is given to the parties interested, and an opportunity granted to them to show by evidence which was prior in date of invention; and the patent will be issued to the one proved to be the first. The business in the Patent Office has become so extensive that there has grown up a class of persons known as patent agents or solicitors of patents, who conduct Patent Office business in behalf of inventors, and, being located in different parts of the U. S., are always accessible to inventors. The term for which patents for inventions issue in the U. S. is seventeen years. If an inventor, after conceiving the outlines of his invention, desires further time to mature the same, and in the meantime to guard against any other patent being granted for the invention, he may do so by filing in the patent office a caveat, setting forth the design and distinguishing characteristics of his invention and praying protection of his right until he shall have matured his invention. Such caveat will be preserved in secrecy by the commissioner of patents, and the effect of it will be to entitle the caveator for one year to notice from the commissioner of any application which may be made for a patent which would in any way interfere with his right. After receiving such notice, if any be given, the caveator will be allowed three months in which to file a complete application.

Designs.—New designs are also patentable, such as a design for a manufacture, bust, statue, alto-relievo, or bas-relief; designs for printed fabrics; ornaments, patterns, prints, or pictures to be placed on or worked into any article of manufacture; also new shapes.

Amendment of Patents.—A patent may be amended by being surrendered to the commissioner and the grant of an amended one, called a reissue, in its stead, or by filing with the commissioner a disclaimer of so much of the thing patented as the patentee was not the first inventor of. To amend by a reissue, the original patent and an amended specification must be delivered to the commissioner, asking an acceptance of the surrender and a grant of a reissue in conformity with the amended specification. A patent may by a reissue be amended in either its descriptive parts or its claims so as to conform to what the patentee was the first inventor of; but no new matter can be introduced into the reissue, nor, in case of a machine patent, can the model deposited on the original application or the drawings attached to the patent be amended except each by the other; but when there is neither model nor drawing, amendments may be made upon proof satisfactory to the commissioner that such new matter or amendment was a part of the original invention and was omitted from the original specification by inadvertence, accident, or mistake. Under late decisions, however, this provision is little more than nugatory. A reissue in which the claims are expanded should be applied for with diligence, and not delayed long after the issue of the original patent.

Repeal of Patents.—There is no statutory provision for the repeal of patents; but where patents interfere by each claiming the same invention, any one interested in either patent may institute a suit in equity against the owners of the other patent, in which case the court has power to declare either patent invalid in whole or in part. It is also understood that the Attorney-General of the U. S. has a right of action to invalidate a patent where there was fraud in the issuing of it.

Sale and Transfer of Patents.—A patentee may sell the entire patent or any undivided part of it for the whole or any specified part of the U. S. The conveyance of such an interest, to be valid, must be in writing, and is called an assignment. Such an assignment will be void as against any subsequent purchaser or mortgagee for a valuable consideration without notice that such assignment had been made, unless it be recorded in the Patent Office within three months from its date. Parties having an undivided interest in a patent are not thereby constituted partners, but are

tenants in common; and any of such parties may grant licenses to others to use the invention in making, using, and vending the patented article, and receive and retain the consideration for the same without liability to their co-owners. Licenses under patents need not be in writing. They may be oral or implied. A license to a party to use the invention is not divisible or assignable unless expressly made so by its terms. A license, although in writing, need not be recorded. An invention not patented is assignable, but an invention is not salable or assignable before it is made, because a thing not *in esse* is not the subject of sale. An agreement, however, to assign an invention when made will be operative upon it as soon as it shall be made.

Remedies for the Protection of Patent Rights.—The law protects patentees against false representations of others. It provides that any person who, without authority from the patentee, shall in any manner mark upon anything made, used, or sold by him, for which he has not obtained a patent, the name, or any imitation of the name, of any person who has obtained a patent therefor, or who shall in any manner work upon or affix to any such patented article the word "patent" or "patented" or the words "letters patent," or any word of like import, with the intent to imitate or counterfeit the mark or device of the patentee, or who shall in any manner mark upon or affix to any unpatented article the word "patent" or any word importing that the same is patented, for the purpose of deceiving the public, shall be liable for every such offense to a penalty of \$100. In case of an infringement of a patent, the law gives its owner right to remuneration for past infringement and to have further infringement prevented. He has a right to an action at law for a trial by jury, in which his recovery will be the actual damages he has sustained from the infringement. He also has a right to sue in equity, in which he can recover not only damages, but, in addition thereto, according to the statute, the profits realized by the defendant from the infringement, and obtain an injunction restraining further infringement; and where no serious doubt is raised respecting the validity of the patent or on the question of infringement, he may, on short notice, have a preliminary injunction restraining the infringement during the pendency of the suit. In suits for infringement all of the owners of undivided interests in the patent for the territory in which the infringement has been committed must be joined as coplaintiffs or cocomplainants. Where there has been a joint infringement, the infringers are jointly and severally liable for the infringement. Ignorance on the part of an infringer of the existence of a patent at the time of infringement is immaterial, so far as his liability for the infringement is concerned. To entitle a patentee to recover for an infringement of his patent, he is not required to show that the infringer knew of the existence of the patent. Still, neither the patentee nor his assigns are allowed to recover damages for infringement, unless it appear that they marked the patented articles made or sold by them "patented," together with date of patent, or that the defendant was personally notified of the infringement and continued to infringe after such notice.

Relation of a Patentee to the Government.—The relation between the public and the inventor is that of contracting parties. It will be noticed that in forming this relation the public neither promises nor imparts anything to the inventor except legal protection to his property, while it receives a valuable addition to its productive resources. From this relation of the inventor to the public, it will be realized how strong is his claim to a full and efficient protection to his right, because (1) he has purchased the protection to his property in the invention for a special and valuable consideration; (2) he receives no greater protection than is furnished to others for other property without a special purchase; and (3) the protection is only for a limited time, while for tangible property the protection is without limitation of time; but notwithstanding this manifestly superior claim of patentees to full protection for their property in patented inventions, their title to such property is treated with comparative indifference, and trespass upon it by others is not held in the same disrepute as is trespass upon other kinds of property. Patents have been, and to a considerable extent still are, regarded as monopolies, creating undue restriction upon the rights of the public and appropriating to individuals what belongs equally to all. One cause of this false impression is a mistake as to what a patent grants, and an assumption that by it the government grants to a patentee an exclusive right to something of which the public was previously in possession;

while another is found in the fact that patents for new inventions had their rise, and for a considerable time their progress, in England in the society of other grants, which did confer upon individuals privileges which belonged of right to the public, and which were therefore odious monopolies, and which in the course of time became so obnoxious to the people as to be entirely abolished. From the fact that patents for new inventions were introduced in the form of and contemporaneously with oppressive monopolies which took rights from the public and gave them to individuals, they caught and have retained some of the odium, and even the name, of monopolies. The distinction between a monopoly and a meritorious patent was drawn in the Statute of Monopolies, which declared "that all monopolies, and all commissions, grants, licenses, charters, and letters patent heretofore made or granted, or hereafter to be made or granted, to any person or persons, bodies politic or corporate whatsoever, of or for the sole buying, selling, making, working, or using of anything within this realm, . . . are altogether contrary to the laws of this realm, and so are and shall be utterly void and of none effect, and in nowise to be put in use or execution," and qualified this declaration by the proviso following, viz.: "That any declaration before mentioned shall not extend to any letters patent and grants of privilege for the term of fourteen years or under hereafter to be made of the sole working or making of any manner of new manufactures within this realm to the true and first inventor and inventors of such manufactures." From the causes above stated the courts of England, for many years after the introduction of patents, treated them with disfavor, and whenever they became the subject of litigation struggled to invalidate them. Patents for new inventions, however, are not monopolies, have none of their properties, and were never considered as such by the common law or intended to be so regarded by the Statute of Monopolies. The common-law definition of a monopoly is given by Lord Coke in the following words: "A monopoly is an institution or an allowance by the king, by his grant, commission, or otherwise, to any person or persons, bodies politic or corporate, of or for the sole buying, selling, making, working, or using of anything whereby any person or persons are sought to be restrained of any freedom or liberty which they had before or hindered in their lawful trade." Justice and consistency require that the property of an inventor, the creation of his own mind, should be exonerated from any idea of his being the grantee of an odious monopoly. Patents should be regarded in their true light of rewards dictated by sound public policy to meritorious men who contribute by their creations to the welfare of the country and of the world.

Revised by FRANCIS M. BURDICK.

Pater. WALTER HORATIO: author; b. in London, Aug. 4, 1839. He proceeded to Queen's College, Oxford, and graduated in 1862, and was elected to an open fellowship at Brasenose College. He was a subtle critic of art and literature, and master of a very graceful prose style. His works are *The Renaissance* (1877; 3d ed. 1888); *Marius the Epicurean* (1885); *Imaginary Portraits* (1887); and *Appreciations* (1889; 2d ed. 1890), besides many articles in the principal reviews. D. in Oxford, July 30, 1894. H. A. B.

Pater'culus. GAIUS VELLEIUS: historian; b. about 19 B. C.; entered early the Roman army, and served from 1 to 13 A. D. under Tiberius in Germania, Pannonia, and Dalmatia. The year of his death is unknown, but his *Historiæ Romanæ ad M. Vinicium Cos. Libri II.* reached to 30 A. D. The first manuscript of this book, and the only one that has come down to us, was discovered by Beatus Rhenanus at Murbach in Alsace, and printed at Basel in 1520. The best editions are that by Orelli (Leipzig, 1835), that by Kritz (2d ed. Leipzig, 1840), and the text by Haase (2d ed. with emendations by Mommsen, 1863) and by Halm (Leipzig, 1876). The beginning is wanting, and there is also a portion lost after the eighth chapter of the first book.

Revised by M. WARREN.

Pater'no: town of Italy; in the province of Catania, Sicily; situated at the foot of the western slope of Etna, about 9 miles from the city of Catania, on one of the routes to the summit of the volcano (see map of Italy, ref. 10-G). Remains of ancient aqueducts and the ruins of an old bridge over the Simeto may be seen here, and other traces of the Roman period. There is an old Norman castle, occupying an elevated position. Paterno has been supposed to occupy the site of the ancient *Hybla Major*. The vicinity is fertile in grapes, olives, hemp, etc. Pop. 15,230.

Pa'ter Nos'ter [Lat., Our Father, the opening words of the Lord's Prayer]: the name given by Roman Catholics to the Lord's Prayer. In the ancient Church it was regarded as so sacred that its formula was kept a secret from the uninitiated. (See *ARCANI DISCIPLINA*.) In later times this prayer was repeated by the vulgar as a charm. The closing words, "For thine is the kingdom," etc., are not present in all the versions, and some Christians do not use them.

Paterson: city (founded in 1791, incorporated in 1850, known as the "Lyons of America"); capital of Passaic co., N. J. (for location, see map of New Jersey, vol. 2, E.); on the Passaic river, the Morris Canal, and the Erie, the Del., Lack, and West., and the N. Y. Susquehanna and West. railways; 15½ miles N. W. of New York city. It is built partly on a broad plain and partly on the slopes of ranges of hills that inclose it on three sides, Garret Mountain, about 500 feet high, overlooking it on the S. W. The river, which affords exceptional power for manufacturing, runs through the city, and Passaic Falls, 72 feet high, are within its limits. The city is lighted by electricity, and has household and mill electric light and power. Founded for a great manufacturing place, the city has had a steady growth in industrial activity. The census returns of 1890 showed that 597 manufacturing establishments (representing 73 industries) reported. These had a combined capital of \$27,387,421, employed 24,135 persons, paid \$11,523,558 for wages and \$22,300,133 for materials, and had products valued at \$41,898,231. The principal industry was the manufacture of silk and silk goods, which had 90 establishments and \$14,353,491 capital, employed 11,596 persons, paid \$5,021,768 for wages and \$12,726,370 for materials, and had products valued at \$22,058,624. Then followed foundry and machine-shop products, which had 29 establishments and \$2,769,321 capital, employed 3,051 persons, and had products valued at \$4,048,592; malt liquors, 6 establishments, \$1,865,889 capital, and products valued at \$1,292,247; iron and steel, 5 establishments, \$1,535,335 capital, and products valued at \$1,813,813; dyeing and finishing textiles, 22 establishments, \$1,433,206 capital, and products valued at \$2,252,316; and jute and jute goods, 5 establishments, \$1,309,148 capital, and products valued at \$575,980. The foundry and machine-shop products and iron and steel manufactures included locomotives, metal bridges, steam fire-engines, cotton machinery, heavy castings and brass and plumbers' goods. Paterson contains 64 churches, 18 public schools, several private schools of high grade, 2 hospitals, 2 orphan asylums, free eye and ear infirmary, Old Ladies' Home, Children's Day Nursery, free public library, electric street-railways, 3 national banks, combined capital \$850,000, savings bank, capital \$100,000, private bank, and 6 daily, 6 weekly, and 4 monthly periodicals. Pop. (1880) 51,031; (1890) 78,347; (1895) 97,344. EDITOR OF "PRESS."

Paterson, WILLIAM: merchant; b. at Skipmyre, Dumfriesshire, Scotland, in 1665; was persecuted as a Covenantor by Charles II.; settled at London as a merchant; visited the West Indies, where he obtained much information about the localities of the Spanish Main from the buccaners; issued proposals for the establishment of the Bank of England, of which, upon its establishment in 1694, he was one of the directors. Paterson made unsuccessful efforts in England in the same year to organize a scheme of colonization in Darien; obtained from the Scottish Parliament in 1695 an act of incorporation; obtained large subscriptions, and proceeded to Darien with a considerable number of emigrants; was unsuccessful on account of quarrels, fever, famine, and the opposition of the Dutch, Spanish, and English Governments; returned to Scotland 1700; was an advocate of the union of Scotland with England; entered Parliament 1708; obtained some compensation for his losses about 1715; wrote several treatises on economical subjects. D. at Westminster, Jan. 22, 1719. See *Biographies* by Bannister (1858) and Pagan (1865), and the *Works* of Paterson (edited by Bannister, 3 vols., 1859).

Pathology [Gr. *πάθος*, suffering, disease + *λόγος*, discourse, reason]: that branch of medical science which treats of disease. It includes the study of the pathological alterations of the body, their causes, and their effects. Generally the subject is divided into aetiology, which treats of the causes of disease; pathological anatomy, which treats of the character of the structural alterations; and general pathology, which treats of the laws under which pathological alterations are produced, and the effect which they have on the function and structure of the other parts of the body.

Under disease we mean a definite alteration in some part of the body which produces a definite series of functional disturbances which we call symptoms. By the study of these symptoms we are able to recognize the situation of alteration and its character. The structural alterations of the body are divided into those which are congenital, and due to imperfections in the development and growth of the organism, and those which are the result of disease. All anatomical changes in the body not due to defects of development are the result of influences not inherent in the body, but acting on it from without.

We may regard life as due to the sum of external influences acting on the body. The character of these influences must be such that under them all the organs of the body act in a normal or physiological manner. When an ordinary external influence is increased to a great degree it may become a cause of disease. Disease is, however, most generally produced by the action of influences different from those ordinarily acting. When an organ is diseased it may be that injurious substances are brought to the organ by the circulation, or it may be that the blood while of a normal quality may vary from the normal quantity, or the part may become affected from direct injury or from its proximity to another diseased organ. These structural alterations of part have an effect not only in impairing their functions, but the impaired function of one organ, if it be an important one, has an effect on the function and structure of the other organs.

The infectious diseases are due to the action of microscopic living organisms which find suitable conditions for their development in the animal body, and as a result of their growth produce various alterations. Experimental pathology forms an important branch of pathology, and to its development a great deal of recent progress made in the increase of our knowledge of disease is due. In this lesions are produced in lower animals, or they are given various diseases by inoculating them with the organisms causing the disease. In such experiments there is the advantage that the effect of the lesions on the functions of the parts can be studied more closely, and by killing the animals at various stages of the disease its gradual course can be traced out.

W. T. COUNCILMAN.

Pathology, Vegetable: a department of botany which deals with the diseased conditions of plants. It is coextensive with physiology, which deals with plants and their organs in their normal, active state. The subject is thus too large to be treated in any but a summary way in this article, which professes to give no more than a mere outline.

Scientifically speaking, "disease is a condition in which the functions of the organism are improperly discharged" (*Ward*). While this general statement applies equally to plants and animals, it must not be assumed that there is a complete identity between their pathological conditions. In a plant nearly all cells are short-lived, and in the growth of an organ or member death follows close after the advancing mass of living, active cells. In a long-lived tree it is its normal condition that perhaps more than 99 per cent. of its mass is dead tissue. Again, in such a tree we observe the periodic death and separation of great masses of tissue in the fall of the leaves and flowers, and the ripening and fall of fruits. These examples will suffice to show why a reference to many languishing or dying cells is excluded from this discussion, which is confined to that part of the subject which deals with what may be called the abnormal pathology of cells, tissues, and organs.

1. *Unfavorable Habitat.*—For ordinary land-plants this includes not only such matters as altitude above sea-level, forest or plain conditions, etc., but even more, the particular conditions of the soil. In a hard soil, even if it is fertile, many plants starve because their roots can not penetrate it. The same thing takes place in a barren soil, although it may be soft and easily penetrated. In a soil which is too dry the plant starves not only for want of water (its most important food), but also for want of the solutions of nitrogenous and other solid food-matters. On the other hand, most land-plants soon languish if their roots are long in a soil which is filled with water. Here it appears that many of the roots die, and the plant starves in the midst of plenty. Sachs has shown that ordinary soil-roots die in completely wet soil, on account of the exclusion of air. In addition to this, in field-culture a wet soil is always colder than one which is moist; thus the absorption of nutritive solutions by the roots may be so checked as to result in starvation.

Occasionally the soil contains injurious or poisonous sub-

stances. Some salts, as those of potash, and soda are sometimes so abundant as to destroy nearly all vegetation. The presence of mineral oils or of some gases in the soil quickly kills the roots of all plants. Here again, as in the preceding cases, it appears that the plant is in fact starved by the cutting off of the supply of water and other food.

2. *Unfavorable Atmospheric Conditions.*—When the air is very dry the loss of water by the plant is excessive, and when this exceeds the water-supply the cells lose their turgidity, become enfeebled and almost inactive. Such cells may regain, to a great extent, their normal activity when the humidity of the air is increased.

Many gases in the air act as poisons to the cells with which they come in contact. The gases from burning coal, especially from that which contains sulphur, and those which escape from chemical-factories are often very destructive to vegetation. "Hydrochloric acid gas, nitric acid in vapor, and chlorine are also very destructive to vegetation, even when in such minute amounts as to be unnoticed on account of their odor" (*Goodale*).

Too intense or too feeble light is injurious to plants. Pringsheim has shown that in very intense white light the chlorophyll granules lose their color, and the cell is soon killed. In deficient light, as when plants are more or less shaded, they lose their color and become slender and weak. To a large extent this loss of strength is doubtless due to lack of nutrition through the inability of the chloroplasts to assimilate carbon.

When subjected to a temperature which is too high the plant wilts, and by the rapid loss of water by evaporation the leaves and younger stems become dry, as if scorched. In a low temperature (but not freezing) the activities of the cells are mostly suspended, and if this is prolonged the plant suffers from a loss of nutrition. When actual freezing takes place death usually follows on account of the withdrawal of the water from the protoplasm. A quick alternation from heat to cold appears to be more harmful than when the change is a gradual one. The so-called sun-scald upon the trunks of apple-trees appears to be the result of the heating of the tissues of the inner bark and younger wood by the afternoon sun on bright winter days followed quickly by a low temperature. The cells are made active by the heat, and when the temperature suddenly falls they are killed.

3. *Mechanical Injuries.*—Here may be mentioned the wounds, as by the breaking or removal of branches, the injuries from hail and lightning, and the twisting and rupturing of the tissues of the stems and leaves by violent winds, in all of which many cells are at once destroyed, exposing others, which in turn are usually injured also by drying, decay, or the attacks of harmful organisms (bacteria, fungi, or insects). Even when the wound has become covered by the growth of living tissue over it, the dead tissues of the original wound are frequently the origin of a more or less rapidly spreading decay, usually hastened by the presence of fungous filaments.

Most of the injuries produced by insects and other small animals are mechanical. The roots, stems, leaves, flowers, and fruits are often badly wounded by biting insects (*Coleoptera*, *Orthoptera*, and the larvæ of *Lepidoptera* and *Hymenoptera*). Here the injury to the plant is twofold; it suffers from the wounds as such, and also from lack of nutrition. The sucking insects (*Hemiptera*), by withdrawing water and other food-matters, to this extent decrease the nutrition of the plant. In addition, in some cases the insect injects a poisonous or irritating fluid, which either kills the tissues or causes abnormal growths, the latter resulting in the formation of galls of various kinds.

4. *Parasitism.*—One of the most fruitful sources of diseased conditions is the presence of parasitic vegetable organisms in the tissues. In a few cases these are phanerogams, as in the dodder and mistletoe, but by far the greater number are fungi and bacteria. The diseases produced by fungi and bacteria manifest themselves in many ways, and are known as anthracnose, blights, gummosis, mildews, rot, rusts, scab, smuts, spots, etc. In some of these there is a slow invasion of the tissues of the host by the parasite, with little apparent harm to the former, while again there may be very great changes in the tissues, resulting in the atrophy of organs, or much more commonly in their hypertrophy. In some again the tissues tend to dry and shrivel up, while in others they are turned into foul, decaying masses. The presence in root-cells of the cabbage and turnip of those low organisms of doubtful affinity, the *Mycetozoa*, gives rise to the distorted growths known as "club-root."

5. *Teratogeny.*—Doubtless we must regard the monstrous growths so frequently found in plants as involving pathological conditions of the tissues of the parts concerned. We know little as to the cause of these malformations, and may here do no more than indicate in a very general way their kinds, as described by Masters, as follows: (1) Abnormal union of parts; (2) abnormal separation of parts; (3) abnormal positions of parts; (4) arrest of development (stasis-morphy); (5) over-development (pleiomorphy); (6) perverted development (metamorphy); (7) irregular development (heteromorphy); (8) multiplication of parts; (9) suppression of parts; (10) overgrowth (hypertrophy); (11) undergrowth (atrophy).

See further the articles BLIGHT, MILDEWS, ROT, RUSTS, SCAB, and SMUTS.

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CHARLES E. BESSEY.

Pathros [Egypt. *Pa-ta-res*, the South Land; Septuagint, Παθούρψ]; the Hebrew name of Upper Egypt as distinguished from the Delta region, which was usually known as Mizraim (Isa. xi. 11; Jer. xlv. 1, 15; Ezek. xxix. 14).

Pat'kul. JOHANN REINHOLD, von: soldier and diplomat; b. about 1660 of a wealthy and influential family of Livonian nobility; received a military education, and served as a captain in the army, but became famous afterward as a diplomatist, or rather as an intriguer. Livonia was at that time a possession of the Swedish crown; and in the controversies between the Livonian nobility and the Swedish king Patkul played a conspicuous part. Accused of rebellion, he was summoned to Stockholm, but on his arrival there he soon discovered that the judgment was sure to go against him. He escaped to Courland, but was sentenced to death, and his estates were confiscated. For some time he lived in Switzerland and France, occupied in scientific studies, but in 1698 he entered the service of Augustus II. of Saxony and Poland, and the formidable alliance which was formed shortly after against Charles XII. by Augustus II., Peter the Great, and Frederick IV. of Denmark was principally Patkul's work. It seems, however, as if he could serve no friend and no purpose with full faith. In 1705 Augustus II. arrested him and put him in the dungeons of Sonnenstein; and when Charles XII. made Patkul's surrender one of the conditions of peace, Augustus II. consented. On leaving Saxony the Swedes carried him away with them, and Oct. 10, 1707, he was broken on the wheel and beheaded in the convent of Kazimierz near Posen.

Patmore. COVENTRY KEARSEY DIGHTON: poet; b. at Woodford, Essex, England, July 23, 1823; son of Peter George Patmore, a man of letters. He was assistant librarian in the British Museum 1846-68; author of *Poems* (1844); *Timerton Church Tower* (1853); *The Angel in the House* (4 parts, 1854-62), and other works; edited the *Autobiography* of Barry Cornwall. A collective edition of his poems was issued in 1886. D. Nov. 26, 1896. H. A. B.

Patmos, or **Patinos** [Gr. Πάτμος, Mediæv. *Palmo'sa*]: an island in the Ægean Sea; one of the Sporades, all of which belong to Turkey; 29 miles W. from Asia Minor, and 18 miles S. of the western extremity of Samos. Steamships pass near it when going from Constantinople to Egypt or Syria. It is a jagged, irregular mass of rock, 9 miles long and 5 miles broad, composed of two unequal parts which are united by a narrow isthmus, on the east side of which is an excellent harbor. Barren and dreary, it was a dreaded place of banishment under the Romans. St. John was confined here under Domitian, and released on the tyrant's death (96). According to Greek tradition he wrote his Gospel in the little village of Katavafsis, which no longer exists, and the Apocalypse in the south part of the island in a grotto now included in the tiny chapel of St. Anne, half way up the hill overlooking the town. This hill is crowned by the forest-like monastery of St. John the Theologian, erected in 1088, and now occupied by about forty monks. In the library are 239 manuscripts. The archives contain valuable ecclesiastical documents. The air is remarkably healthful, and pest and cholera are unknown. The inhabitants, numbering about 4,000, are industrious Greeks who gain a scanty subsistence by fishing, navigation, weaving a coarse kind of cloth, and working in Asia Minor or on the larger islands. E. A. GROSVENOR.

Pat'na: city; in the province of Bengal, British India; on the right bank of the Ganges, 285 miles N. W. of Calcutta (see map of N. India, ref. 6-H). It extends with its suburbs along the river for a distance of $7\frac{1}{2}$ miles. It is indifferently built, handsome brick buildings alternating with mud huts covered with tiles or thatched; but it has some manufactures of shawls, table-cloths, lacquered ware, and, being situated on the East India Railway, it has become the center of the opium-trade. It is the chief seat of Mohammedanism in India. Pop. (1891) 165,192.

Paton, JOHN GIBSON, D. D.: missionary; b. on the farm of Braehead, parish of Kirkmahoe, near Dumfries, Scotland, May 24, 1824; during his educational course in the University of Glasgow and the Reformed Presbyterian Divinity Hall, he was missionary in Glasgow; was missionary in Tanna, New Hebrides, from 1858 till 1862, when he was driven away; traveled in the interests of the New Hebrides mission, in Australia 1862-63, in Great Britain 1863-64, in the Australian colonies 1865, in Great Britain and North America 1892-94; and since 1865 has been missionary in Aniwa, New Hebrides. Dr. Paton was moderator of the Synod of the Reformed Presbyterian Church in Scotland 1863; delegate to the Pan-Presbyterian Council in Belfast 1884, and at Toronto 1892. An account of his life has appeared in two forms—an autobiography edited by his brother, *John G. Paton, Missionary to the New Hebrides* (2 vols., London and New York, 1889-90; new ed. Chicago, 1 vol., 1892), and *The Story of John G. Paton Told for Young Folks* (New York, 1892). C. K. HOYT.

Paton, Sir JOSEPH NOEL: historical painter; b. at Dunfermline, Scotland, Dec. 13, 1821. He was a designer for a manufactory of damask fabrics, and went to London at the age of twenty, where he entered the schools of the Royal Academy. In 1847 his pictures entitled *Christ Bearing the Cross* and *The Reconciliation of Othello and Titania* won for him a prize of £300 at the Westminster Hall competition. The latter work is in the National Gallery, Edinburgh. He was elected a member of the Royal Scottish Academy in 1850, and in 1867 was knighted. He is a sculptor of ability and a writer on archeological subjects. Studio in Edinburgh. WILLIAM A. COFFIN.

Patras: fortified town of Greece, in the Morea, on the Gulf of Patras; capital of the nome of Achaia and Elis; has a large though precarious harbor; is connected by rail with Athens (see map of Greece, ref. 16-J). Its customs receipts are larger than those of any other town in Southern Greece. The city is the seat of an archbishopric; and is well built and prosperous. It exports oranges, lemons, and currants, which are extensively cultivated in the vicinity. Pop. (1890) 33,529. E. A. G.

Patriarch [Gr. *πατριάρχης*, father or chief of a race, family, or country, patriarch; *πατρίδ*, fatherhood, paternal lineage, clan + *ἀρχή*, rule]: a title. In the Old Testament it was applied to heads of families till the time of the twelve sons of Jacob, who were the last patriarchs. In Jewish post-Christian history the Jewish pontiff, whose authority centered at Tiberias and extended over all the Jews W. of the Euphrates from about 175 to 415, was called Patriarch of the Jews. In ecclesiastical history, in the fourth century the Bishops of Rome, Antioch, and Alexandria assumed the title, as representative of the Christians in Europe, Asia, and Africa respectively. To them were added the patriarchs of Constantinople and Jerusalem. The Roman Catholic Church reckoned twelve patriarchs attached to her communion; namely, of Constantinople, Jerusalem, Antioch, Venice, West Indies, Lisbon, Antioch (of the Melchites), Antioch (of the Maronites), Antioch (of the Syrians), of the Catholic Armenians in Cilicia, and the Chaldeans or Nestorians of Babylon; and also the Bishops of Aquileia and Bourges. The Eastern Orthodox or Greek Church reckoned five: of Constantinople, Rome, Alexandria, Antioch, and Jerusalem. Considering the patriarchate of Rome as vacant through heresy, she established the patriarchate of Russia in 1437, which was suppressed in 1700 by Peter the Great. Various other ancient Christian communities, as specially the Armenians, retain the same office and title. Patriarchal functions are mainly of precedence and supervisory.

E. A. GROSVENOR.

Patriarchies: See ETHNOLOGY; also INDIANS OF NORTH AMERICA.

Patrician [from Lat. *patr'icius*, pertaining to the nobility, of senatorial rank, deriv. of *pa'tres*, nobles, senators,

liter., fathers]: a name given to the members of the Roman *gentes*, constituting the original *populus Romanus*. The Roman historians supposed that originally the *patricii* were the sons of the senators or *patres*. So Livy: "*Patres certe ab honore, patricique progenies eorum appellati*" (Liv. I. 8). Doubtless the true explanation of the word patrician is that offered by Mommsen; he says: "Whoever was begotten in an illegal marriage or out of marriage was excluded from the membership of the community. On this account the Roman burgesses assumed the names of the 'father's children' (*patricii*), inasmuch as they alone in the eye of the law had a father." (*Hist. of Rome*, ch. v., vol. i., p. 69, Eng. trans.) It is certain that the patricians were the original burgesses of Rome; in the earliest times there was no plebeian class inside the state. The patricians were divided into certain clans, *gentes* as they were called; the *gentes* were divided into families, and all these families were connected together by certain religious rites called *sacra gentilia*. Attached to each household were the slaves and the clients, the latter including foreign refugees and emancipated slaves. Sometimes a patrician would marry a client's daughter, in which case the children resulting from the marriage would take rank neither with the patricians nor the clients; they would have no political rights, but would be independent. There were many ways in which a state of independency might be attained by the clients; as, for instance, when a patron died and left no heir. Thus there soon arose in Rome a third class, the plebeians. To the class so formed were added many citizens among the conquered tribes round about Rome; after the conquest of Alba many of their citizens were brought to Rome, only a few being received as burgesses, while the majority joined the plebeians. The civil history of Rome for more than four centuries after the foundation of the city presents a constant struggle between the two orders of patricians and plebeians. At the beginning of the struggle the whole political, judicial, and hierarchical power was in the hands of the patricians; at the end of it a perfect equalization had taken place. The first great advantage gained by the plebeians was the establishment of magistrates of their own, tribunes of the plebs (495 B. C.), for the sole object of the protection of plebeians. During the next half century from that date rapid advances were made; internarrriage between the two orders was sanctioned; the consulship was for a while discontinued and the office of military tribune established, to which plebeians were made eligible; and a way into the senate was prepared for the plebeians by throwing open the quaestorship. The patricians, however, at this date still retained some of the highest offices; they alone were eligible for the augurships and the pontificate. Further, two new offices were created—offices of the highest power—the censorship and the praetorship of the city. By the coming of the Gauls (390 B. C.) the work of equalization was thrown back somewhat, but only for a time. By the Licinian rogations the consulship was restored, and it was definitely arranged that one of the two consuls should be a plebeian. In B. C. 356 a plebeian was raised to the dictatorship; in 351 the censorship was thrown open; the praetorship followed soon after; and at length, in 300 B. C., the plebeians were elected to the highest sacred offices, the pontificate and the augurships. Some offices of no political significance continued to be reserved to patricians, but in general from this time forward the title of patrician carried with it no advantages apart from the respect which was considered due to high birth and the memory of noble ancestry. After the transference by Constantine of the seat of imperial authority to Byzantium the term *patricius* was made a personal title, indicating a rank a grade lower than that of consul. Revised by G. L. HENDRICKSON.

Patrick, SAINT—Lat. form *Petrucius*; the apostle and patron saint of Ireland. His baptismal name was *Succat* (brave in battle). His name as a captive was Cothraige; latter he was called Magonus, or Imigonus, or Maun; on his ordination he took the name Patricius. His birthplace is not certainly known, and his dates are all disputed. The dates in this article are probably only approximations. He says of himself, in his *Confession*, that he was born at "Bannavem Taberniae," which may probably be identified with Kirkpatrick, near Glasgow, in Scotland. He was born about 372; was a captive and the slave of the King of Dalradia in Ireland from 388 to 395; went to Gaul, and was there ordained priest and bishop; went to Ireland as a missionary in 432, and died at Saul, near Strangford Lough.

County Down, Ulster, where many years before he had founded his first church, on Mar. 17, 465, the day now sacred to his memory. Ireland was then occupied by a great number of petty tribes, most of which were evangelized by Patrick. So well was the work accomplished that Ireland was known in subsequent centuries as the "island of the saints." The method employed was that of dealing cautiously and gently with the old paganism of the people. The chieftains were first won over, and then through them their clans. Of Patrick himself much that has been related is fabulous; but his autobiographical *Confession* and his *Epistle to Coroticus*, both of which are unquestionably genuine, reveal a devout, simple-minded, unlettered man, and a most discreet and energetic missionary. It is a very curious fact that in these writings of his we find no mention of the pope, and no trace of purgatory, auricular confession, transubstantiation, or worship of the Virgin; while salvation by faith and all the related doctrines are clearly taught. See W. D. Killen's *Ecclesiastical History of Ireland* (2 vols., London, 1875); Whitley Stokes's *The Tripartite Life of St. Patrick, with other Documents relating to that Saint* (1887); Eng. trans. of all his writings, by C. H. H. Wright (1889). Revised by S. M. JACKSON.

Patripas'sians, or Monarchians [*Patripassians* is from Lat. *pa'ter*, *pa'tris*, father + *pa'ti*, *pas'sus*, suffer; *Monarchians* is from Gr. *μόνος*, single + *ἀρχή*, first place, beginning, principle]: Antitrinitarians of the ancient Christian Church, who either taught, or were charged with teaching, either expressly or by implication, that God the Father was incarnated and suffered in the person of Jesus Christ. They denied the doctrine of Three Persons in the Godhead, teaching only three manifestations of the One Person. For themselves, they claimed that they were emphasizing both the unity of God and the divinity of Christ. Of those who held to the heresy in its bolder form, the most eminent were Praxeas of Asia Minor, who was in Rome between 190-200 A. D., Noëtus, who was excommunicated at Smyrna shortly after 200, and the two popes Zephyrinus (202-218) and Callistus (218-223). A much finer type of the heresy was developed by Beryllus of Bostra, recovered to orthodoxy by Origen in 244, and by Sabellius of Ptolemais in Egypt, 250-260 A. D., whose system has frequently reappeared, especially in Occidental Christendom. See **CHRISTOLOGY**.

Patroclus (in Gr. *Πάτροκλος*): the friend of Achilles; a son of Menoëtus of Opus, a brother of Peleus, the father of Achilles. Of his participation in the Trojan war, his death by the hand of Hector, and the frightful revenge which Achilles took, the *Iliad* contains a grand picture in its songs xvi.-xxiii.

Patronage [from Lat. *patro'nus*, protector, patron, deriv. of *pa'ter*, father]: in general, the right of making appointments to vacant benefices, but it is commonly limited to the right of presenting candidates to vacant ecclesiastical benefices. So long as the Christian Church was chiefly missionary there could, of course, be no question of patronage. In the district or diocese which was placed under his superintendence the bishop fixed his residence at the religious house, where he lived together with a number of priests, as many as were sufficient for the religious instruction of the population of the diocese, and the whole establishment was maintained at the expense of the episcopal treasury. In course of time the bishop at the cathedral church would establish and endow branch churches in his diocese and nominate a priest among the *episcopi clerici*, who enjoyed the revenues of the parish endowment. Soon, however, when Christianity became the generally accepted religion, the bishop became unable to provide his whole diocese with churches or the churches with revenues. Private persons of wealth and piety then took the duty upon themselves. The count, the baron, the lord of the castle, built on his domain a church and endowed it with land or other property sufficient to maintain the building and the priest. He now became the patron of this church; and he enjoyed the right of nominating a person in holy orders to be the officiating minister. So far the development was natural and sound. The third Lateran Council of 1179, and also the fourth of 1215, decreed that presentation by the patron, or induction, as it was called, was by itself not sufficient to confer any ecclesiastical benefice, as it referred only to the temporalities of the office; institution or investment, with its spiritualities, was furthermore necessary; and as this could only be given by the Church, the bishop, or the pope, the patron's right of appointment was thereby actually annulled. In the thirteenth

century the pope claimed for himself the patronage of all benefices whose incumbents died at the court of Rome; and as the number of ecclesiastics of all ranks and from all countries who visited Rome was very great, this claim was of considerable importance. The pope also gave dispensations for non-residence and for holding several benefices at the same time, and even assumed the right of giving away bishoprics, abacies, and other ecclesiastical benefices before they were vacant—a measure which roused general indignation, so much the more as it was well known that he sold them. In England, under Edward I., an act of Parliament made every one subject to heavy penalties who should venture to enforce the authority of such papal provisions in England. France also made vigorous and successful protest. (See **GALLICAN CHURCH**.) With the Reformation the patronage generally returned to the original possessor, the founder of the church. In England it is treated exactly like any other piece of property; it may be connected with the manor, and is then called *appendant advowson*, and it may have been separated from it and belong to a person, in which case it is called *advowson in gross*. In Scotland it was twice canceled and twice re-established; it still exists there, but in a somewhat restricted form. In Denmark it was abolished by the constitution of 1848. In the Episcopal Church in the U. S. the right of appointing to vacant ecclesiastical positions, such as rectorships or the position of an assistant minister, rests with the vestry as representing the congregation. Sometimes the bishop has a co-ordinate power with the vestry, or the right to choose one from two or more nominations. Rarely, if the clergyman is not liable to episcopal censure, can the bishop veto the appointment of one of his vestries. In unorganized congregations or missions the bishop usually nominates the incumbent. Revised by W. S. PERRY.

Patronage (in politics): See **CIVIL SERVICE**.

Patrons of Husbandry: a secret order having for its object the mutual protection and advancement of the interests of the agricultural classes.

At the close of the civil war in the U. S. the agricultural interests in the Southern States were greatly depressed; the poverty of the farmers, the difficulty in obtaining efficient labor, the imperfect and ruinous methods of cultivation, and the absence of mixed husbandry were sufficient causes for this depression. In order to seek relief, President Johnson appointed O. H. Kelly, of the Bureau of Agriculture, as agent of the Department of Agriculture of the South, to collect statistical information for publication with a view to encouraging immigration to the South. While on this mission he conceived the idea of an association that would not only improve the condition of agriculturists in all parts of the U. S., but would also bind them into one great brotherhood. He communicated his conclusions to several employees of the Government at Washington, who received Kelly's plan of organization with favor, and held a conference with him on Nov. 15, 1867, when "Patrons of Husbandry" was adopted as the name of the order and the "grange" as the name of its constituent bodies and place of meeting. On Dec. 4 of the same year another meeting was held, officers were elected and the National grange formally organized. The early growth of the order was slow, and many obstacles seemed almost insurmountable for the time being. In Jan., 1871, not more than eighty-eight subordinate granges and three State granges were in existence, but during that year the number of granges was more than doubled and for many years each succeeding year brought many new granges and greatly increased membership. In 1892 nearly every State and Territory contained granges, and many were reported in Canada.

In States where granges are most numerous they have been a potent factor in improving the condition of the farmer and his family. The saving in money by combining orders and purchasing for cash, encouraging the practice of selling direct to the consumer and buying from the manufacturer, the combining of granges in one or more counties to form mutual fire relief associations—all have aided in improving the financial condition of the members of this order; yet even greater benefits have been derived from the discussion and practice of improved methods of agriculture, the establishment of grange libraries and reading-circles, and the great prominence given to educational work.

Comparatively early in the history of the order the granges in several of the Western States undertook the control of the railways, elevators, and other commercial enter-

prises, with indifferent success for the time being; afterward they succeeded in bringing about more favorable legislation for the agriculturist. The founders made it a part of the fundamental law that the order should not meddle with political questions. Agriculturists of all political parties and of none are equally welcome in the order, but they must not bring into it discussion of partisan politics or party measures under penalty of expulsion.

Though the National grange was formed first the *subordinate grange* is really the unit of organization, and must consist of fifteen members, of whom not less than four must be women. A complete grange must have thirteen officers, viz.: Master, overseer, lecturer, steward, assistant steward, chaplain, treasurer, secretary, and gate-keeper may be all men; Ceres, Pomona, Flora, and lady assistant steward must be all women. These each have their appropriate insignia of office and their well-defined duties. There is also an executive committee of three persons, and often an organist and librarian. Subordinate granges confer four degrees, and all business meetings are held in the last or fourth degree. The meetings of subordinate granges are held monthly or oftener, and may determine upon such measures as shall promote the interests of the grange and its members. *Pomona granges* are county or district organizations composed of masters and past masters of subordinate granges and their wives, who are members with other fourth degree members in good standing, who are recommended by subordinate granges in the county for the fifth degree. The *Pomona grange* is essentially a fifth degree grange, although its business, aside from degree work, is done in the fourth degree. *State granges* are composed of masters of subordinate granges and their wives, who are members of subordinate granges. It is, however, provided that when these become so numerous as to render the body too large, delegates shall be selected to represent the whole body upon such a basis as the grange shall decide. The sixth degree belongs to the State grange, though it may confer the fifth degree at pleasure. The *National grange* is the highest in authority, and the laws enacted by the State, Pomona, and subordinate granges must not conflict in any way with those enacted by this body. The National grange confers the sixth and seventh degrees. The State and National granges meet annually. The officers of the State and National granges are the same as those of the subordinate grange. The officers of the subordinate granges are elected for one year, those of the State and National granges for two years. GEORGE C. WATSON.

Patronymic [from Gr. *πατρωνυμικός*, like the father's (sc. *ὄνομα*, name): *πατήρ*, father + *ὄνομα*, name]: a proper name formed upon the basis of a father's or ancestor's name, and indicating descent. Family names like Johnson, Williamson, Peterson, were originally patronymics attached to the Christian name of an individual for the sake of more precise distinction. The element *Mac-* in Irish names like McCarthy signifies "son of" (O. Ir. *macc*, boy), and is cognate with Goth. *magus*, boy, from which Goth. *magafis*, girl; Germ. *magd*; Eng. *maid*; similarly the Aramaic *Bar-* in names like *Barabbas*, *Bartimeus*, *Bartholomew*. Very commonly a mere suffix serves the purpose, as in the case of the Greek *-ides*, as *Peleides*, son of *Peleus*, *Philippides*, son of *Philippus*; or *-ion*, as *Kronion*, son of *Kronos*. In Teutonic the suffix *-ingas* or *-ungas* is used similarly; thus O. Eng. *Hrēþling*, son of *Hrēþel*; also in tribal names, O. Eng. *Wylfingas*; M. H. Germ. *Wūlfinge*. It survives in modern English family names and place-names like *Manning*, *Billings*, *Reading*, *Walsingham*, *Buckingham*; cf. Germ. names *Göttingen*. This suffix represents an Indo-Europ. *-endós*, or *-ndós*; cf. Gr. *-akos* in *Ἰππακός* (Ἰππων).

Patroons: those Dutch settlers in the colony of New Netherland (afterward New York), who on certain conditions as to colonizing enjoyed manorial rights over their lands. To obtain the privileges of a patroon it was necessary to plant a colony of fifty persons over fifteen years of age on lands selected for the purpose, and within four years after notice was given of intent to colonize. The rights of these proprietors, as enumerated in the charter of 1629 "to all such as shall plant colonies in New Netherland," were of a semi-feudal nature, and the colonies were governed by the same laws as the feudal manors of the United Provinces. Accused of encroachment on the rights of the West India Company, the patroons were involved in continual quarrels with the directors, and were more zealous in undertaking trade ventures for their own profit than in bringing in new colonists. The feudal tenures of these manorial lords were

maintained after the Revolution, and although laws were passed in 1779 and 1785 abolishing them, the proprietors contrived a form of deed by which the tenant bound himself to perform services and pay rents and dues in the same manner as before the old system was abolished. From 1839 to 1847 there was considerable opposition to these burdens, and associations of so-called ANTI-RENTERS (*q. v.*) were organized to redress the grievances of tenants. F. M. COLBY.

Patten, SIMON NELSON, A. M., Ph. D.: economist; b. at Sandwich, Ill., May 1, 1852; educated at Northwestern University, Evanston, Ill., and at the University of Halle, Germany, where he received the degree of Ph. D. in 1878. He was elected Professor of Political Economy in the University of Pennsylvania 1888. He is author of *The Stability of Prices* (1888); *The Consumption of Wealth* (1889); *The Economic Basis of Protection* (1890); *Principles of Rational Taxation* (1890); *The Educational Value of Political Economy* (1891); *The Theory of Dynamic Economics* (1892); and many valuable papers on economic topics to the *Annals of the American Academy of Political and Social Science*, *The Political Science Quarterly*, *The Journal of Economics*, *Conrad's Jahrbücher*, and other periodicals. C. H. T.

Patterson, CARLILE POLLOCK: superintendent of civil survey; son of Daniel Tod Patterson; b. at Shieldsboro, Bay of St. Louis, Miss., Aug. 24, 1816; appointed midshipman Sept., 1830; joined the frigate *Brandywine* in October, and served in the Mediterranean squadron; in Feb., 1836, returned to the U. S. in the line-of-battle ship *Delaware*, carrying his father's flag as commodore; was passed midshipman June, 1836; graduated from Georgetown College, Ky., as civil engineer early in 1838; joined the U. S. Coast Survey, and served until 1841; as second lieutenant of the U. S. brig *Boxer* cruised in the West Indies until Jan., 1844; again in Coast Survey in 1845, and conducted a hydrographic party in the Gulf of Mexico; took command of Pacific mail steamship *Oregon* in Jan., 1850; resigned as lieutenant in the navy Sept., 1853, and remained on the Pacific coast until Mar., 1861. In May, 1861, he became hydrographic inspector U. S. Coast Survey, and so continued until Feb. 17, 1874, when he was appointed superintendent of that work. D. Aug. 15, 1881. See COAST AND GEODETIC SURVEY.

Patterson, DANIEL TOD: naval officer; b. on Long Island, N. Y., Mar. 6, 1786; appointed midshipman in the navy in 1800; attached to the frigate *Philadelphia* when that vessel ran on a reef near Tripoli in Oct., 1803, and, being defenseless, surrendered to a flotilla of Tripolitan gunboats. Patterson remained a prisoner until peace was concluded in 1805; promoted to the rank of lieutenant in 1807, and to that of master-commandant in 1813. In 1814 he commanded naval forces at New Orleans, and for able co-operation with Gen. Jackson in defending that city received the thanks of Congress. He commanded the flotilla which captured and destroyed the forts and other defenses of Lafitte, the pirate, on the island of Barataria; was appointed captain in Feb., 1815; commanded the frigate *Constitution* 1826-28 in the Mediterranean; served as navy commissioner 1828-32; commanded the Mediterranean squadron 1832-36; and from 1836 was commandant at the navy-yard, Washington, where he died in 1839.

Patterson, JOHN: b. at New Britain, Conn., 1744; graduated at Yale College 1762; became a lawyer; removed to Lenox, Mass., 1774; was a member of the first and second provincial congresses of Massachusetts 1774-75; raised a Berkshire regiment of minute-men and started for Cambridge within eighteen hours of receiving the news of the battle of Lexington; took part in the disastrous expedition against Canada and the battles of Trenton and Princeton; was appointed brigadier-general Feb. 21, 1777; rendered important services at the battle of Stillwater; was present at Burgoyne's surrender and at the battle of Monmouth; remained in service throughout the war; was engaged in the suppression of Shays's rebellion 1786; settled soon afterward at Lisle, Broome co., N. Y.; became a county judge, member of the State Legislature, of the constitutional convention of 1801, and of Congress 1803-05. D. at Lisle, July 19, 1808.

Patterson, ROBERT: military officer; b. in Tyrone County, Ireland, Jan. 12, 1792; at an early age came to the U. S., and subsequently became a very successful merchant of Philadelphia. On the outbreak of the war with Mexico he was appointed a major-general of volunteers in the service

of the U. S., and commanded a division under Gen. Scott, taking part in the battle of Cerro Gordo. On the breaking out of civil war in 1861 he was mustered into the service of the U. S. as major-general of Pennsylvania troops assembled under the President's first call on the States (Apr. 15, 1861) for 75,000 men for three months. Commanding the force on the Potomac in the neighborhood of Harper's Ferry, opposed to the Confederate force under Gen. J. E. Johnston, he was charged with neutralizing that force and preventing its junction with Beauregard at Manassas Junction; but Johnston succeeded in effecting a junction, his advance reaching Manassas on the 20th, the battle of Bull Run ensuing the next day. (See *BULL RUN*.) On the expiration of his commission (July 27, 1861) Gen. Patterson was mustered out of service. He from that time resided in the city of his adoption, Philadelphia, one of her most honored and influential citizens, and one of the largest mill-owners in the U. S. D. Aug. 7, 1881.

Patterson, ROBERT WILSON, D. D., LL. D.: minister; b. near Maryville, Tenn., Jan. 21, 1814; was educated at Illinois College and Lane Seminary; was tutor in Illinois College 1839-40; supplied several churches 1840-42; was pastor of the Second Presbyterian church, Chicago, from its organization, 1842-74; Professor of Evidences and Ethics in McCormick Seminary 1873-81; president of Lake Forest University 1876-78; and lecturer in Lane Seminary 1880-83. Dr. Patterson was moderator of the General Assembly (New School) at Wilmington, Del., in 1859. D. in Evanston, Ill., Feb. 28, 1894. C. K. HORT.

Patteson, JOHN COLERIDGE, D. D.: missionary; b. in London, England, Apr. 1, 1827; educated at Merton and Baliol Colleges, Oxford; became a fellow of Merton 1852; curate of Alfrington, Devonshire, 1853; went in 1855 with Bishop Selwyn to New Zealand; labored as a missionary until 1861, when he was made Bishop of the Melanesian islands; spent the remainder of his life visiting the islands under his episcopal charge, and endeavoring to suppress the kidnapping of the natives to be carried to Queensland; was killed on the island of Nukapu by the Melanesians, Sept. 20, 1871. His *Life* has been written by Miss C. M. Yonge (2 vols., London, 1874) and by Francis Awdry, *The Story of a Fellow-soldier* (1875).

Patti, ADELINA MARIA CLORINDA: singer; b. in Madrid, Spain, Feb. 19, 1843. Her father, Salvatore Patti, was a Sicilian, her mother a Roman, and both were operatic singers. In 1844 her parents removed to the U. S., and lived humbly in New York. At the age of four the child displayed wonderful talent. She received instruction on the piano from her sister Carlotta, who later became a singer of high reputation, and in vocalization from her step-brother Barili, and her brother-in-law, Maurice Strakosch. When about nine years of age Adelina appeared at a concert in New York, and achieved a remarkable success. In a series of concerts given in connection with Maurice Strakosch and Ole Bull, the infantile prima donna's share of the profits amounted to \$10,000. On Nov. 24, 1859, she made her *début* in opera at the Academy of Music, New York, appearing as Lucia. She made professional visits to Boston, Philadelphia, and other cities, and went to Europe in 1861 under the management of Maurice Strakosch. The London managers would not give her an opportunity to sing, and she was on the point of returning to the U. S., when manager Gye, of Covent Garden theater, promised to allow her to sing three times, for which she was to receive no pay whatever. She appeared May 14, 1861, as Amina, in *La Sonnambula*, and her triumph was instantaneous. Since that time she has sung in all the capitals and the principal cities of France, Germany, Italy, Spain, Russia, Mexico, and South America. In 1868 she was married to the Marquis de Caux in London, but was divorced from him in 1878. She married, in Wales, Signor Nicolini, an opera-singer, June 9, 1886. She has a magnificent country-seat at Craig-y-Nos, Wales. Her repertory is chiefly confined to the Italian school. No singer in the nineteenth century is to be compared with her. B. B. VALLENTINE.

Pattison, MARK: scholar; b. at Hornby, Yorkshire, England, 1813; was educated at Oriel College, Oxford, and was elected a fellow of Lincoln College, in that university, in 1840. In 1861 he became rector of his college. He published *Tendencies of Religious Thought in England from 1688 to 1750* (1860); *Report on Elementary Education in Protestant Germany* (1860; 2d ed. 1871); *Suggestions on Academic Organization, with Special Reference to Oxford* (1868); *Pope's Essay on Man*, with notes (1869; 6th ed.

1879); and *Pope's Satires and Epistles*, with notes (1872; 2d ed. 1874). He also wrote a biography of Milton, and a celebrated *Life of Casaubon* (2d ed. 1892), and published annotated editions of Milton's sonnets, etc. D. at Harrogate, July 30, 1884. A volume of his *Memoirs* was published in 1885; of collected *Sermons* in 1885; and of *Essays* in 1889. For a sketch of his wife, see DILKE, LADY EMILIA.

Revised by A. GUDEMAN.

Patton, FRANCIS LANDEY, D. D., LL. D.: clergyman; b. at Warwick, Bermuda, West Indies, Jan. 22, 1843; educated at University College, Toronto, Canada; studied theology at Knox College, Toronto, and at Princeton Theological Seminary, graduating at the latter institution in 1865; was ordained by the Presbytery of New York, and was pastor of Presbyterian churches in Eighty-fourth Street, New York, 1865-67, Nyack 1867-71, and Chicago 1874-81, and from 1871 to 1881 was Professor of Didactic and Polemical Theology in the Presbyterian Theological Seminary at Chicago. In 1873-76 he edited *The Interior* at Chicago; became Professor of the Relations of Philosophy and Science to Religion in Princeton Theological Seminary 1881; and in 1888 president of the College of New Jersey. He was moderator of the Presbyterian General Assembly in 1878.

Revised by S. M. JACKSON.

Patuxent River: a stream which rises 18 miles E. of Frederick, Md.; flows S. S. E. and S., and falls at last into Chesapeake Bay by a wide and deep estuary. Its valley is very narrow, and the river is for many miles a navigable tidal stream, abounding in oyster-beds of great value.

Patwin Indians: See COPEHAN INDIANS.

Patzcuaro: a city near the central part of the state of Michoacan, Mexico; beautifully situated on the plateau, by a lake of the same name; 7,185 feet above the sea; pop. (1893) about 10,000 (see map of Mexico, ref. 7-G). It is said to have been a very ancient capital of the Tarascan Indians. The lake is about 30 miles in circumference, and contains several forest-covered islands. Patzcuaro is connected with Morelia and Mexico by rail, and, being the center of a rich agricultural region, is rapidly growing. Much of the beautiful feather-work sold in Mexico is made here. H. H. S.

Pau, pō: chief town of the department of Basses-Pyrénées, France; picturesquely situated on the Gave du Pau, at a height of over 600 feet above the sea; 143 miles S. E. of Bordeaux (see map of France, ref. 9-D). It has fine promenades, commanding magnificent views of the Pyrenees. It was formerly the capital of the kingdom of Béarn and Basse-Navarre, which was united to France in 1620. It has a remarkable old castle, built by Gaston de Foix in 1363, in which Henry IV. was born, several good educational institutions, linen, steel, leather, and chocolate manufactures, and an active trade in wine, hams, fruits, and flour; but the inhabitants chiefly depend upon their 4,000 winter visitors, of whom many come from England. Pop. (1891) 32,111.

Paul, SAINT: the apostle to the Gentiles; b. in Tarsus, in Cilicia, a province of Asia Minor, probably about 1 A. D. His name at first is Saul, but from Acts xiii. 9 Paul, without explanation of the change. He was a Benjamite and a Pharisee. He was also a free-born Roman citizen; his father must therefore have been enfranchised. As was the practice among the Jews, even those of independent condition, the lad was taught a trade. Hair-cloth for tents was one of the chief products of Cilicia, and the trade of tent-making was the one which this boy learned.

Education.—Doubtless he received such education as could be furnished in the synagogue schools of Tarsus; he was sent to Jerusalem, where he became a pupil of the great Gamaliel, grandson of Hillel, and one of the seven great Jewish Rabbans. Saul must have been studying in Jerusalem while Jesus was in seclusion at Nazareth; but it is unlikely that Jesus and Paul ever met. It is probable that after completing his study of the law with Gamaliel he returned to Tarsus, and was dwelling there during the term of Christ's public ministry.

Return to Jerusalem.—After the death of Christ we find Paul again in Jerusalem. The sect of the Nazarenes is growing rapidly, and Jewish conservatism is alarmed. One of the younger leaders of this sect, a deacon named Stephen, undertakes an active propagandism, and in the synagogues of "the Libertines and of the Cyrenians and of the Alexandrians and of them of Cilicia and of Asia" (Acts vi. 9) there is hot controversy between this zealous advocate of what the Jews called "The Way" and the orthodox Jews.

The Martyrdom of Stephen.—When, shortly after, Stephen was arrested and dragged before the Sanhedrin on a charge of blasphemy, Saul was undoubtedly present. For when Stephen was condemned to death by stoning Saul accompanied the mob of executioners to the place outside the gate where the deed was done, and the witnesses who hurled the missiles laid down their garments at his feet. The narrative in the Acts was written by one of Paul's traveling companions, and it is altogether probable that the report of the execution was gleaned from the apostle's own lips. That "Saul was consenting unto his death" is not an accusation but a confession, and the serene and triumphant faith of the first martyr made an impression on his mind which was never effaced. It has been supposed that either before or soon after the death of Stephen Saul was elected a member of the Sanhedrin; the principal evidence of this is his statement that he was not only active in the persecution of the Christians, but that when they were condemned to death he gave his vote against them (Acts xxvi. 10). This is the literal meaning of the Greek, but it may be used metaphorically. If Paul was a member of the Sanhedrin he must have been married and the father of a family, and the absence of all allusions to such relations, in those passages where a man of his mental habit would have been sure to refer to them, makes it seem highly improbable that he could have had a family.

Whatever may have been his official position, there is no doubt that he became about this time the leader of the persecution which was raging against the Christians. Not only in Jerusalem and its environs did he harry them to prison and to death, but by some strange confusion of jurisdiction or connivance of officials he received from the chief priests authority to proceed to Damascus, the capital of another province, five or six days' journey distant, that he might stamp out the heresy in that region.

It was on this journey that the remarkable event took place which changed the whole current of this impetuous life. Most truly has Dr. Harnack said that this event "has proved to be of transcendent importance for the religious history of mankind."

This man had been, as he testifies, a most conscientious observer and a most strenuous upholder of the Jewish law, but a hard, literal conformity to a merely external standard brought him no satisfaction, and his restless spirit sought in a still more intense devotion the peace which had always eluded him. The lonely journey to Damascus gave him time for meditation; doubtless the gentle and tolerant words of his old master Gamaliel came back to him with power, and in the midst of these mental overturnings a vision of the Nazarene appeared to him in the sky, and a voice in the Hebrew tongue cried: "Saul, Saul, why persecutest thou me?" Paul's own belief was that Jesus appeared to him. The one thing certain is that from this hour he ceased to be a persecutor of the Nazarenes and became, in due time, their foremost leader. At Damascus he was received and befriended by those whom he had come to destroy.

"Many days" passed, not less than three years, it would seem, before Paul ventured to return to Jerusalem. Part of this time was spent, as he tells us, in seclusion in Arabia. He felt that repose and meditation were needed that he might comprehend the nature of his vocation, and understand the relation between the old faith and the new. When, at last, he went back to the scene of his Pharisaic exploits, although the distrust of the disciples was overcome, the enmity of his former coreligionists was inflamed, and he was forced to flee to his home in Tarsus. Here he tarried, we know not how long, perhaps preaching Christ in the synagogues of Cilicia. After a while a remarkable interest in the story of the Gospel was awakened in Antioch, and Barnabas, who had been commissioned to take the superintendency at that place and who had great confidence in Paul, sought him out at Tarsus and entered into active association with him in this work. Here for more than a year these two wrought side by side in the great Syrian capital, and here it was that the disciples, who became a great multitude, were first called Christians.

Missionary Journeys.—From Antioch Barnabas and Saul set forth upon the first of those missionary journeys which were to occupy the remainder of his active life. These journeys took him by sea many times across the Eastern Mediterranean and the Ægean, and by land through Syria and the whole of Western Asia and Southern Europe; in nearly every prominent city of Asia Minor and of Greece he preached the Gospel and established churches; his activity

during these missionary years must have been prodigious. In the first of these journeys he was accompanied by Barnabas and Mark, later by Silas and Timothy and Luke, the writer of the Acts of the Apostles. His practice on entering any city was to put himself first in communication with the synagogue of the Jews, and to impart to them his message; if they would not receive it he turned to the Gentiles. His success in gathering converts and establishing churches, when measured by the standards of modern missionaries, was certainly phenomenal. In Ephesus, in Thessalonica, in Athens, in Corinth he heralded the Gospel, sometimes to groups gathered in the market-places, sometimes to assemblies of philosophers, sometimes in little companies assembled in some hospitable home.

Arrest in Jerusalem.—On his return from his third missionary journey he was arrested in Jerusalem on the charge of profaning the temple, and was only saved by Roman officers from destruction by the mob. After a tedious imprisonment he appealed to the emperor's court, and so at last was forwarded as a prisoner to Rome, where for two years he awaited trial, dwelling in his own hired house, "receiving all that went in unto him, preaching the kingdom of God, and teaching the things concerning the Lord Jesus Christ with all boldness, none forbidding him" (Acts xxviii. 31). This is the end of all historical record concerning the apostle. There are many conjectures and traditions respecting his future career, and inferences from some of his epistles make it probable that his first trial resulted in an acquittal; tradition says that he then set forth upon another missionary journey, which was interrupted by his arrest and his second imprisonment at Rome, where he finally suffered martyrdom. All these rest upon very uncertain foundations.

The trustworthy records of Paul's life are found only in the Acts of the Apostles and in his epistles. (See PAULINE EPISTLES, THE.) Of the latter, thirteen in the New Testament are ascribed to him, not counting the Epistle to the Hebrews; nearly one-fourth of the bulk of the New Testament literature is supposed to have come from his pen. The authorship of some of these epistles is, however, in dispute. From the letters whose genuineness is unquestioned we may have the substance of his doctrine. Paul was the philosopher of the apostolic group; it is to him that we chiefly owe the reasoned statement of the principles of Christianity.

Doctrine.—Paul's doctrine is, moreover, largely the product of his own experience; what he teaches he has verified. He knows that neither perfection nor peace can be won by "the deeds of the law"; that neither in obedience to an external rule nor to the ethical imperative is the way of life revealed. The effort after self-perfection only emphasizes the self; when our thought is fixed upon our own performance, we miss, through our self-consciousness, the beauty of holiness. By the deeds of the law shall no flesh be justified. It is only when the soul goes out of itself in unselfish devotion to some worthy object that it finds life. When the man who has been struggling after perfection by obedience to the law learns that the struggle is hopeless, and surrenders himself to Him who in his own person reveals the law of the spirit of life, he passes from bondage to liberty, from death to life. Thus Christ is the end of the law for righteousness to every one who believeth; the perfection that we miss by aiming at it, we win by an unselfish trust in Him who is the revelation in human form of the divine perfection. It is impossible here to present, even in outline, the various analogies under which Paul seeks to express these sublime truths. His glowing metaphors have often been hardened into dogmas, but it has been impossible to suppress the life that pulsates through all his writings; after the Christ, in whom and for whom he lived, he is the one incomparable teacher of Christendom.

The First Reformer.—He is also the first of the Christian reformers; but for him the apostolic church would have been only a modified type of Judaism. The other apostles were strongly inclined to insist that no man could become a Christian without first becoming a Jew. It was Paul who demolished this barrier and opened the door of the Christian fellowship to the Gentile world. No more daring innovation was ever attempted. The victory which was won for Christian liberty in the council of Jerusalem, under the leadership of Paul, was one of the most illustrious and beneficent in Christian history. From this time his commission as the apostle to the Gentiles was unquestioned, and the truth "that the Gentiles are fellow heirs and fellow members of the body of Christ and fellow partakers of the

promise in Christ Jesus through the Gospel" was once for all established as the Christian doctrine.

LITERATURE.—Of books devoted to the life of Paul, a few of the most accessible are Conybeare and Howson's *The Life and Epistles of St. Paul*; Farrar's *The Life and Work of St. Paul*; Lewin's *The Life and Epistles of St. Paul*; and Stalker's *The Life of St. Paul*. Of books in foreign languages, some of the more important are Neander's *History of the Planting and Training of the Christian Church*; Baur's *Paul the Apostle of Jesus Christ*; and Renan's *The Apostles and St. Paul*. WASHINGTON GLADDEN.

Paul, SAINT VINCENT, de; b. at Pouy, Gascony, Apr. 24, 1577, in humble circumstances; received his first instruction from the Franciscan friars at Aeqs; studied afterward at Toulouse; took holy orders in 1600, and was captured in 1605 by pirates on a voyage from Marseilles to Narbonne, and carried as a slave to Tunis. In 1607 he succeeded in making his escape; visited Rome and then Paris; was appointed chaplain to the ex-queen Margaret of Valois, and in 1622 chaplain to the galleys at Marseilles; repaired in 1627 to Paris, where he developed an extraordinary activity in the establishment and management of charitable institutions, hospitals, asylums, etc., and in the foundation of religious fraternities, the Lazarists, the Sisters of Charity; was a member of the "council of conscience," by which all ecclesiastical preferments were distributed. D. at St. Lazare, Sept. 27, 1660. He was a man not only of great religious and philanthropic zeal, but also of wonderful knowledge of human nature, great practical tact, and unflagging energy. His order of the Priests of the Mission, confirmed by Parliament in 1631 and settled in the house of St. Lazarus in 1632, was not immediately successful, but became eventually an institution of great importance. He was beatified by Benedict XIII. in 1729, and canonized by Clement XII. in 1737. His *Maxims and Counsels for Every Day in the Year* appeared in English translation (London, 1884). There are numerous *Lives* of the saint, e. g. in French by A. Loth (Paris, 1879) and Jean Morel (1884); in English by C. A. Jones (London, 1873).

Paul: the name of several popes. **PAUL I.**, a Roman, succeeded his brother, Stephen III., in 757, and died at Rome, June 28, 767. He was an able prelate, and strengthened the papal authority in spite of its numerous enemies.—**PAUL II.** (*Pietro Barbo*), b. at Venice, Feb. 26, 1418; became a cardinal in 1440; was chosen in 1464 to succeed Pius II. He is especially noted for his hostility to the spirit of the Renaissance and his persecution of the humanists. He preached a crusade against George Podiebrad, King of Bohemia, who favored the Hussites. D. at Rome, July 28, 1471.—**PAUL III.** (*Alessandro Farnese*), b. at Canino, Feb. 29, 1468; succeeded Clement VII. as pope in 1534. He pursued with address and vigor his two chief aims in life, the aggrandizement of the Farnese family and the suppression of heresy. Among the prominent events of his important pontificate were the publication of a brief condemning slavery in 1537, the excommunication of Henry VIII. of England 1538, the approval of the order of Jesuits 1540, and the convocation of the Council of Trent 1545. D. at Rome, Nov. 10, 1549.—**PAUL IV.** (*Giovanni Pietro Caraffa*), b. at Capriglio, June 28, 1476; became Archbishop of Chieti 1507; was nuncio to London, and later had a high public office at Madrid; became Archbishop of Brindisi 1518; founded the Theatines 1524; became cardinal 1536; succeeded Marcellus II. as pope 1555; joined France in the war for the conquest of Naples from Spain 1555–57; strove for the elevation of his family, and his impolitic course regarding England and Germany strengthened the Protestant cause. He was bitterly hated by the common people of Rome on account of his austere rule. D. at Rome, Aug. 18, 1559.—**PAUL V.** (*Camillo Borghese*), b. at Rome, Sept. 17, 1552; became legate to Spain and cardinal 1596; succeeded Leo XI. as pope 1605. This pontificate was marked by the interdict laid upon Venice, the close of the Molinist controversy, the establishment of the Congregation of the Oratory and the orders of the Ursulines and the Visitation, and by great activity in the work of missions in heathen regions. D. at Rome, Jan. 28, 1621.

Paul: Czar of Russia; b. at St. Petersburg, Oct. 2, 1754; was the son of Peter III. and Catherine II.; succeeded to the throne on Catherine's death in 1796. He immediately set about to reverse her policy in every particular. His reign began well. Kosciuszko and the other Polish prisoners were liberated and treated with generosity. In 1799–1800

his troops served in Italy and Switzerland against France; but in 1800 he changed sides, embraced the cause of Napoleon, and challenged to personal combat any prince who refused to join him in a league against Great Britain. Meanwhile the puerilities and tyrannies of his rule begot a strong popular discontent, and he was murdered in his bed-chamber by his nobles, Mar. 24, 1801. Paul had some generous qualities. His own family he treated with a kindness before almost unknown in the Russian imperial house. He intended, it is said, to give Poland her freedom and autonomy; but his feeble intellect, his scanty education, and an absurd and almost insane self-conceit led him into many acts of tyranny.

Paul, POWL, HERMANN, Ph. D.: philologist; b. at Salbke, Magdeburg, Prussia, Aug. 7, 1846; studied in Berlin and Leipzig; lectured in the University of Leipzig 1872–74; became professor at Freiburg, Baden, in 1874. He has published: *Ueber die ursprüngliche Anordnung von Freidanks Bescheidenheit* (1870); *Zur Kritik und Erklärung von Gottfrieds Tristan* (1872); *Gabes eine mittelhochdeutsche Schriftsprache?* (1872); *Zur Nibelungenfrage* (1877); *Untersuchungen über den germanischen Vocalismus* (1879); *Principien der Sprachgeschichte* (1880); *Mittelhochdeutsche Grammatik* (1881); an edition of *Gregorius*, by Hartmann von der Aue (1873); *Altdeutsche Textbibliothek* (1882, sqq.); *Beiträge zur Geschichte der deutschen Sprache und Literatur* (1874–91); *Grundriss der germanischen Philologie* (1889, sqq.).

BENJ. IDE WHEELER.

Paulding, JAMES KIRKE: author; b. in Pleasant Valley, Dutchess co., N. Y., Aug. 22, 1779. He received a scanty training in school, and in early life removed to New York, where his sister had married William, an elder brother of Washington Irving, with whom he became associated in the authorship of *Salmagundi* (1807), but the second series of *Salmagundi* (1819) was by Paulding alone; became in 1814 secretary of the board of navy commissioners; was navy agent at New York city from 1825 to 1838, and was Secretary of the U. S. Navy 1838–41; was a facile essayist and humorist, and author of numerous works, among which were novels, political pamphlets, poems, etc. The best of his writings are *The Dutchman's Fireside* (1831), a novel, and a *Life of Washington* (1835). D. at Hyde Park, N. Y., Apr. 6, 1860. Revised by H. A. BEERS.

Paulding, JOHN: b. in New York, 1758; served through the Revolutionary war, being three times taken prisoner; was one of the captors of Maj. André, for which service he received from Congress a silver medal, inscribed on one side "Fidelity" and on the other "Vincit Amor Patriæ," and was granted an annuity of \$200. D. at Staatsburg, N. Y., Feb. 18, 1818. A monument to his memory was erected at Peekskill over his remains in 1827 by the corporation of the city of New York, and his name has been given to one of the northwest counties of Ohio, his companions, Van Wart and Williams, having been similarly honored.

Pauli, POWLĚ, GEORG REINHOLD: b. in Berlin, Germany, May 25, 1823; studied philology and history at Berlin and Bonn; lived in Great Britain from 1847 to 1855, and was appointed Professor in History at Rostock in 1857, at Tübingen in 1859, at Marburg in 1867, and at Göttingen in 1870. Besides several minor essays on various subjects, and some larger works relating to the history of England, he wrote *König Alfred und seine Stellung in der Geschichte Englands* (Berlin, 1851; Eng. trans. by Thomas Wright, London, 1852) and *Bilder aus Alt-England* (Gotha, 1860; Eng. trans. by E. C. Otté, London, 1861). The sharp criticism to which he subjected the policy of the government of Württemberg in a review in the *Preussische Jahrbücher* (1866) occasioned his removal from Tübingen to Marburg. D. June 3, 1882.

Paulicians: a dualistic sect of the Eastern Church, which originated in Armenia in the middle of the seventh century, in the village of Mananalis, near Samosata, where lived Constantine Silvanus, its founder, and preached in that locality from 657 till 684, when he was stoned for heresy. Our knowledge of the sect comes from their enemies, and is defective as well as vitiated by prejudice; but it seems to be proved that they were dualists; held that the soul proceeded from God but the body from the evil one; denied the perpetual virginity of Mary, and opposed Mariolatry, the doctrine of the atonement, and the Church view of the sacraments. Their founder had put an inordinate value upon the Pauline epistles, and so did his followers.

They also had in their canon the four Gospels, the Acts, the Epistles of James, John, and Jude; but they rejected the Epistles of Peter, because he had opposed Paul, the Revelation, and all the Old Testament. They were zealous for the Scriptures, and held in honor those among them who were their copyists and circulated these copies. They had no sacerdotal caste, but pastors and teachers, and were devout Bible students. After their founder their great man was Sergius, murdered for his faith's sake (835). After it had spread quietly in Armenia for about two centuries, though now and then persecuted by the Byzantine emperors, the Empress Theodora (842-857) undertook to suppress the sect. More than 100,000 are said to have been put to the sword, and the rest were exiled. Some fled to the Saracens, others to the Bulgarians, and in Bulgaria remnants of the sect were found as late as the sixteenth century. In the thirteenth century Paulician ideas were introduced into Europe by those who returned with the crusaders, and such sects as the Cathari and Bogomiles had Paulician elements.

SAMUEL MACAULEY JACKSON.

Pauline Congregation: See PIARISIS.

Pauline Epistles, The: Letters written to churches and individuals by the apostle Paul.

1. *Number, Order, and Date.*—It is the common opinion that thirteen of these epistles have been preserved to us. From about the fifth century to the Reformation era the Epistle to the Hebrews was also reckoned as a Pauline epistle, making fourteen. This opinion arose in the Eastern Church, and at length became prevalent chiefly through the great influence of Jerome and Augustine. In the early centuries of the Christian era the epistle was not held to be Pauline by the Fathers of the Latin or Western Church. Clement of Rome quotes it, but does not refer it to Paul. Neither Irenaeus nor Hippolytus quotes it as Paul's, and Tertullian ascribes it to Barnabas. Two considerations—one negative, the other positive—seem decisive against the Pauline authorship of Hebrews. (a) The epistle does not purport—as do all other alleged Paulines—to have been written by Paul. (b) The language, style, and modes of thought are characteristically different from Paul's.

The common view respecting the order and approximate dates of the epistles may be shown by the following grouping, which is not only chronological but according to their subject-matter: I. *The earlier or missionary epistles*, 1 and 2 Thessalonians, written at Corinth during A. D. 52 or 53. II. *The great doctrinal epistles*: Galatians, written at Ephesus within the period 54-57; 1 Corinthians, written at Ephesus in 57 or 58; 2 Corinthians, written in Macedonia in 57 or 58; Romans, written at Corinth, A. D. 58 or 59. III. *The epistles of the imprisonment*: Colossians, Philemon, Ephesians, Philippians, commonly believed to have been written during the apostle's Roman imprisonment during the years 62-63. IV. *The Pastoral Epistles*: 1 Timothy and Titus, written in Macedonia, and 2 Timothy, written during a second Roman imprisonment, shortly before the apostle's martyrdom. The date of this group is supposed to be 67 or 68.

Several points in this grouping have been called in question by competent scholars who accept the Pauline authorship of all thirteen letters. By some (as Bleek, Davidson, Conybeare and Howson, and Lightfoot) Galatians is placed third, instead of first, in the second group. On this view it was written in Corinth, probably during 57 or 58. Bishop Lightfoot gives as reasons for this view: (a) Galatians most closely resembles 2 Corinthians in its personal and apologetic elements and Romans in its doctrinal method and content, and thus naturally falls between them. (b) The development of Judaizing opposition to Paul best accords with this order. (c) This order corresponds to the development of doctrine. (See Lightfoot's introduction in his *Commentary on Galatians*, pp. 36-56.) While these arguments are not very cogent, they are perhaps as much so as that for the earlier date, which is based upon the rather indefinite expression in Gal. i. 6, "I marvel that ye are so quickly removing from him that called you," etc.

Many distinguished German scholars held that the first three epistles of the third group were written during Paul's imprisonment at Caesarea (Acts xxiii. 23, xxvi. 32). The ingenious arguments by which this theory is supported may be found in full in Meyer's *Commentary on Ephesians*, Introduction, § 2. This view has found little favor with English scholars.

Bishop Lightfoot maintained that Philippians was the

earliest of the *epistles of the imprisonment* on the following grounds: (a) Philippians stands apart from the other three in spirit and matter. (b) It reflects the state of Paul's mind which is illustrated in Romans and in 1 and 2 Corinthians. (c) Colossians and Ephesians are more nearly related to the *pastoral epistles* than is Philippians (see Lightfoot's dissertation, *Order of the Epistles of the Captivity*, in his *Commentary on Philippians*, pp. 30-46); but the progress of the Gospel at Rome, which had penetrated even the emperor's household (iv. 22), the Philippians' knowledge of Paul at Rome, the sending of Epaphroditus, his labors, sickness, etc., would point to a later time of writing, as would also the fact that Paul was more confident of release (ii. 24) than when Colossians and Ephesians were written, and so was, presumably, nearer to it.

Incidental allusions to lost epistles of Paul are found in 1 Cor. v. 9. and Col. iv. 16. These passages, according to their most natural interpretation, show that Paul wrote a letter to the Corinthians (antedating our 1 Corinthians), and that at the time when he wrote to Philemon and to the church at Colossae he also wrote an epistle to the neighboring church at Laodicea. Some discern in passages like 2 Cor. ii. 4 and vii. 8, 9, allusions to a letter to the Corinthians intermediate between 1 and 2 Corinthians. General allusions to the frequency with which Paul wrote private letters, only one of which—that to Philemon—is extant, are found in 1 Cor. xvi. 3, 2 Cor. x. 10, and 2 Thess. iii. 17.

2. *Macedonia and Achaia.*—1 *Thessalonians.* The narrative of the founding of the Church at Thessalonica is found in Acts xvii. 1-9. Some Jews, many women of noble birth, and many proselyte Greeks, accepted the Gospel, but Jewish opposition at length drove the apostle and his assistants from the city. Paul was eager to revisit his converts, and had twice purposed to do so, but had been hindered (ii. 18). When he could no longer restrain his anxiety to hear from them, he sent Timothy (from Athens, where they were at that time; cf. Acts xvii. 15) to encourage them and learn their state. Meanwhile Paul went on to Corinth. There Timothy joined him and brought his report concerning the Church. This report was the occasion of the epistle. Though faults and errors were to be corrected, their progress and patient endurance of persecution gave Paul great joy. The keynote of the letter is "Now we live, if ye stand fast in the Lord" (iii. 8).

2 *Thessalonians.*—In 1 Thessalonians Paul had encouraged his converts to endure their trials with patience by expressing the hope of the Lord's speedy return (iv. 16, v. 2). This expectation—fostered chiefly by a letter falsely purporting to have been written by Paul, ii. 2—became the occasion of developing a fanatical spirit among the Thessalonians. So near did they think the *parousia* to be that they abandoned their occupations (ii. 1-12, iii. 15, iii. 10-12). Paul wrote the epistle to rebuke this spirit, to urge them to resume their employment, and to divert their attention to certain events which should precede the *parousia* (see ii. 1-12).

Galatians.—The occasion of this epistle is found in the presence in the Galatian community of Jewish-Christian teachers who insisted that Gentiles who became Christians must also become Jews, that is, be circumcised and keep the Old Testament law as such. It is generally thought that these Judaizers had come from Palestine (so Meyer); others (as Neander) suppose that they were partly from Judea and partly native to Galatia, and still others (as Weiss) maintain that they were connected with Jewish-Christian congregations which had been gathered in Galatia previous to Paul's founding the Gentile-Christian churches in the province. No data exist for settling this question. Whoever these persons were, it is certain that they did not comprehend the newness and completeness of Christianity; it was to them but an appendix or supplement to the Old Testament system. Paul was the champion of the opposite view. For him Christianity was complete in itself and those who accepted it were not under the law. His opponents' position was contrary to the decision of the apostolic conference held at Jerusalem (Acts xv., Gal. ii.) at which the most conservative primitive apostles, Peter, James, and John, had approved his teaching and disclaimed any desire to supplement or change it.

1 *Corinthians.*—From v. 9 it appears that Paul had written to the Corinthians an earlier letter than 1 Corinthians. There are hints in v. 10, vii. 1, viii. 1, xii. 1, xvi. 1, and xvi. 12 of a letter from them to the apostle in return. The inquiries contained in this letter, and the condition of the

Corinthian church which they revealed, were the occasion of the epistle. An additional occasion lay in the report which Paul had received concerning divisions among them from the slaves of a certain Corinthian woman, Chloe (i. 11). These party rivalries seemed to the apostle more important than the inquiries contained in the letter of the Corinthians, for he takes up that subject first and devotes to it a large share of the epistle.

2 Corinthians.—It is impossible to determine with certainty the events which intervened between the two Corinthian epistles. It is certain, however, that opposition to Paul had increased in the Church. The Jewish-Christian portion—probably the Christ-party, especially—had accused him of fickleness, double-dealing, and cowardice, and had cast suspicion upon his character and apostleship. The aim of the epistle was to refute these calumnies, and to vindicate himself as a man and as an apostle. In chapters. i.–viii. Paul addresses himself more to the faithful majority, and in the latter part of the epistle turns more directly to the hostile Judaizers—the “false” or “exceeding apostles”—the extremists who had come to Corinth with letters of recommendation from Palestine.

Romans.—The occasion of this epistle is not clear, and many theories respecting it have been advanced. Baur regarded it as a polemic against Jewish Christianity; Schweigger as a defense of Paul's doctrine; Weizsäcker as intended to fortify Christians against attacks upon their faith in the future; Weiss as an attempt to draw up a statement of his doctrine of salvation, defending it on all sides against objections. Some combination of these views seems necessary. There are large polemic and apologetic elements in the epistle, and the protection of his converts against attacks upon their faith by Judaizers and the commendation of his doctrine to the favorable consideration of Jewish Christians may have been subordinate motives in writing. We may state his main object thus: To present a fuller exposition and defense than he had yet made of his “gospel” in contrast to Judaizing teaching and in its application to the Christian life. The growing importance of the Roman Church, by reason of its size and position, would furnish a sufficient reason why he should address the letter to them, although he had not founded the Church and had never even visited it.

Colossians.—This epistle was written to combat the errors which certain false teachers were introducing into the churches of the Lycus valley. The heresy appears to have been a sort of Jewish eclecticism which combined some of the tenets of the Essenes with Gnostic speculations. Its leading characteristics were: (a) Asceticism, a self-imposed subjection to ordinances and severity to the body (ii. 16–23). (b) Notions akin to the Gnostic doctrine of æons; theories of intermediate agents (angels) between God and the world (ii. 9, 10, 18). (c) An over-emphasis of an alleged knowledge on the part of its adherents (ii. 8–10, 18; cf. i. 9, 15, 16, 26, ii. 2, 10, 19). The tendency of this speculation was to degrade Christ to the rank of a creature, and to substitute ascetic rigors for trust in divine grace. In opposition to these false views Paul insists on the headship of Christ over the world and its powers, and upon the sole sufficiency for salvation of his person and work.

Philemon.—This is a private letter written at the same time as Colossians, and addressed to a Colossian Christian and friend of the apostle (Philemon). It is written to commend Onesimus, a slave of Philemon, who had stolen from his master and gone to Rome. There he met Paul and became a Christian. Paul sends him back to his master with a cordial commendation of his changed character. He reminds Philemon that he owes his own conversion to himself, and entreats him to receive his former servant as a Christian brother.

Ephesians.—No definite occasion for this epistle can be confidently assigned. By many critics it is regarded as an encyclical letter designed for a group of churches; by others it is believed to be the epistle to the Laodicean Church alluded to in Col. iv. 6. The omission of the phrase “in Ephesus” (i. 1) in the best MSS. strongly favor the first view, although it is not easy to explain satisfactorily the remaining words on the supposition of this omission. Perhaps a blank space was originally left in order that the name of the particular place where the letter was read might be inserted. The epistle resembles Colossians most nearly in scope and contents. Certain differences may, however, be noted: (a) Ephesians treats more of redemption in general (soteriology); Colossians of the Redeemer personally

(Christology). (b) Ephesians aims at edification and education; Colossians at the refutation of heresy. (c) Ephesians treats more of the relation of Christ to the Church; Colossians of his relation to the universe. (d) In Ephesians the pre-eminence of Christ is made to depend more upon the divine will; in Colossians more upon his metaphysical nature.

Philippians.—When Paul was a Roman prisoner the Philippian Church, to which he was especially attached, sent one of their number, Epaphroditus, to supply his wants. This epistle is a letter of thanks for the gift, but it goes beyond its primary purpose and gives information concerning himself, adding warnings and advices for their benefit. It is the warmest and most affectionate of all Paul's letters.

The Pastorals.—These letters are addressed to the trusted helpers of the apostle, Timothy and Titus, to encourage and aid them in their work in Ephesus and Crete respectively. In them he has no occasion to deal with definitions or defenses of the Gospel. He urges the evangelists to adhere to “sound doctrine” and to avoid certain current speculations as unprofitable. These tendencies are characterized as a “different doctrine” (1 Tim. i. 3) from his own, and as dealing with Jewish fables, endless genealogies, and strivings about the law (Tit. 3, 9, 1 Tim. i. 4). We can not identify these speculations with the tenets of any particular sect.

3. Criticism.—F. C. Baur (1792–1860), the founder of the Tübingen school, admitted but four epistles (Galatians, 1 and 2 Corinthians, and Romans) as genuine. The others were rejected on grounds of internal evidence. The great doctrinal letters were made the standard of genuineness, and variations from these in style and contents were regarded as evidence of spuriousness. Since Baur's time, however, the tendency among the adherents of his school has been toward the admission of some of the discredited epistles as genuine. Holtzmann, Pfleiderer, and S. Davidson, for example, concede the genuineness of 1 Thessalonians and Philippians, and admit Pauline elements in 2 Thessalonians and Colossians. The pastoral epistles are most widely rejected on the following grounds: (a) There is no place for them in Paul's known life. (b) The errors combated in them belong to the post-apostolic age. (c) The church organization which they reflect is more highly developed than that found in the apostolic age. It is answered: (a) The Acts breaks off abruptly; Paul expected to be released from his imprisonment (Phil. ii. 24), and early tradition represents this to have been the fact. A place may thus be found for those letters in the apostle's last years. (b) The errors of the pastorals show no close affinity to the Gnosticism of the second century. (c) The only church officers in the pastorals are presbyter-bishops and deacons (as in Philippians).

In recent years a school has arisen which rejects even the four “undisputed” epistles. The chief representative of this type of criticism is Rudolf Steck, a Swiss professor. His theory of the history of the apostolic age is the opposite of that propounded by the Tübingen school. He maintains that the sharp opposition between the principles of faith and works, or grace and merit, which the doctrinal letters reflect, would develop only slowly and late, and therefore the writings in which this conflict of principles is presented must fall within the post-apostolic age. He places these writings in the second century. In opposition to this theory both the critical and the conservative schools agree in maintaining that the sharpest conflict of opposing principles is experienced in the early stages of a controversy, and that the development is toward adjustment and reconciliation. The extra-canonical literature of the second century shows no such contrast of Pauline and Judaizing Christianity as is illustrated in Galatians and Romans. Steck's theory reverses the common order of history, and is contrary to all the evidence which bears upon the progress of the controversies between the Gentile-Christian and the Jewish-Christian branches of the Church.

LITERATURE.—Only a select bibliography of recent literature can here be given. The works referred to are, in most instances, such as treat of the literary and historical questions connected with Paul's epistles rather than of his life in general or of his theology. F. C. Baur's *Paulus, u. s. w.* (Stuttgart, 1845; 2d ed. Leipzig, 1866–67), marks an epoch in the criticism of the Pauline epistles. More recent German treatises are largely taken up with the problems so boldly raised and discussed in this work. Many recent critics still follow Baur's method, and in part adopt his

arguments, while modifying more or less his premises and conclusions. S. Davidson's *Introduction to the New Testament* (3 vols., 1848-51; 3d ed., 2 vols., London, 1894) is conservative in the first edition; the second and third reproduce largely the Tübingen criticism. E. Reuss's *Geschichte d. Heiligen Schriften d. Neuen Testament* (Halle, 1842; 6th ed., 1887; Eng. trans. Edinburgh, 1 vol., 1884; Boston, 2 vols., 1884) is a critical summary and history of opinion with ample references to the literature. P. J. Glog's *Introduction to the Pauline Epistles* (Edinburgh, 1874) is a conservative summary and review of opinions. In H. A. W. Meyer's *Commentary on the New Testament* (various editions; Am. ed., New York, 1884-86) the introductions to the epistles are elaborate and conservative treatises. Those on the pastorals are written by Meyer's continuator, Huther, who maintains their genuineness, as Meyer did not. Meyer held to the genuineness of all the other epistles. J. B. Lightfoot's introductions and dissertations in his *Commentaries on Galatians* (8th ed., London, 1884), *Philippians* (8th ed., 1885), and *Colossians and Philemon* (9th ed., 1890), are of the highest value. The dissertations are published separately in a volume entitled *Dissertations on the Apostolic Age* (London, 1892). A. Sabatier, in *L'Apôtre Paul* (Paris, 1881; Eng. trans. New York, 1891), gives a vivacious treatment of Paul's letters in their historical setting, unfavorable to the pastorals. The English translation contains an essay *per contra* by the translator, G. G. Findlay. *Das Urchristenthum, u. s. w.* (Berlin, 1887), and *Der Paulinismus* (Leipzig, 1873; 2d ed., 1890), by O. Pfleiderer, discuss the Pauline literature in the spirit and method of Baur, with important modifications, however, in detail. H. J. Holtzmann's *Einleitung in das Neue Testament* (Freiburg, 1885; 2d ed., 1886) is a history and summary of opinions from the standpoint of the "critical" school. B. Weiss's *Lehrbuch d. Einleitung in d. Neue Testament* (Berlin, 1886; 2d ed., 1889; Eng. trans. 2 vols., Edinburgh, 1888, and New York, 1889), critical but conservative, is the best manual at present available in English. *An Introduction to the New Testament*, by M. Dods (New York, 1888), is a brief presentation of the main results of criticism. F. Godef's *Studies in the (Pauline) Epistles* (London, 1889) are popular essays, conservative in tone. *The Epistles of Paul the Apostle*, by G. G. Findlay (London, 1892), and J. R. Lumby's *Popular Introduction to the New Testament* (London, 1883) are both excellent manuals for popular use. In vols. ii. and iii. of the *Hand-Commentar zum Neuen Testament* (4 vols., Freiburg, 1891) are found elaborate introductions (by Schmiedel, Lipsius, and von Soden) on the Pauline letters. They are written from the critical point of view, and account is taken of the latest discussions. F. Godef's *Introduction au N. T.*, vol. i., *Les Épitres de S. Paul* (Paris, 1893), contains a history of the criticism of the Pauline epistles from the first century to the present time. The standard treatise of the modern radical criticism is *Der Galaterbrief nach seiner Echtheit untersucht* (Berlin, 1888), by R. Steck. The opinions of Steck are shared more or less fully by certain Dutch theologians, as Loman, van Manen, van Loon, and Völter. For a review and critique of these views, see Lipsius, *Hand-Commentar, Einleitung zu Gal.*, pp. 8, 9; Pfleiderer, *Der Paulinismus* (2d ed.), pp. 34-38; A. C. Zenos in the *Presbyterian Review* (Jan., 1891); and Knowling, *The Witness of the Epistles*, ch. iii. (London and New York, 1892).

GEORGE B. STEVENS.

Paulinus, MEROPIDUS PONTIUS ANICIUS: a Latin writer from Gaul; b. in Burdigala (Bordeaux) in 353; pupil of Ausonius, and through his influence made consul suffectus before 379. In 389 he was converted to Christianity, and in 409 made Bishop of Nola in Campania, which office he held until his death in 431. Hence he is commonly called Paulinus Nolanus. His extant works consist of some fifty letters and thirty-six poems in various meters, which show considerable culture and poetic feeling, with reminiscences of Horace, Vergil, Lucan, and Juvenius. The best account of his Christian poetry is given by Manitius, *Geschichte der Christlich-lat. Poesie*, pp. 261-297. See Migne, *Patrol.*, vol. lxi. A critical edition is promised by Hartel for the *Vienna Corpus Script. Eccles. lat.* M. WARREN.

Paulist Fathers, or The Congregation of St. Paul the Apostle: a missionary society of priests in the Roman Catholic Church, founded in 1858 by Rev. Isaac Thomas Hecker, and approved by Pope Pius IX. They are chiefly men who have abandoned Protestantism. The mother-house is in New York.

Paullinia sorbilis: See GUARANA.

Paulo Affonso Cataract: See SÃO FRANCISCO RIVER.

Paulownia imperialis: scientific name of a fine tree of the family *Scrophulariaceae*, native of China. It has something the habit of a catalpa, the leaves being large and heart-shaped, the branches being crooked and nearly horizontal; the flowers are in large clusters of a pale-violet color, and precede the leaves. The tree rarely exceeds 40 feet in height, and its trunk is usually less than a foot in diameter. In the U. S. it is hardy as far N. as New York. The luxuriant growth and great heavy leaves make it a desirable tree for many effects in landscape-gardening.

Revised by L. H. BAILEY.

Paulsen, powlsen, FRIEDRICH, Ph. D.: professor of philosophy and pedagogy; b. in Langenborn, Schleswig, July 16, 1846; educated in the common schools of his native town, the gymnasium in Altona, and the Universities of Erlangen and Berlin; privat docent 1875-78, extraordinary professor 1878-93, and Professor of Philosophy since the autumn of 1893 in the University of Berlin. In philosophy Paulsen is classed with the new-school Kantians. His published works and numerous magazine articles give him a foremost rank among German philosophers, but no less important are his contributions to the history of pedagogy. In respect to secondary and higher education he is a recognized authority. His principal works are: *Versuch einer Entwicklungsgeschichte der Kantischen Erkenntnistheorie* (1875); *Geschichte des gelehrten Unterrichts auf den deutschen Schulen und Universitäten, vom Ausgang des Mittelalters bis auf die Gegenwart* (1885); *System der Ethik* (1889; 3d ed., 1894); *Einleitung in die Philosophie* (1892; 3d ed., 1894); *Wesen und Geschichte der deutschen Universitäten* (in the work edited by Lexis, *Die deutschen Universitäten*, 1893).

J. E. RUSSELL.

Paulus, POWΛΟΣ. HEINRICH EBERHARD GOTTLOB: theologian; b. at Leonberg, near Stuttgart, Württemberg, Sept. 1, 1761; studied Oriental languages and theology at Tübingen, Göttingen, London, and Paris, and was appointed Ordinary Professor of Oriental Languages in 1789 at Jena, in 1803 at Würzburg, director of the department of public worship and education in 1808 at Bamberg, in 1809 at Nuremberg, in 1811 at Ansbach, but moved in the same year as Professor of Exegesis and Ecclesiastical History to Heidelberg, where he died Aug. 10, 1851. He was one of the most prominent representatives of the rationalistic theology in its historical-critical phase. Among his numerous works are *Clavis über die Psalmen* (Jena, 1791, Heidelberg, 1815); *Clavis über Jesaias* (1793); *Kommentar über das Neue Testament* (but it only goes to John xi.; Lübeck, 4 vols.; 1800-04; 2d ed., 1804-05); *Leben Jesu* (2 vols., 1828); *Ezegetisches Handbuch über die drei ersten Evangelien* (3 vols., Heidelberg, 1830-33; 2d ed., 1841-42). He edited Schelling's *Vorlesungen über die Offenbarung* (1843), which implicated him in a lawsuit. He wrote a partial autobiography, *Skizzen aus meiner Bildungs- und Lebensgeschichte* (Halle, 1839), and left materials for a full biography, which were utilized by Prof. Reichlin-Meldegg under the title *H. E. G. Paulus und seine Zeit* (2 vols., Stuttgart, 1853).

Revised by S. M. JACKSON.

Paulus, JULIUS: a celebrated Roman jurist, contemporary with Ulpian, who held under Alexander Severus in 222 the office of praefectus praetorio. He was a voluminous writer, and more than 2,000 excerpts from his works are contained in the digests. His most important work, *Ad edictum*, embraced eighty books. An abridgment of his *Sententiarum ad filium libri V.*, is extant. See Huschke *Jurapendentes Antiquae et quae supersunt*, pp. 450-561 (Leipzig, 1886).

M. W.

Paulus, LUCIUS, EMILIUS, surnamed **Macedonicus**: soldier; b. at Rome about 230 B.C.; a son of the consul of the same name, who fell at Cannae 216; was praetor in 191; commanded afterward as pro-consul in the province of Further Spain, where he put down a formidable insurrection and defeated the Lusitanians; was consul the first time in 181, and a second time in 168; censor in 164. D. in 160. During his second consulship he finished the third Macedonian war by his brilliant victory over Perseus at Pydna. The Romans did not at once appropriate the territory of their vanquished enemy, but divided the Macedonian empire into four districts with oligarchical governments under the protection of Rome.

Revised by G. L. HENDRICKSON.

Paulus Diaconus, or Levi'ta: historian; b. at Cividale, in Friuli, about 725; educated at the Lombard court at

Pavia; he was ordained deacon not later than 763; at the instigation of Adelperga, wife of the Duke of Benevento, he composed about 770 his *Historia Romana*, a continuation of the *Breviarium of Eutropius*. (See edition by Droysen, Berlin, 1879.) He entered the monastery of Monte Casino, whence he addressed a poem to Charlemagne in 781, setting forth in a touching manner the sufferings of his family in consequence of Charlemagne's confiscation of their estates as a punishment for his brother's rebellion. Charlemagne was so much interested in the poet that he summoned him to his court. There Paulus lived till 787, and there he collected his *Homiliarius*, which was often reprinted in the fifteenth and sixteenth centuries and translated into German and Spanish, and wrote his *Gesta Episcoporum Mettensium*, printed in Pertz's *Monumenta Germaniæ Historica*, vol. ii. (Hanover, 1827); made an abridgment of Festus's *De Significatione Verborum* (see FESTUS); returned to Monte Cassino in 787. D. there about 797. His last and most important work was his *Historia Langobardorum Libri VI.*, which ends at 744, containing many valuable traditions. The best edition is by G. Waitz (Hanover, 1878) in the *Monumenta Germaniæ Historica*. See Felix Dahn, *Des Paulus Diaconus Leben und Schriften* (Leipzig, 1876). Revised by M. WARREN.

Paulus Egineta: Greek physician and author; b. in Ægina at an unknown date, but Abulfaragius places him in the seventh century A. D., which is probably correct. His *De Re Medica Libri Septem* had great influence among European and Arabian physicians in the Middle Ages, and several Latin and Arabic versions were made. Of the Greek text the edition of 1528 (Venice) and 1538 (Basel) are complete. The Sydenham Society published (London, 1847) an improved edition of Francis Adams's complete translation, with abundant notes, in three volumes 8vo. Several other works of Paulus are mentioned by old writers. See SURGERY. Revised by J. R. S. STERRETT.

Paul Veronese: See VERONESE.

Pauncefoot, Sir JULIAN: British jurist and statesman; b. at Munich, Germany, Sept. 13, 1828; educated at Paris, Geneva, and Marlborough College; called to the bar at the Inner Temple 1852; attorney-general of Hongkong 1865; chief justice of Supreme Court in Hongkong 1869; knighted 1874; Assistant Under-Secretary of State for the Colonies 1874; Assistant Under-Secretary of State for Foreign Affairs 1876; became permanent Under-Secretary of State for Foreign Affairs 1882; British minister at Washington 1888. C. H. THURBER.

Pauperism [from Lat. *pauper*, poor (>O. Fr. *paure*, whence Eng. *poor*): in a general sense, the settled condition of large masses of people, who are more or less dependent on the alms of the community for their support. In earlier ages slavery, which was almost universal, rendered public assistance for paupers almost unnecessary, because the master was expected to provide for his aged and invalid slaves, as well as to assume the cost of rearing the young, which, in some modern communities, imposes the greater part of the public burden for the poor; but wherever slavery began to be abolished by individual emancipation, or by the result of war, or by other causes, pauperism, in the modern sense, began to take its place; and this process went on for centuries, from the earliest period of authentic Grecian history, until the present age, when the most general emancipations have taken place. Again, the reduction of large masses of the free population to a state of dependence, by the extension of landed estates and the effect of long-continued warfare, especially under the Roman rule, gave occasion for the greatest development of public charity which the world has seen, during the later years of the Roman republic and the first three centuries of the empire. When the rural inhabitants of Italy lost the land which they had cultivated, because great landlords absorbed the small *prædia* of their neighbors, they at once became dependent for support either on the rich, as clients, or on the public. It was to supply the needs of this class that the *leges frumentariæ* (corn-laws) were passed, at first cheapening the price of grain, and afterward providing for its distribution from the public granaries among the free-born poor of Rome and the provinces. These corn-laws were in fact poor-laws, and they laid the foundation of a pauper system of great extent, and very demoralizing in its influence, which prevailed from the time of Sulla through the flourishing period of the empire. It is said that in the reign of the Antonines 500,000 persons received this donation from the public—a

proportion to the whole estimated population much larger than has usually prevailed under the pauper systems of Great Britain, France, or the U. S.

The pagan times give many examples of charity, and after Christianity began to influence the world the better adherents of the old religion exalted charity, both public and private, in emulation of the Christian practice. Cicero (*De Legibus*, xiv.) had proclaimed philanthropy as the basis of justice, and the Emperor Julian, following Cicero, regarded charity as the most sacred of duties. Similar sentiments were expressed by Plato, Xenophon, Seneca, and other ancient writers, whose works prove that the distribution of alms and the relief of the infirm and invalid were virtues well recognized by the followers of the older religions, but it was left for Christianity to make them its basis and rule. The introduction of Christianity may have checked in some degree the growth of pauperism in its Roman form, but the establishment of monasteries and religious houses, and even of churches, increased the number of persons who lived by begging; and vagrancy and mendicity were everywhere common when the legislation of Western Europe first began to take notice of the growing evil. The first poor-laws of England and France were decrees or statutes against vagrancy and mendicancy; and when at the Reformation many monasteries were broken up, and the administration of the church funds in the parishes was changed, a great number of paupers who had been relieved by the clergy or their servants were thrown upon the civil authorities for support, restraint, or relief. Economical changes going on at the same time in the century from 1520 to 1620 caused the number of poor people in England to increase greatly. Hence the increasing frequency of poor-law legislation in England from 1540 to 1601, when the famous statute (43 Elizabeth) which forms the basis of the pauper system both in England and the U. S. was enacted. An attempt had been made as early as the reign of Richard II. to repress vagrancy by severe statutes, and a law of Henry VII. sent beggars not able to work back to the parish of their last residence. The able-bodied beggar had been treated as a criminal much earlier, and in 1531 the law required him to be whipped and sent back to his birthplace. A few years later the local officers of each parish were required to support poor and vagrant persons, at the same time compelling them to labor; while almsgiving on the street or at the house-door was forbidden, on pain of forfeiting ten times the amount given. A "sturdy beggar" was to be whipped for the first offense, for the second his right ear was to be cropped, and for the third he was to be sent to jail, and if convicted, to suffer death, but legislation grew gradually milder against this evil from the experience gained that severe penalties did not diminish it. Licenses were now permitted for beggars on condition that they begged only in their own parish and for food alone, and in the manner directed by the churchwardens and overseers. In the time of Charles II. the more modern condition of settled pauperism had begun to take the place of mendicant vagrancy. The poor-law of Elizabeth did indeed succeed in diminishing mendicancy, but it again appeared in alarming proportions.

Legislation in France was quite as severe as in England against vagrancy, and the result was much the same. When the cruel French laws, enacted before 1550, failed to check vagrancy and begging, the authorities, gradually discovering how useless such legislation was, in the seventeenth century made trial of more humane methods of repression. In 1627 the law required beggars to be forced into the service of commercial companies or into the French naval service, and to embark for the Indies. At the same time there were ordered to be founded in the different provinces "hospital workshops" or workhouses, which were the beginnings of the French system of "dépôts de mendicité." Again, in 1688, an ordinance was passed expelling every pauper and beggar from Paris, under penalty of being sent to the galleys. Nothing, however, seemed to check mendicity in France, and in 1698 it was calculated that one-tenth of the whole population of the country was reduced to beggary. In the eighteenth century, although the progress of manufacturing, industry, and commerce checked the evil, yet in 1790 a decree was passed ordering the opening of workshops for able-bodied beggars. The poor who were impotent or sickly were to be sent to the hospitals, and strangers to the kingdom were to be expelled. Another law organized workhouses and almshouses for ordinary beggars, while those were sentenced to transportation who persisted in begging

after their punishment, or who committed other offenses. Under the First Empire the principle seems to have been recognized that before punishing mendicity as an offense work must be offered. A decree of 1808 ordered that a workhouse or "dépôt of mendicity" be established in every department. In four years eighty of these were founded. Many complaints against them, however, arose on account of their large expenditures and their industrial competition with non pauper laborers. It was hoped that these establishments would nearly support themselves by the labor of the inmates, but this proved illusory, and they gradually became refuges of incurables. Under the Restoration they were nearly all suppressed, and at present there are very few "dépôts of mendicity" in France. Several workshops were substituted for the "dépôts," and some provinces founded houses of refuge for beggars, but none of these succeeded. Thus during five centuries every species of penalty and punishment has been tried in vain in France to suppress mendicity. Humane legislation has been equally a failure, and the sum of experience in that country is that all legal means fail to reach this great evil.

Poor-laws and Pauperism in France.—The English poor-law of Queen Elizabeth has never been formally introduced in France, but pauperism has long existed there, and has been met by a system of public relief, somewhat different from the English "workhouse test." An eminent French economist, Émile Levasseur, in his great work on *Population* (finished in 1892), has much to say of public charity in France. Malthus, in 1818, declared that the division of landed property which took place in France at the Revolution, and was further promoted by the laws of inheritance then adopted, would turn France into a rabbit-warren of paupers. Instead of verifying this prediction, Levasseur shows that pauperism is proportionately much less under the third republic than under the first. The statistics cited by him are confessedly imperfect, but they establish this fact beyond doubt. Since 1850 France has had a much smaller percentage of paupers in its population than England, but more than Germany, with the exception of Prussia, in which pauperism seems to have been greater before the Franco-German war than in France. After an examination of the statistics of pauperism, Levasseur concludes: "It can not be argued that pauperism has increased in Paris during the last hundred years; the contrary is true. The growth of population, the increasing emigration from country to city, the attractive force of a great city on the pauper class, have not, as some writers conjectured, resulted in the aggravation of pauperism." He calls attention, however, to what has been noticed in all other cities and countries since 1791, adding: "What has increased is the cost of relieving the poor. In 1804 the revenue accruing to hospitals, infirmaries, charity bureaus, and the support of foundlings was less than 8,500,000 francs in Paris; but in 1887 the public charities of the city expended 52,638,000 francs. The increase of wealth has allowed Paris to furnish more efficacious relief, to take care of the sick poor in their homes, to procure for them greater comforts in the hospitals, to establish sanitary measures which have decreased the death-rate, to watch with more solicitude over the education of neglected children, to ameliorate the management of infirmaries, and to give an easier existence to old people and chronic invalids." An earlier French writer, Baron, who in 1882 published an elaborate work on French pauperism (*Le Paupérisme, ses Causes et ses Remèdes*), lays great stress on inducing the workingmen to practice life-insurance, deposit in savings-banks, and in other ways raise themselves above the common level of poverty, from which he says it is but a step, in illness, old age, or vice, to the gulf of pauperism. Since then, in France, as well as in Great Britain, an agitation has begun in favor of giving to old people pensions drawn from a fund provided either by taxation or voluntary contribution, and administered by the Government. The cost of public charity has increased, especially in France, where the poor-law expenditure of cities greatly exceeds that of rural districts in France. Concerning the latter Levasseur says: "Wealth in general is less in the country than in the cities and large towns, but, in return, poverty also is less felt there, and pauperism, strictly speaking, rarely occurs in small country districts. Public relief is also much less abundant in such places; only about a third of the communes in France with less than 500 people keep up a charity bureau, while this form of relief exists in more than two-thirds of the communes which have 1,000 people or more."

France practically has a poor-law, and recognizes the duty of public aid, although it has never been carried so far, nor with such injurious results, as the poor-law system of England. In fact, the French system closely resembles in many particulars that which has grown up naturally and almost universally in the U. S. The first step in this system is the creation of a local board, called in France a charity bureau (*bureau de bienfaisance*) and in the U. S. a board of overseers, guardians, supervisors, etc., according to the usage in different parts of the country. These boards, both in France and the U. S., first distribute "family aid" (*secours à domicile*), which is what the English rather absurdly have termed "outdoor relief." They mean relief given outside the workhouse door—it having been a theory at one time in England that all the public poor, with a few exceptions, could be thrust into workhouses, but experience, in the British islands as well as in France, has shown that this theory is unfounded. Extending his observation from Paris to France as a whole, Levasseur says that increase of wealth has not aggravated pauperism in that country, although the cost of relieving the poor is so much greater than formerly. This is true in Great Britain, in the U. S., and in all civilized countries. Thus in Great Britain, where the cost in 1847 was only about \$30,000,000, it is now (1894) considerably above \$40,000,000, although the number of paupers is actually less than in 1847. Mr. Goschen, when president of what is now the Local Government Board, said in 1870: "It can not be denied that the more humane views which have prevailed during the last few years as to the treatment of the sick poor have added most materially to the poor-law expenditures. Workhouses, designed originally mainly as a test for the able-bodied, have, especially in the large towns, been of necessity gradually transferred into infirmaries for the sick; and the higher standard for hospital accommodations has had a material effect upon the expenditures." The process here mentioned has been going on more rapidly in Great Britain, in France, in Germany, and in the U. S. since 1870 than before; but previous to 1833 it had shown itself abundantly in France. In 1800 France expended less than 65,000,000 francs in public charity; in 1833 170,000,000; and since the latter date the cost of public charities has greatly increased. It is impossible to obtain in France such accurate returns of the poor as in England, where the paupers are counted twice a year; but there is reason to suppose that the number of paupers is now less, in proportion to the whole population, than it was in 1887. This is also true in England and Wales, where there has been a noticeable decrease both in indoor and outdoor relief since 1870, and still more since 1845, when pauperism was about at its maximum. In 1870 the number reported in a given day in England and Wales, both indoor and outdoor, was 1,047,662, but four years later it was only 784,006, and in 1894, although the whole population had increased to 30,000,000, the paupers enumerated on a given day were less than 840,000. The U. S. census of 1890, though far from accurate, indicates the same diminution of pauperism when compared with the whole population of the republic.

Indoor and Outdoor Relief.—This decrease of the public poor in England and Wales is due in part to the cutting off of "outdoor relief." Many British authorities attribute the pauperism now existing in the United Kingdom to the outdoor relief granted there still, and some hold that if outdoor relief were entirely cut off there would be a marvelous diminution of pauperism. This is a theoretical view which facts do not wholly sustain. The system followed in the U. S. is to mingle outdoor and indoor relief, since both are needful and their conjoint use is more judicious than the absolute exclusion of either. It often happens that a little relief given in a small community will keep a family from absolute dependence, while residence in an almshouse degrades and pauperizes. Outdoor relief in large communities by public authorities is, however, dangerous, because it is especially liable to misuse through want of vigilance or as a means of bribery or corruption. The principles which should govern almsgiving may be summed up in the words of Malthus: "It is in the highest degree important to the general happiness of the poor that no man should look to charity as a fund on which he may confidently depend." The application of this requires that outdoor relief should in no case be given to able-bodied men; that in cities it should be left as far as possible to organized private charity, lest the poor fall into the habit of believing in a right to relief at the hands of the public authorities; and that where given it should be bestowed in such a manner and under

such conditions as would tend to prevent future pauperism. The "workhouse test," however, to which Malthus was firmly attached, will not meet the exigencies of the case in Britain or anywhere else. The old-fashioned workhouse has been expanded since Malthus wrote, so that its door, originally but one, has become the manifold doors of infirmity, hospital, school for paupers, asylums for the blind, for the idiot, and for the insane, schools for the deaf, etc. "Indoor relief" now includes, or should include, support by the public in all establishments for the poor and suffering; while "outdoor relief" means "household aid" to those persons—much the larger number—who do not need the restraint or the special care of a public establishment, whether asylum, hospital, poorhouse, or by whatever other name. One reason why family aid has been carried, especially in cities, so far as to prove an abuse, was the desire to prevent the breaking-up of families, the corruption of the young, and the unspeakable distress of the old and virtuous by throwing them into forced association with the dregs of mankind in a so-called charitable establishment. This same desire counts for much in the present movement to pension the aged poor, which Charles Booth and other English writers strongly support, and which has already produced a pension-law, guarded by many restrictions, for the aged poor of Denmark. If experience can teach anything it is that both indoor relief and family aid (outdoor relief) properly practiced are indispensable in any complete system of public charity. Where to draw the line in individual cases is a matter only to be determined by the wise discretion of the poor-law officers. Indoor relief will generally be found more costly in proportion to the number relieved than family aid; and it will also, in general, apply to a much smaller number of cases, but so far as it can be rationally and humanely used it should be made to cover as many cases as possible. Family aid, on the other hand, should be restricted as much as possible, except for classes of the poor to whom indoor relief is (presently or prospectively) likely to be injurious. The public generally prefer, for reasons of sentiment and oftentimes of good sense, the use of "family aid" rather than the separation of households and the sequestration of persons in great establishments where individuality is lost in the mass.

Pauperism in the United States.—The national census chiefly takes account of the indoor poor of the U. S., but by no means includes them all in its tabulations, while it omits almost entirely the much more numerous class of the outdoor poor. The census of 1890 exhibits as the aggregate of paupers in almshouses in the whole republic 73,045; and this is probably less than 10,000 short of the actual number at any one time in 1890, which may be estimated at 80,000. The outdoor poor, which the census sets down as only 25,000, were in fact, upon careful estimates based on State returns, not less than 250,000 at any one date—that is, the average number. If we add to the almshouse poor the number of the insane poor supported by the public in hospitals, asylums, etc., which may be estimated at 30,000, and other classes of the indoor poor who are supported in establishments other than poorhouses and asylums for the insane, we shall probably find the whole number of the indoor poor of the U. S. rising toward 150,000. Assuming these estimates to be approximately correct, we should then have 400,000 as the constant or average number of paupers in a population of a little less than 63,000,000. At this rate the number of English paupers at any given date should be less than 200,000, for the population of England and Wales is less than half that of the U. S. The actual number of the English paupers in 1894 exceeded 800,000, so that, viewed in this proportion alone, pauperism is more than three times as common in England as in the U. S. There is, however, another consideration affecting this problem. How many paupers in the course of a year are represented by the single pauper who appears in the aggregate average number? Mr. Charles Booth, the most accurate calculator on this element of the question, finds that in England the total of pauperism during the year is to the average number as two and a half is to one. In the U. S. this proportion is no doubt smaller.

Settlement Laws and Poor-law Systems.—In the fifty States and Territories of the U. S. the poor-laws, including laws for the "settlement" or definite fixing of the pauper in a given locality, vary so much that no general statement can well be made. A poor-law may be said to exist almost everywhere in the U. S.—that is, the localities are everywhere expected to support their own poor by taxation; but the

prevalence of the county system in many States, of the township system in others, and of a combination of township, county, and State systems in some localities, makes it extremely difficult to say what usages prevail in the republic as a whole. In the older Atlantic States the law of pauper settlement is derived from the English statutes of Charles II. and earlier reigns; yet the American laws all differ materially from the English statutes, and were never precisely the same, even in the provincial period. The period requisite for gaining a pauper settlement varies from one year to ten, or even more under some circumstances; but mere residence does not always confer this right without the payment of taxes or some other qualification. Marriage with a person who has a pauper settlement generally carries settlement with it for the wife and children; legitimate children follow the settlement of the father, if any, otherwise of the mother; illegitimate children follow the settlement of the mother; and this provision applies to women who have married a husband insufficiently divorced from a former wife. The complications which may arise from the article of marriage alone are numerous, and the whole body of settlement laws has given room for infinite litigation between towns, counties, and States; but an incidental advantage, springing even from obscure and complex pauper laws, has appeared in New England, and particularly in Massachusetts, where these laws have less simplicity, perhaps, than anywhere else. Their very complexity requires the official who acts under them to investigate every case of poverty brought to his notice, and in this way the condition of families, the existence of kindred, the nature of maladies, and all the numerous circumstances needing to be investigated are brought under examination. The formation in nearly a hundred cities of the U. S., since 1870, of charity organization societies (see CHARITY ORGANIZATION), has also promoted these inquiries into the state of the poor—guarding against much imposture, and bringing those truly in need under the eye of public or private charity. An important question arising under the immigration laws of the U. S. concerns "interstate migration," a subject which was brought before the national conference of charities in Denver, June 28, 1892. This national body, after hearing a report on the question, passed a resolution to memorialize Congress for the regulation by national authority of the migration of poor, vagrant, insane, diseased, and criminal persons from one State to another. Such an exercise of the Federal authority, it was thought, would lead to a more systematic code of laws and a more uniform administration of public charity throughout the U. S. and would incidentally promote the collection of more exact statistics of pauperism.

F. B. SANBORN.

Paupor'ida: name applied to a group of MYRIAPODA (*q. v.*), containing a few minute species, formerly placed between the Chilopods and Chilognaths, but shown by the researches of Schmidt (*Zoologischer Anzeiger*, 1894) to be degenerate members of the Chilognathous group. The genera *Paupopus* and *Eurypaupopus* occur in the U. S.

Pausa'nias (in Gr. Πανσάνιος): the Periegete or "conductor," of Magnesia in Asia Minor, who wrote toward the close of the second century A. D. a *Guide to Greece* (Περίηγησις τῆς Ἑλλάδος) in ten books. In this work, which is beyond price for archæology and mythology, especial attention is paid to monuments of art, in which the writers of the Greek Renaissance took great interest. The preference shown for temples and votive offerings is also explicable from the tendencies of the century. Pausanias doubtless compiled his manual from earlier guides, among whom POLEMON (*q. v.*), 150 B. C., is conspicuous; but this does not exclude personal vision any more than the free use of an old Murray or Baedeker would do to-day, and the absence of allusion to the great monuments of the period in which the compiler lived is of a piece with the antiquarian unreality of the age. The work has been edited by Siebelis (5 vols., Leipzig, 1822); Schubart and Walz (Leipzig, 1838; English translation by Thomas Taylor, 3 vols., London, 1793-94); and by Shilleto in Bohn's Library (2 vols., 1886). See also Kalkmann, *Pausanias der Perieget* (Berlin, 1886), and Gurlitt, *Pausanias* (Graz, 1890).

B. L. GILDERSLEEVE.

Pausanias: a son of Cleombrotus and regent of Sparta during the minority of his cousin, Plistarchus, the son of Leonidas; commanded the confederate Greeks at Platææ 479 B. C., and achieved several brilliant victories during the following years; but, elated by these successes and led astray by an exorbitant ambition and vanity, he entered

into treasonous negotiations with the Persians. He desired to bring the whole of Greece under his sway, and he hoped to realize this plan by the aid of Xerxes, which he proposed to buy by placing his future kingdom under Persian authority. Meanwhile he assumed Persian dress, surrounded himself with a body-guard of Persian and Egyptian troops, and introduced Persian ceremony and Oriental luxury in his household. The Athenians denounced him and the Spartans suspected him. Twice he was recalled from the army and arraigned before the ephors, but no proofs could be presented and he was acquitted. He continued the negotiations with Xerxes, and even began to form a conspiracy with the Helots. At last a letter from him to Xerxes was delivered over to the ephors by the slave intrusted to carry it to the Persian camp, and when he learned that his treason was discovered and his plan frustrated, he took refuge in the temple of Athene Chalceceus, where the people shut up the entrance by a pile of stones, to which his own mother carried the first, and he died of hunger about 468 B. C.—His grandson PAUSANIAS was King of Sparta from 444 to 394, when he fled the country to escape condemnation to death for treason. He died in Tegea in 385 B. C. The murderer of Philip, King of Macedonia, was still another person of the same name.

Revised by J. R. S. STERRETT.

Pauw, pōw, CORNELIS, or CORNELIUS, de: author; b. at Amsterdam, 1739. He was educated at Göttingen; entered the Franciscan order; became canon of Xanten, near Cleves, and for a time represented the Bishop of Liège, at Berlin; but most of his life was spent in literary labors. Like his celebrated nephew, Anacharsis Clootz, he was very eccentric, and he was insane before his death. De Pauw's writings were intended to explode the sentimental theories then in vogue respecting the American Indians and the Orientals; they show much research, and their spirit of criticism was valuable, though unduly violent, resulting in hot controversies. The principal ones are *Recherches Philosophiques sur les Américains* (Berlin, 1768-69; translated into English), and similar works on the Egyptians and Chinese (1774), and on the Greeks (1788); collected edition 1795. D. at Xanten, July 7, 1799.

HERBERT H. SMITH.

Pavements: coverings of wood, stone, brick, or asphalt, laid firmly on a street in order to give a smooth and convenient surface for travel. The coverings of gravel and broken stone used for macadam roads in country and suburban districts, and also in small towns, are described under **ROADS**, while this article deals with the pavements for streets in larger towns and cities; such road surfaces, although well adapted to park drives, become so covered with mud and dust under the wear of heavy traffic, and require such a heavy expense for maintenance and renewal, that they can not be used in the thickly settled parts of cities. A street pavement should be durable, be readily cleaned and kept in repair, give a secure foothold for animals and easy traction, not become slippery from use, and be as noiseless as possible. It should also be of such material and construction that the original cost plus the expense of maintenance may be a minimum.

Foundation.—A good foundation is essential for the stability of a street pavement. The most common foundation is sand or gravel, laid in a thickness of from 3 to 6 inches upon a sub-grade surface, which is made nearly parallel to that of the pavement itself. Cobblestones set firmly in sand or gravel, rubblestones set on edge in contact, and rubblestones set on edge but not in contact with the voids filled with concrete, are also used. The best foundation is one of hydraulic concrete, 6 or 8 inches in thickness, but this is the most expensive, its cost being about \$1.50 per square yard of surface. The surface of an old road sometimes makes a good foundation for a new pavement; for instance, in Brooklyn, N. Y., asphalt pavements have been laid on top of old cobble pavements, and in New York an asphalt pavement was laid in 1892 on the old macadam surface of the Boulevard.

Wooden Pavements.—The cheapest wooden pavement is made of round blocks sawed from small trees in lengths of 6 inches, the diameters of the blocks ranging from 2 to 12 inches. The earth is first excavated to the curve of the finished pavement and 2 or 3 inches of sand laid; on this boards are placed which are covered with hot coal-tar. The blocks are then set on end in contact, the interstices filled with sand, the surface coated with hot tar, and covered with a thin layer of sand. The cost of such a pavement is about \$1.25 per square yard, and for a year or two it gives good satisfaction, being smooth, clean, and noiseless; it then be-

gins to wear in ruts, and also to decay rapidly, so that renewal is necessary in a few years. The best wooden pavement is composed of rectangular blocks, 3 to 4 inches in width, 6 to 14 inches in length, and 6 inches deep, which are laid in courses across the street with an open joint three-quarters of an inch wide between the courses. This is also laid on a foundation of sand covered with boards, and the open joints are filled with coal-tar and gravel. The wooden blocks should be creosoted to prevent decay. There are many patented details of construction in wooden pavements, but experience indicates that none of them secures durability and economy. The rapid wear and decay necessitates a heavy expense for renewals; the odor arising from the noxious liquids, held in absorption by the wood or retained in the joints between the blocks, is sometimes offensive; and the dust resulting from wear and decay is often found to be injurious to health.

Stone Pavements.—The layer of cobblestones formerly in common use scarcely deserved the name of pavement; it was noisy, rough, hard to clean, and unpleasant for traffic, and it can now be said to be almost entirely abandoned. The best stone pavements are made of rectangular blocks set in contact in rows running across the street, and resting on a foundation of concrete. The Belgian pavement is formed of blocks nearly cubical in shape, the edge of the cube being from 5 to 7 inches long; trap-rock is generally employed on account of its toughness. The Guidet pavement, which may be seen on Broadway, in New York, is formed of granite blocks from 4 to 5 inches wide, 10 to 15 inches long, and 8 to 10 inches in vertical depth. The blocks are set in close contact on the foundation, over which a layer of sand is laid, and are then rammed with heavy wooden rammers. The joints are filled with sand, or sometimes with asphalt. This pavement costs on a sand foundation from \$4 to \$5 per square yard. Stone pavements are durable, and when well made require little repair. They are open to the objection that they collect and retain the surface liquids between the joints, and in addition are noisy. Where the traffic is very heavy, however, stone seems to be the most advantageous material for a street pavement.

Brick Pavements.—The brick used for this purpose are hard burned, usually without being vitrified, and should be of uniform hardness and low porosity. A foundation of sand or gravel is first made and compacted by rolling, and upon this a course of brick is laid upon the flat side. A layer of sand an inch thick is next spread, and on this the top course of hardest and toughest bricks is laid, the bricks being set on edge with their longest dimension running across the street. This is covered with sand and well rolled until the pavement is brought to the assigned form of surface. Another method of construction is to omit the lower layer of bricks, using tarred boards instead, and sometimes the top layer has its courses laid diagonally across the streets. The first successful brick pavements were those built in Illinois and Ohio between 1875 and 1880, and they are now extensively used in the western parts of the U. S. With a good quality of brick and a traffic not heavy good results have been obtained, the pavement being clean, not noisy, durable, and the traction being easy. With brittle or soft bricks, however, cracking and wearing into ruts occurs. The cost of brick pavements has generally been between \$1.50 and \$2.50 per square yard on a sand foundation, and the construction of them is constantly increasing in large towns and smaller cities where the traffic is not severe.

Asphalt Pavements.—The bituminous limestone or asphalt rock of Switzerland, when heated, crumbles into a sandy powder, which, when spread on a good foundation in a sheet 2 or 3 inches thick and compacted by ramming with heated pestles, makes an excellent road covering. The bitumen from Trinidad mixed with heated sand makes a compound closely resembling that derived from the natural asphalt rock. It is also used in the form of rectangular blocks or bricks, which are made under heavy pressure. Such pavements when well made are very durable, the wear compacting the material instead of grinding it away. They are dustless, noiseless, smooth, and easy of traction, and do not absorb or retain noxious liquids. It does not become slippery from continual wear, although in wet weather it sometimes fails to give sufficient foothold to horses. It is adapted to all streets except those having steep grades and those crowded with traffic, and its use has become very extensive in the U. S., particularly for residence streets. The cost has usually ranged between \$2.50 and \$4 per square yard on a concrete foundation.

The comparative merits of the different kinds of pavements would be differently estimated, according to the character of the traffic. For a very heavy traffic nothing but stone blocks will prove satisfactory, while for lighter traffic brick or asphalt may be preferred. Stone is the most durable and wood the least, while asphalt and brick lie between the two. Wood is the cheapest in first cost, brick next, followed by asphalt, while stone is the dearest. Regarding maintenance and repairs probably asphalt stands first, stone second, and wood last. In the important matter of cleanliness and hygienic considerations asphalt stands first, brick second, and stone third, while wood is liable to many grave objections.

Statistics.—In a paper read in 1892 before the Commercial Club of Kansas City, Mo., Robert Gillham collected statistics of street-paving from fifty-one principal cities of the U. S. Stone pavements are divided into two classes—(1) dressed stone blocks of regular dimensions, and (2) cobblestone, rubblestone, or undressed irregular blocks. The number of miles of each kind of pavement for different groups of States is given in the following table:

STATES.	Stone. (1.)	Stone. (2.)	Brick.	Wood.	As- phalt.
New England States, 9 cities.....	177	20	...	...	5
Middle and Central States, 22 cities..	879	1,079	56	480	323
Southern and Southwestern States, 9 cities.....	163	31	7	85	60
Northwestern States, 6 cities.....	38	...	25	170	29
Pacific States, 5 cities.....	31	2	...	1	4
Totals, 51 cities.....	1,288	1,132	88	736	421

New York had 321 miles of stone pavement of class (1) and only 3 miles of class (2), 16 miles of asphalt, less than 1 mile of wood, and none of brick. Philadelphia had 120 and 491 miles of the two kinds of stone pavement, 20 miles of brick, 43 of asphalt, and none of wood. Chicago had 23 miles of stone, 410 of wood, 9 of asphalt, and less than 1 mile of brick. It will be seen that the use of brick for street-paving is as yet limited in comparison with other materials. More than half of all the wood pavement in the U. S. is in Chicago. Buffalo, N. Y., takes the lead in regard to asphalt, having 125 miles, or more than one-fourth of the total, while Washington, D. C., stands next with 60 miles.

Planks, slag bricks, and gravel concrete are used to a very limited extent for street pavements. Granolithic paving is a kind of artificial stone, composed largely of hydraulic cement, which is made in place; the use of this, however, is mostly confined to sidewalks and court-yards. See Gillmore's *Roads, Streets, and Pavements* (1876); Love's *Pavements and Roads* (1889); and Byrne's *Highway Construction* (1892).

MANSFIELD MERRIMAN.

Pavia, pãa-vee'ãã (anc. *Ticinum*; med. *Papia*); city of Northern Italy; on the left bank of the Ticino, 2 miles above its junction with the Po; 21 miles by rail S. of Milan, with which it is also connected by a canal (see map of Italy, ref. 3-C). Pavia is still for the most part surrounded by walls, which form a circuit of $3\frac{1}{2}$ miles. It was formerly called the city of the hundred towers. It is connected with the suburb of Ticino by a brick-built covered bridge which dates from the fourteenth century. The churches of Pavia are of great historic and architectural interest; among them are San Michele Maggiore, of the sixth or seventh century, perhaps the finest specimen of Lombard architecture existing; the cathedral of San Stefano (founded in 1488), containing the monument (fourteenth century) to St. Augustine and the remains of Boethius, which were brought thither from the ruined church San Pietro in Ciel d'Oro. Of the old castle, on the site of the ancient Lombard royal palace, little of interest is left except the half-ruined gateway. The University of Pavia, the *alma mater* of many illustrious men, is said to have been founded by Charlemagne, though not formally constituted until 1361. In 1891 there were 1,095 students and 56 teachers; attached to it are two colleges and a library with 185,000 volumes. The Museo Malespina contains some good pictures and a fine collection of engravings. Near Pavia is the picturesque old church Beato Lanfranco; but the great attraction of the neighborhood is the magnificent CERTOSA DI PAVIA (*q. v.*). Pavia is of very ancient, probably Ligurian, origin. It was of some importance under the Romans, and had a Christian church in 326. In 573 it became the Lombard capital, and for 200 years was a rich and great city. In 1524 Francis I. of France suffered a terrible defeat under the walls of Pavia,

and was taken prisoner by the troops of Charles V. Three years later the town was barbarously sacked by the French, but it soon afterward fell into the hands of Austria. Bonaparte having taken Pavia (1796), at the prayers of the citizens limited his soldiers to a sack of three hours, so that the town was not totally destroyed. By the Peace of 1814 it returned to Austria, and after the battle of Solferino became a part of the kingdom of Italy. Pavia has some trade in rice, hemp, silk, wines, etc. Pop. (1893) 37,000.

Revised by R. A. ROBERTS.

Pavlov', NIKOLAI FILIPPOVICH: writer; b. in Moscow, Russia, in 1803; d. Mar. 29, 1865. He was brought up for the stage, but abandoned it two years after his *début*, and devoted himself to literature, although in order to acquire a better education he had first to prepare for the University of Moscow, and go through the courses there. He also was obliged to support himself by serving for some years as a government official. Some of the poems which he published in the newspapers were of merit, but he was more successful with his tales and essays, especially his *Four Letters to Gogol* (1847); *Vopros o Evreakh* (The Hebrew Question, 1858); *Mr. Chernyshevskii and his Time* (1861). From 1860 to 1863 he was editor of the paper *Nashe Vremia* (Our Time) which was a failure.

A. C. COOLIDGE.

Pawcatuck' River: a stream formed in Washington co., R. I., by the union of the Charles and Wood rivers. It is navigable for small vessels for several miles, and forms the southern portion of the eastern boundary of Connecticut.

Pawn: See BETEL.

Pawnbroking [from O. Fr. *pan*, pledge, assurance, identical in form with *pan*, cloth, skirt (< Lat. *pannus*), but connected in meaning with *paner*, rob; Germ. *pfand* is probably a loan-word from O. Fr. *pan*]: the loaning of money upon the security of goods or chattels pledged by the borrower with the lender as security for the repayment of it. The word pawn is often applied in a broad sense to goods or chattels pledged as security for the performance of a contract, or the fulfillment of an obligation, or to the contract by which it is so pledged. The contract of pawn or pledge is a species of BAILMENT (*q. v.*), and differs from a hypothecation in that the latter does not require the actual delivery of the property, and from a chattel mortgage in that the mortgagee acquires the legal ownership. A pawnee has a larger right than a lienor, who does not have the right to sell on failure of payment.

The history of the practice of pawnbroking is lost in antiquity. The earliest records, however, of all civilized nations show that the practice existed among them, and that it was early regulated by laws which uniformly aimed to suppress extortion by the lender and to protect the borrower by strict regulations. Thus there is frequent mention in the Bible of laws among the ancient Hebrews forbidding lenders to keep or receive as security chattels the want of which exposes the borrower to great hardships or privations, as where it is forbidden to keep a man's coat over night or to take "nether or upper mill-stone to pledge," etc. See Exod. xxii. 26, 27; Deut. xxiv. 6, 11, 12, 13, 17.

Among the Chinese pawnbrokers are very numerous, and are kept under strict regulations, and any one acting without a license is severely punished. Pledges are usually redeemable for three years, and 3 per cent. per month is the highest rate of legal interest; and in the winter the monthly interest on pledges of wearing apparel may not exceed 2 per cent. These regulations have been enforced among the Chinese for at least 1,500 years. Interesting facts with regard to the practice are also found in the early records of the Hindus and Arabs and other nations of the East.

In modern times among European nations the first professional pawnbrokers were probably the Jews. The oppression and the hardships caused by the practice of the pawnbrokers early led to the passage of laws by which pawnbroking was exclusively intrusted to public institutions of a quasi-benevolent nature, now called *monts-de-piété*. The first of these was established at Padua, and from there the institutions were introduced into many states in Europe, and some of them still exist, as at Paris, Madrid, Brussels, Antwerp, etc. They were originally intended to be supplied with funds by contribution, and to loan upon with little or no interest; but this was found impracticable. Attempts have been made to introduce them into Great Britain, but they have met with no success; and several schemes that were started resulted in great loss of capital and the ruin of many interested. The *mont-de-piété*

at Paris may be described as giving a general idea of them all. It was opened in 1777, destroyed by the Revolution, opened again in 1797, and obtained a monopoly of pawnbroking in Paris in 1804, since which time it has continued with some minor changes. There is a central office and a number of commissioners who receive pledges in the various arrondissements. These commissioners make provisional loans on goods and then forward them to the central office, where they are appraised by the valuers of the *mont-de-piété*, the practice being to advance four-fifths on the value of gold and silver goods and two-thirds on that of other non-perishable goods. Since the *mont-de-piété* has a monopoly, the advances made are less liberal than where there is competition, so that the local commissioners make advances over the amount and recoup this by taking 2 per cent. of each pledge, 1 per cent. on redemption, and interest on the excess of advance. These charges have to be added to the 9 per cent. interest and $\frac{1}{2}$ per cent. for valuation made by the central office. The trading capital of the *mont-de-piété* is obtained by the issue of promissory notes at $2\frac{1}{2}$ per cent. for money deposited, by cash reserves, and by profit on the redemption and sale of pledges.

In England, as elsewhere in Europe, the first professional pawnbrokers were probably Jews, who, at and after the time of the Conquest, for more than two centuries charged from 45 to 65 per cent. per annum. This led to restrictive legislation, and in 1275 they were forbidden to take interest on pain of death, and in 1290 were expelled from the kingdom. Pawnbroking then fell into the hands of the Lombards, who thrived upon it, although interest was unlawful until 1646, when it was fixed at 10 per cent. See *USURY*.

The taking of goods and chattels as security for the redemption of money lent thereon was first regulated by statute in England in 1757 (25 George III., c. 48, sec. 6). The provisions of this act were amended and re-enacted in several temporary statutes which were superseded by the Pawnbrokers' Act of 1800 (39 and 40 George III., c. 99). This act was also subsequently amended by various acts, but nevertheless grew unpopular, until in 1871 a committee was appointed by the House of Commons to investigate the matter of pawnbroking. In 1872, on their recommendation, a general act was passed regulating the business and repealing all previous laws. This act (35 and 36 Vict., c. 93) applies without qualification to every loan of a pawnbroker of not more than 40s., and to loans of from 40s. to £10, unless the parties by special contract, in statutory form, agree to exclude the operation of the act as to profit and certain other particulars. Books of account of all transactions must be kept in a prescribed manner, and a pawn-ticket briefly stating the contract must be given with each pledge. The lawful profit is now a halfpenny per florin, or $2\frac{1}{2}$ per cent., per month, on loans up to 40s., and a halfpenny per half-crown, or $1\frac{1}{2}$ per cent., on loans from 40s. to £10. The act also contains numerous other provisions, as for the liability in case of fire, for the prevention of the making of unlawful pawns, etc.

The system of pawnbroking as it exists in the U. S. is borrowed directly from that which prevails in England, and the subject is generally regulated by statutes or legal ordinances, the general effect of which is to restrict the interest which may be charged, and in other ways provide for the protection of the borrower, as by restricting the hours of business, requiring tickets to be given for each pledge, etc., essentially as in Great Britain. See Jones on *Bailments*; Tyler on *Usury, Pawns, and Loans* (Albany, 1873); Turner's *Contract of Pawn* (London, 1883).

F. STURGES ALLEN.

Pawnee City: village (founded in 1856); capital of Pawnee co., Neb. (for location, see map of Nebraska, ref. 11-H); on the Burlington Route and the Chi., Rock Is. and Pac. railways; 75 miles S. of Lincoln. It is in an agricultural and stock-raising region, and has 6 churches, college, graded high school, 2 national banks with combined capital of \$110,000, a State bank with capital of \$15,000, and 2 weekly newspapers. Pop. (1880) 763; (1890) 1,550; (1894) estimated, 2,500. Editor of "Press."

Pawnee Indians: See *CADDON INDIANS*.

Pawtucket: city; Providence co., R. I.; at the head of navigation on the Pawtucket river; on the N. Y. and New England and the N. Y., N. H. and Hart. railways; 4 miles N. of Providence, 39 miles S. S. W. of Boston (for location, see map of Rhode Island, ref. 7-N). It was the birthplace of the cotton-manufacturing industry in the U. S., which

was initiated in 1790 by SAMUEL SLATER (*q. v.*). The river here has a fall of about 50 feet, furnishing abundant power for manufacturing, and is spanned by several bridges of iron and stone. The city presents a picturesque appearance, and has a public park, a system of water-works introduced in 1878 at a cost of \$1,333,000 and enlarged in 1887 at a cost of \$150,000, several lines of street-railway, sewerage and electric-light plants, a public library (founded in 1876) containing over 11,000 volumes, public-school property valued at over \$375,000, 3 national banks with combined capital of \$800,000, 3 savings-banks with deposits aggregating over \$3,000,000, and a monthly, 3 daily, and 2 weekly periodicals. It receives annually large quantities of coal, lumber, lath and shingles, brick, cement, lime, stone, and cotton. In 1893 the assessed valuations were, real property, \$24,155,698; personal, \$5,206,852—total, \$29,362,550; and the net debt was \$2,828,852, which included a water debt of \$1,635,590. Since Samuel Slater's initial work Pawtucket has been noted for the extent and variety of its manufactures. The census returns of 1890 showed that 347 manufacturing establishments (representing 70 industries) reported. These had a combined capital of \$14,208,632, employed 7,693 persons, paid \$3,433,563 for wages and \$8,658,281 for materials, and had products valued at \$14,349,595. The principal industry was the manufacture of cotton goods, which had 14 establishments, combined capital of \$6,819,504, and products valued at \$3,526,300. There were 7 hosiery and knit-goods mills, yielding a product valued at \$745,712, and 6 textile dyeing and finishing factories, yielding a product valued at \$308,919. Other important industries were the manufacture of foundry and machine-shop products, which had 12 establishments, \$991,604 capital, and \$1,055,852 receipts for products; and slaughtering and meat-packing, 3 establishments, \$547,100 capital, and \$2,895,191 receipts for products. Pawtucket was settled about 1655, was included in Bristol co., Mass., till 1861, and was incorporated as a city in 1886. Pop. (1880) 19,030; (1890) 27,633; (1895) 32,573.

Paxton: city (founded in 1858); capital of Ford co., Ill. (for location, see map of Illinois, ref. 5-F); on the Ill. Cent. and the Lake Erie and West. railways; 49 miles E. of Bloomington, 103 miles S. by W. of Chicago. It is in an agricultural region; contains 8 churches, Rice Collegiate Institute (founded in 1878), a national bank with capital of \$50,000, and 2 weekly newspapers; and has water-works, electric-light plant, flour-mills, and various manufactures. Pop. (1880) 1,725; (1890) 2,187. Editor of "RECORD."

Paxton, Sir JOSEPH: architect and horticulturist; b. at Milton-Bryant, Bedfordshire, England, Aug. 3, 1803, of humble parentage; educated in the free school at Woburn; obtained employment at Chiswick as a gardener in the service of the Duke of Devonshire, where he displayed such remarkable talent for landscape-gardening that the duke made him manager of his Derbyshire estates and commissioned him to remodel the grounds at Chatsworth. Under his care that mansion soon became the most renowned country-seat in Great Britain, the great conservatory especially being regarded as a wonderful triumph of art. This building became the germ of the idea which culminated in the plans for the Crystal Palace, the vast edifice of iron and glass erected from his designs for the great Universal Exposition of 1851. For this service he was knighted and received honors from several European sovereigns. He removed the buildings to Sydenham; erected a magnificent mansion for Baron James Rothschild; entered Parliament 1854; and published several works on botany, horticulture, and floriculture. D. at Sydenham, June 8, 1865.

Payment [from O. Fr. *payement*, deriv. of *payer*, pay < Lat. *paid* or *pari*, satisfy, deriv. of *pari*, *paris*, peace]; a mode of discharging an obligation by the delivery and acceptance of money, or of something substituted for money by agreement of the parties. The original obligation may impose the liability to make payment. In such a case payment discharges it by performance. In other cases payment is made not in performance of the original obligation of the payer, but of one which the parties have substituted therefor—for example, one who is bound to transfer property or render services may prefer to pay a sum of money in lieu of performance. If the other assents to this, the original obligation is discharged by the substitution of the new agreement, and the latter is discharged by payment. A debtor often gives to his creditor a negotiable instrument instead of money. If the instrument is a genuine bill of a bank which has not failed, it will operate as money. A

forged bank bill, or, in most jurisdictions, the bill of a bank which has suspended payment, is treated as a nullity, and its delivery and acceptance are not payment. If the bill, note, or check of the debtor or of a third person be received by the creditor instead of money, it will have the effect of an absolute payment, provided the parties actually agree that such shall be its effect. In the absence of an actual agreement, however, the general rule is that it will operate as conditional payment only. If the condition is broken by the non-payment of the paper at maturity, the obligation is not discharged, but the creditor is remitted to all his original rights. See APPROPRIATION OF PAYMENTS AND NEGOTIABLE INSTRUMENTS.

FRANCIS M. BURDICK.

Payn, JAMES: novelist; b. at Cheltenham, England, in 1830. He was educated at Trinity College, Cambridge, and graduated in 1854; in 1858 became editor of *Chambers's Journal*, and in 1882 of *The Cornhill Magazine*. His published books, chiefly novels, are more than 100 in number, and include *Richard Arbour* (1861); *Lights and Shadows of London Life* (1867); *Won, not Wooed* (1871); *What he Cost her* (1877); *Under one Roof* (1879); and *The Eavesdropper* (1888).

H. A. BEERS.

Payne, CHARLES HENRY, D. D., LL. D.: minister and educator; b. at Taunton, Mass., Oct. 24, 1830. He was educated at East Greenwich Academy, Rhode Island, Wesleyan University, Middletown, Conn., and at the School of Theology of Boston University. He joined the Providence Conference in 1857; was pastor 1857-76, serving several of the leading churches in Brooklyn, Philadelphia, and Cincinnati; president of Ohio Wesleyan University 1876-88; elected corresponding secretary of the Board of Education 1888, and re-elected in 1892. He prepared a plan of federation of Methodist institutions of learning which, with some modifications, was adopted by the General Conference of 1892. He has published *The Social Glass and Christian Obligation* (1868); *Shall our American Sabbath be a Holiday or a Holy Day?* (1872); *David, the Uncompromising Young Man* (1873); and *Guides and Guards in Character-building* (1884).

A. OSBORN.

Payne, JOHN: poet; b. in London, 1842. He is a solicitor, and is known especially as a translator and a poet of the neo-romantic school, like Marzials and O'Shaughnessy, greatly influenced by Baudelaire and the French romanticists; author of *The Masque of Shadows* (1870); *Intaglios* (1871); *Songs of Life and Death* (1872); *Lautrec* (1878); *New Poems* (1880); *François Villon: a Biographical Study* (1881); and of the following translations: *The Poems of François Villon* (1881); *The Book of the Thousand Nights and One Night* (the first complete English version 1882-84, 9 vols.); *Tales from the Arabic* (1885); and *The Decameron of Boccaccio* (1886).

H. A. BEERS.

Payne, JOHN HOWARD: dramatist and actor; b. in New York, June 9, 1792; began to edit a weekly paper, *The Thespian Mirror*, when thirteen years of age; two years later published twenty-five numbers of a periodical called *The Pastime*; made a successful debut as an actor at the Park theater, New York, Feb. 26, 1809, in the character of Norval; appeared on the stage at Boston and other cities, also in London 1812-13, where he produced many new dramas, chiefly imitated from the French, for one of which, called *Clari, or the Maid of Milan*, he wrote the song *Home, Sweet Home*; published a volume of juvenile poems, *Lisping of the Muse* (1815); successfully produced his tragedy *Brutus* at Drury Lane 1818; was a friend and correspondent of Coleridge and Charles Lamb; edited in London a dramatic paper called *The Opera-glass* 1826-27; returned to the U. S. 1832; was U. S. consul at Tunis, Africa, 1841-45; again appointed 1851. D. there Apr. 10, 1852. Among his best writings were the plays *Virginus* and *Charles the Second*. His remains were removed from Tunis, Africa, to Washington, D. C., in 1883. A volume of his collected works, with a memoir, was published in 1875. See Brainard's *John Howard Payne*, a biographical sketch with narrative of removal of his remains to the U. S.

Revised by H. A. BEERS.

Payne, WILLIAM HAROLD, A. M., Ph. D., LL. D.: educator; b. at Farmington, N. Y., May 12, 1836; educated in common schools in New York and at Macedon Academy; superintendent of public schools in Three Rivers, Niles, Ypsilanti, and Adrian, Mich., 1858-79; Professor of Science and Art of Teaching, University of Michigan, 1879-88; became chancellor University of Nashville and president

Peabody Normal College, 1888; author of *School Supervision* (Cincinnati, 1875); *Outlines of Educational Doctrine* (Adrian, 1880); *Contributions to the Science of Education* (New York, 1887); translated and edited *Compayré's History of Pedagogy* (Boston, 1884); *Compayré's Lectures on Teaching* (1888); *Compayré's Elements of Psychology* (1890); *Rousseau's Emile* (1892).

C. H. THURBER.

Paysandú, pí-saän-doo': a town of Western Uruguay, the third in size in the republic; on the river Uruguay; 214 miles N. W. of Montevideo; pop. about 14,000 (see map of South America, ref. 8-E). It is the center of a rich grazing region and has a large trade, by the river, in cattle and hides; above it, at Guaviyu, is an extensive meat-packing establishment. During the war of 1864-65 between Brazil and Uruguay, Paysandú was taken by the Brazilians, Jan. 2, 1865, after an engagement of fifty-two hours. It is the capital of the department of Paysandú, which has an area of 5,116 sq. miles, and a population (1887) of 28,417.

HERBERT H. SMITH.

Payson, EDWARD, D. D.: clergyman; b. at Rindge, N. H., July 25, 1783; was a son of Rev. Dr. Seth Payson (1758-1820); graduated in 1803 at Harvard; was three years teacher of an academy at Portland, Me., where he was in 1807 ordained to the Congregational ministry and was colleague pastor with a Mr. Kellogg until 1811, when he became sole pastor. Here he remained till his death, Oct. 22, 1827. He was a man of great zeal and of saintly devotion. It is a curious misconception which generally prevails that he was a "hell-fire preacher." He was tenderness itself, and the hold he had upon the esteem of New England is shown by the number of children to whom his name was given in baptism. He was a faithful, considerate pastor, a zealous and impassioned preacher. He was at times melancholic, probably because dyspeptic and morbid, but ordinarily he was a most agreeable companion. His sermons, etc. (3 vols., Portland, Me., 1846; new ed. Philadelphia, 1859), have been published, together with a *Life*, by Asa Cummings, D. D.—His uncle, PHILLIPS PAYSON, D. D. (1736-1801), for many years Congregational minister of Chelsea, Mass., was one of the most scholarly and influential divines of the Revolutionary period. Revised by S. M. JACKSON.

Pāzand: a form of language. See under PAHLAVI.

Paz Soldan, paath'söl-daan', MARIANO FELIPE: geographer, historian, and publicist; b. at Arequipa, Peru, Aug., 1821. He graduated in law at Arequipa 1847; took up his residence in Lima, held judicial positions, and was secretary of the Peruvian legation in Colombia; in 1853 he studied prison systems in the U. S., making an elaborate report. He was Minister of Foreign Affairs under Castilla, and of Justice under Balta; was long director of public works, and introduced important reforms in the Peruvian prisons. During the Chilean occupation of Peru he lived in exile at Buenos Ayres. His geographical and historical works are numerous, and are standard authorities. They include *Atlas geográfico del Perú* (1861); *Historia del Perú independiente* (1866); *Diccionario geográfico estadístico del Perú* (1877); *Diccionario de la República Argentina* (1884); and *Historia de la Guerra del Pacífico* (1884). D. at Lima, Dec. 31, 1886.—His brother, MATEO PAZ SOLDAN (b. 1814; d. about 1872), published several mathematical works and a *Geografía del Perú* (1861).

HERBERT H. SMITH.

Pea [recently formed as sing. to *pease* (regarded as a plur.) < M. Eng. *pese*, from O. Fr. *peis* (> Mod. Fr. *pois*) < Lat. *pisum* = Gr. *πίσσιον*; the word appears also by direct borrowing from Lat. in O. Eng. as *pise*]: a plant of the family *Leguminosae*, much prized in temperate countries for its seeds. The pea is known to botanists as *Pisum sativum*. It is native to Asia. The field pea, *P. arvense*, thought by de Candolle to be a native of Italy, is probably not specifically distinct. This latter is much grown in the northern parts of the U. S. and in Canada as a forage plant. The garden peas fall into two general categories, the common or shelling sorts and the sugar or edible-podded varieties. The shelling peas are those which are commonly grown in the U. S., the edible product being the seeds alone, which are shelled from the pod. In the U. S. these seeds are generally eaten when fresh and green, but dry peas are much used in parts of Europe. The edible-podded peas are those which possess a soft pod which does not burst open when the seeds are ripe. The pod, with the inclosed seeds, is eaten in the green state, much as "string" beans are used. Like the common peas,

the varieties are either dwarf or climbing. The common or shelling peas may be again divided into smooth-seeded and wrinkled-seeded varieties, the latter being considered of the better quality. Each of these classes is again divided into dwarf and climbing varieties. The peas now sold by the seedsmen of the U. S. number about 150 varieties, of which the Extra Early, or Philadelphia, strain includes the greater number of forms, strains, or sub-varieties. In the census year 1890 there were 56,162 acres devoted to peas upon the larger truck-farms of the U. S., and the aggregate of the plantations in smaller market gardens and home gardens must have been half as much more. In that year, 7,971 acres were used in growing peas for seed. The pea industry has increased rapidly because of the demand for the canned product. The plant thrives best in the Northern States and in the cooler months. It will endure light frost, and the seeds are therefore generally sown for the main crops just as soon as the soil can be worked in spring. The half-dwarf varieties are generally preferred for field culture, as they do not need poles or brush upon which to climb, and they are more productive than the very early and very dwarf varieties. The cow-pea, now much grown in the Southern States for forage, is *Vigna* (or *Dolichos*) *sinensis*. It is native to China and Japan. The black pea, gray pea, and others are varieties of it. L. H. BAILEY.

Peabody: city; Marion co., Kan. (for location, see map of Kansas, ref. 6-H); on the Atch., Top. and S. Fé and the Chi., Rock Is. and Pac. railways; 36 miles N. of Wichita, 118 miles S. W. of Topeka. It is in an agricultural region; contains 6 churches, public library, a national bank with capital of \$50,000, a State bank with capital of \$50,000, several flour-mills, creamery, windmill-factory, and 2 weekly newspapers; and has a large business in exporting cattle, hogs, poultry, eggs, wheat, flour, butter, etc. Pop. (1880) 1,087; (1890) 1,474; (1895) 1,361. EDITOR OF "GAZETTE."

Peabody: town (formerly South Danvers); Essex co., Mass. (for location, see map of Massachusetts, ref. 1-I); on the Boston and Maine Railroad; 2 miles W. of Salem, of which it was once a part. It contains 9 churches, 9 public-school buildings, public-school property valued at over \$140,000, Peabody Institute (founded by George Peabody in 1852), 2 libraries (Peabody Institute and the Eben Dale Sutton Reference, founded in 1867), 2 national banks with combined capital of \$400,000, a savings-bank, and 2 weekly newspapers. The principal industry is the manufacture of plain and morocco leather. The town was named after George Peabody, who was born there. Pop. (1880) 9,028; (1890) 10,158; (1895) 10,507. EDITOR OF "REPORTER."

Peabody, ANDREW PRESTON, D. D., LL. D.: clergyman and author; b. at Beverly, Mass., Mar. 19, 1811; graduated at Harvard in 1826; was three years a teacher; studied divinity at Cambridge, Mass.; was tutor at Harvard College 1832-33; was minister of the South parish (Unitarian), Portsmouth, N. H., 1833-60, and was Plummer Professor of Christian Morals and preacher to Harvard University 1860-81; edited *The North American Review* 1852-61, and was long a leading contributor to the religious periodical press. Author of *Lectures on Christian Doctrine* (1844); *Sermons of Consolation* (1847); *Conversation* (1856); *Christianity the Religion of Nature* (1864); *Sermons for Children* (1866); a book of European travel (1868); *Christianity and Science* (1874), besides many published sermons, translations from classic authors, reviews, personal reminiscences, etc. One of the most conservative of his sect, he was equally admired and loved by all parties. D. in Boston, Mass., Mar. 10, 1893. Revised by J. W. CHADWICK.

Peabody, ELIZABETH PALMER: educator; b. at Billerica, Mass., May 16, 1804; spent her childhood in Salem; became a teacher at Boston 1822; wrote articles, chiefly on educational topics, for *The Journal of Education*, *The Christian Examiner*, *The Dial*, and *The Democratic Review*; translated de Gerando's *Moral Self-Education*; edited *Æsthetic Papers* (1849), *Crimes of the House of Austria against Mankind* (1850); published *R. G. Hazard's Essay on Language, and Other Papers* (1857), *Records of a School, First Steps to History* (1833), *Chronological History of the United States* (1856), *Letters to Kindergarten* (1886), *Last Evening with Allston, and Other Papers* (1887), and other works; and with her sister, Mrs. Mary (Peabody) Mann, published *Moral Culture of Infancy and The Kindergarten Guide* (1863). Her special service was in the promotion of the kindergarten in the U. S. D. at Jamaica Plain, Mass., Jan. 3, 1894. Revised by C. H. THURBERG.

Peabody, FRANCIS GREENWOOD, A. M., B. D., and D. D., Harvard University, and D. D., Yale; clergyman and theological professor; b. in Boston, Mass., Dec. 4, 1847; graduated at Harvard College in 1869, and from Harvard Divinity School in 1872; shortly became pastor of the first parish church in Cambridge, Mass., and after a brief ministry, remarkable for its high character and success, resigned on account of ill-health; has been for some years overseer and preacher of Harvard University, Parkman Professor of Theology, and Plummer Professor of Christian Morals. To connect the study of sociology with the study of ethics and religion has been his most characteristic aim. Both as a writer and speaker he is attractive and persuasive to a high degree. He is a frequent and valued writer for the reviews and magazines. JOHN W. CHADWICK.

Peabody, GEORGE, D. C. L.: philanthropist; b. at South Danvers, Mass., Feb. 18, 1795, of poor parents; received a scanty education; was a clerk in stores at Thetford, Vt., Newburyport, Mass., and at Georgetown, D. C., where he became partner with Elisha Riggs in the dry-goods business 1814; removed to Baltimore 1815; soon afterward opened branch houses at New York and Philadelphia; made several voyages to Europe on commercial business; became head of the firm 1829; removed to London, England, 1837; withdrew from the house of Peabody, Riggs & Co., and established a banking-house 1843; accumulated a large fortune; aided Mr. Grinnell in fitting out Dr. Kane's Arctic expedition 1852; founded in the same year the Peabody Institute in his native town, the endowment of which he subsequently increased to \$200,000; visited the U. S. in 1857; gave \$300,000 for the establishment at Baltimore of an institute of science, literature, and the fine arts; in 1862 gave \$2,500,000 as a fund for building lodging-houses for the poor in London; gave in 1866, during another visit to the U. S., \$150,000 to establish at Harvard College a museum and professorship of American archaeology and ethnology, an equal sum for a department of physical science at Yale College, and created a Southern educational fund of \$2,100,000, subsequently increased to \$3,500,000, besides devoting \$200,000 to various objects of public utility. In 1867 he gave \$140,000 to trustees who established the Peabody Academy of Science at Salem, Mass. In recognition of his munificence, Queen Victoria offered him a baronetcy, which he declined, and gave him her portrait; the corporation of London conferred on him the freedom of the city, and the citizens ordered a statue by W. W. Story, which was unveiled in the Royal Exchange July 23, 1869, by the Prince of Wales, during Mr. Peabody's absence on a final visit to the U. S. On this occasion he raised the endowment of the institute at Baltimore to \$1,000,000; gave \$60,000 to Washington College, Virginia, \$50,000 for a Peabody Institute at North Danvers, \$30,000 to Phillips Academy, Andover, \$25,000 to Kenyon College, Ohio, and \$20,000 to the Maryland Historical Society, besides making large gifts to various charities. In the previous year he had endowed an art school at Rome. D. in London, Nov. 4, 1869, less than a month after returning from the U. S. His remains, after funeral honors in Westminster Abbey (Nov. 12), were taken to the U. S. in a British vessel of war and buried in his native town, now called Peabody. Several other bequests to objects of public utility were made by his will, in which his remaining fortune, about \$5,000,000, was left to his relatives. See the *Life*, by Phebe A. Hanaford (Boston, 1882), and *Cochrane's Beneficent and Useful Lives* (1890).

Peabody, Gen. NATHANIEL: soldier; b. at Topsfield, Mass., Mar. 1, 1741; settled at Plaistow, N. H., as a physician 1761; became lieutenant-colonel of militia; was one of the captors of Fort William and Mary at Newcastle, Dec., 1774; was an active and influential member of the legislature, of several conventions, and of the committee of safety during the Revolutionary war; became adjutant-general of the State militia 1777; delegate to the Continental Congress 1779-80; filled nearly every State office during a long course of public service, including those of Speaker of the House 1793 and major-general 1793-98, and was one of the founders of the New Hampshire Medical Society 1790. D. at Exeter, N. H., June 27, 1823.

Peabody, OLIVER WILLIAM BOURNE: biographer and reviewer; b. at Exeter, N. H., July 9, 1799; graduated at Harvard College 1816; practiced law at Exeter 1819-30; edited *The Rockingham Gazette* and *Exeter News-Letter*; removed to Boston 1830; aided his brother in his career.

H. Everett, in editing *The North American Review*; was for several years an editor of *The Daily Advertiser*; was Professor of English Literature at Jefferson College, Louisiana, 1842-43; wrote the *Lives* of Gens. Putnam and Sullivan in Sparks's *American Biography*; published an edition of Shakspeare, with a *Life* and notes (7 vols., 1844); became pastor of the Unitarian church at Burlington, Vt., in Aug., 1845. D. at Burlington, July 5, 1848.

Revised by H. A. BEERS.

Peabody, WILLIAM BOURNE OLIVER, D. D.: clergyman and scientist; twin-brother of O. W. B. Peabody; b. at Exeter, N. H., July 9, 1799; graduated at Harvard College 1816; was assistant instructor at Exeter Academy 1817; studied theology at the Cambridge Divinity School under Dr. Henry Ware; was licensed as a preacher 1819, and ordained in Oct., 1820, pastor of the Unitarian church at Springfield, Mass., where he remained through life. Dr. Peabody was a man of extensive knowledge, of gentle nature, and winning manners. He wrote much on various branches of natural history; was one of the commissioners of the Massachusetts zoological survey, for which he prepared a *Report on the Birds of the Commonwealth* (1839); wrote the *Lives* of Alexander Wilson, Cotton Mather, David Brainerd, and James Oglethorpe in Sparks's *American Biography*; was well versed in landscape-gardening, and was an able lecturer upon scientific topics. D. at Springfield, May 28, 1847. His sermons, with a prefatory memoir by his brother, were published in 1849, and his *Literary Remains* in 1850.

Revised by J. W. CHADWICK.

Peace [M. Eng. *pees*, from O. Fr. *pais*, *pes* (> Mod. Fr. *pair*): Ital. *pace*: Provenc. *patz*: Span. *patz* < Lat. *pax*, *pacis*, peace]: a suspension of war and a return to a state of intercourse such as existed before war, and to *amnesty*, or the oblivion, the waiving, of all future claims on account of those particular acts of injury for which a war was initiated. For the existence of peace a treaty is necessary, unless, indeed, complete conquest and absorption of an entire country has taken place, when there would be no one to negotiate with. Such a treaty, if there be a number of belligerents, may be made by all the parties on one side with all on the other; or each on one side may make a treaty with every other. The great treaties, such as the Treaty of Westphalia and the final act of the Congress of Vienna, are complicated documents; the first combining in two separate treaties—one between France and the German powers, and the other between Sweden and the same powers—the results of negotiations in two separate places; while the other contains the results of a great number of special treaties with powers not properly parties to the congress, or of such powers with one another, as well as of treaties between the parties to the congress themselves. If any question of ownership is left unsettled by the treaty of peace, the rule of *uti possidetis* applies, i. e. property of every kind remains legally in the hands of that state which at the close of hostilities actually was master of it. The effects of a treaty of peace, in particular the cessation of all war operations, begin at once upon its signature, even if ratification still remains necessary, unless the contrary is specified.

Revised by T. S. WOOLSEY.

PEACE is also good order among the members of a state. Blackstone declares that "the common law hath ever had a special care and regard for the conservation of the peace; for peace is the very end and foundation of civil society." The primitive state, however, makes little pretense to the maintenance of public peace. On the other hand, private war between its members is not only tolerated but legally sanctioned. In English legal history the first attempts by the state to keep the peace appear to have been confined to the citizen's homestead. "Every man was entitled to peace in his own house. The brawler or trespasser in another's homestead broke the owner's peace, and owed him special amends." The grade of the offense varied with the owner's rank. Breaking the peace of an earl, or of a church, was a serious matter, while the peace of the king's house was broken at the risk of the wrongdoer's life. The domain of the king's peace was extended as his power increased. Under the later Saxon kings it covered the four great roads of the realm and all waterways on which provisions were carried. It was also given by the king's hand as a special privilege to individuals, and was to be enforced throughout the kingdom during certain periods, such as Christmas, Easter, and Whitsuntide weeks. After the Norman conquest the king's peace soon became synonymous with the peace of the king-

dom. It was proclaimed at his accession as extending to all his loyal subjects, and after the adoption of the fiction that the king never dies, in legal contemplation it was never suspended. Royal officers were appointed to maintain it, notably the justices of the peace, and forms of legal procedure were devised for its more effective enforcement. One who had reasonable fear of harm to his person or property was allowed a writ *de securitate pacis*, by which the person threatening could be made to give security to the complainant to keep "our strict peace according to the custom of England." With the institution of this writ the king's peace became a well-defined common-law right of every law-abiding citizen. Thereafter breaches of the peace included not only public assaults and riots, but all unlawful acts which tended directly to produce public disorder, such as challenges to fight and the publication of libels. Modern statutes carefully define criminal breaches of the peace and regulate their punishments. See BILL OF PEACE.

FRANCIS M. BURDICK.

Peace, Breach of: See PEACE.

Peace River: a river of British America, which rises in the Coast Range Mountains N. of British Columbia, and flows N. E. through the Rocky Mountains to near Athabasca Lake, more than 600 miles, where it turns N., and under name of Slave river enters Great Slave Lake. It is navigable for most of its extent, and passes through a fertile valley.

Peach [from O. Fr. *pesche* > Fr. *pêche* < Late Lat. *persica* (whence Germ. *pflrsich*, peach), for Lat. *persicum* (sc. *malum*, apple), Persian apple, peach, the peach having once been supposed to have come from Persia]: one of the most delicious of all fruits of temperate climates, a member of the rose family, and closely allied to the apricot and plum. Most botanists now agree in referring the peach to the genus *Prunus*, which includes the plum, and its botanical name is then *Prunus persica*. There are some writers, however, who prefer to retain the old genus *Persica*, and who call the peach *Persica vulgaris*. It is now considered that the peach is native to China, although it is not known to have been found truly wild. The opinion of Knight, cited by Darwin and others, that the peach is derived from the almond is not generally accepted. The species is a small tree, usually under 25 feet in height at maturity, with a brittle wood, and narrow, willow-like, lanceolate leaves. The tree is usually short-lived, rarely living beyond fifty years, and under the strain of high cultivation and heavy production it usually perishes or becomes unprofitable before the twentieth year. The flowers are sessile and borne singly upon the branches of the previous year's growth, and appear in early spring in advance of the leaves. They have a five-parted calyx, five pink or blush petals, about twenty stamens borne upon the throat of the calyx, and a single superior ovary containing a pair of ovules. When ripe the ovary becomes a fleshy drupe with a hard rough pit or stone, which, by suppression of one ovule, generally contains but a single seed, and a soft fuzzy skin. A type of peach has arisen, however, with a perfectly smooth plum-like skin, and this is known as the NECTARINE (*q. v.*). The peaches proper, exclusive of the nectarines, fall into two general classes, the clingstones, or paves, and the freestones, these terms referring to the manner in which the flesh joins the pit. These classes grade into each other, especially in the early peaches of the Hale Early type, which are pronounced clingstones in ordinary or dry seasons, but which may become nearly free in moist seasons. The clingstones are now little prized in the Eastern States because they are difficult to prepare for culinary uses, but they comprise the chief California peaches which are now shipped to the eastern markets. Each of these classes may be again divided into white-fleshed and yellow-fleshed peaches, of which the former are, in general, of the better quality, but the latter are much more popular in the market, and are therefore mostly grown in the U. S. There are also various red-fleshed or blood peaches, but they are little grown. The flat peaches, sometimes considered a distinct species (*Prunus platycarpa*), are really only modifications or varieties of the common peach. They are sometimes flattened to little more than the width of the stone. The Peen-to is the chief representative of this class in the U. S.

The peach thrives in those warm or mid-temperate climates which abound in warm days and bright suns. It is scarcely grown in England in the open air because of the cool and humid climate. There is no country in which the peach is cultivated so commonly and with such great success as in

the U. S. Its range is from the Gulf of Mexico to Southern New England and the shores of Lake Ontario, in both New York and Canada, and Lake Michigan, and upon the Pacific coast it again finds congenial climate over a wide extent of territory. In the Northern States the peach thrives only in favored localities, as in Southern Connecticut, along the western end of Lake Ontario and about the lakes of Central New York, along Lake Erie, and on the eastern shore of Lake Michigan. In the north only those areas within the influence of bodies of water are safe for peaches, because they there escape the late spring frosts which destroy the fruit-buds. Large areas in Southern Illinois, in Missouri, and other of the Mississippi and plains States are devoted to peach-culture. While the peach grows upon a variety of soils, it thrives best in a loose sand. Some of the best peach regions are those with even poor and leachy sandy soil. The trees are set from 16 to 20 feet apart in the orchard, and they should be given clean cultivation, and annual crops should not be grown among them after the third year. The trees may be expected to bear a crop the third year from planting. Peach-trees are always sold and planted when a year old or less, from the bud. That is, the seed is planted in the spring, and the resulting seedlings are budded the following August or September. These buds grow the next spring (see GRAFTING), or a year from the time the seeds were planted, and the trees are ready for sale the following fall, by which time the tree has grown from 4 to 7 feet tall. In the southern parts of the U. S. this process is sometimes hastened by "June budding," which consists in budding the stocks the June or July following the sowing of the seeds. The buds grow at once, and in the fall of the same year the trees are ready for sale. The varieties of peaches are very many. The Melocoton tribe is still the most popular in the northern parts of the U. S. The Red-cheek Melocoton was a famous peach of American origin, which is now scarcely, if at all, known in its original form. It was a firm, yellow-fleshed peach, with a red-splashed cheek and a prominent tip-like projection upon the apex. It is now represented by the Early and Late Crawford and many others of the same type; and the Elberta, which is now the leading peach of the Southern and Middle States, is undoubtedly an offshoot of the same type. The Hale Early type, represented in many varieties, is still prominent. This class is characterized by rather small or medium-sized fruits, with white flesh of indifferent quality and clinging more or less tenaciously to the stone. These are chiefly valuable for their earliness and productiveness. The best account of them is Stoll's *Amerikanische Frühpflirsiche* (Klosterneuburg, near Vienna, 1889). Other important varieties are Mountain Rose, Old Mixon, Hill's Chili, Stump, Smock, Salway, Stevens's Rareripec, Chinese Cling, Honey, the two last being chiefly grown in the Southern States. The leading peach shipped from California is the Lemon Cling or similar varieties.

There are many serious diseases and insect enemies of the peach. The chief of these is the yellows, a disease of unknown origin, which always terminates fatally. It is characterized by a red-spotted and usually prematurely ripening fruit, the putting forth of short stiff-leaved shoots from the tips or upper buds of growing twigs, the pushing out of slender and generally bunched growths from the larger limbs or trunk, and finally by the general sickening and death of the tree. It is now known that this disease is not due to any peculiarities of soil or climate, nor to injuries, insects, or parasitic fungi. It is communicable from tree to tree, although its method of spread is unknown. An affected tree lives from three to six years. There are laws for the suppression of the disease in many peach-growing States. Rosette is a somewhat similar but more virulent disease occurring in Georgia and Kansas.

Fungous diseases of the peach are several, of which the most destructive is the twig-blight and fruit-rot, conditions caused by a fungus, *Monilia fructigena*. Spraying with Bordeaux mixture (see FUNGICIDE) in spring before the flowers appear is considered to be the best preventive. The curculio is the best known of the insect enemies of the peach. This beetle lays its eggs in the young fruit, and the larvae are the "worms" of the stone fruits. The beetles are usually caught upon sheets or in a large canvas-covered hopper by jarring the trees in the morning before the insects begin to fly. Some success has been attained in spraying cherries with Paris green (see INSECTICIDE) to destroy the curculio, but the foliage of the peach is so tender that such treatment often injures it, and it is also doubtful

if the practice is generally efficient. Borers are very troublesome in the trunks of peach-trees, especially near the base. These should be dug out in spring and fall. The stunted and yellow condition of trees injured by borers is often mistaken for the yellows. For fuller information on peaches in America, see the fruit manuals; also the special works of Fulton, Rutter, and Willcox. L. H. BAILEY.

Peach curl: a fungous disease of peach-trees, in which twigs, in which they become somewhat swollen and much curled and deformed. It is caused by a minute parasitic fungus, *Eroasus deformans* (family *Gymnoascaceae*), which penetrates the tissues of the leaf and finally produces spore-sacs upon the surface. In the latter eight or more spores are produced. Scribner recommends the early removal and destruction of all the diseased leaves and shoots, and suggests spraying the trees in early spring with a 30 to 40 per cent. solution of iron sulphate. C. E. BESSEY.

Peach-yellows: a contagious disease of peach-trees characterized by the yellowish-green foliage, dwarf shoots, and prematurely ripened, often reddish-stained fruits. A year or two after the first attack the trees die outright, or languish for several years, gradually dying from the extremities downward. It is common in most peach-growing districts in the eastern parts of the U. S. The cause of this disease is not certainly known, but is thought by some investigators to be due to the presence of bacteria. It is readily propagated by inoculation. No cure is known; all that can be done is to remove and burn the affected trees. CHARLES E. BESSEY.

Peacock [*pāo* < O. Eng. *pān*, *pāna*, peacock, from Lat. *pāvō*, peacock, a loan-word, like Gr. *ταῦς*, from Semit.; cf. Arab. *tāwūs*]; any bird of the genus *Pavo* and family *Phasianidae*. The several species are remarkable for the long and showy tail-coverts of the male. Three species are now recognized: 1, The common peacock (*Pavo cristatus*); 2, the black-shouldered peacock (*Pavo nigripennis*); and, 3, the Javan peacock (*Pavo mutans*). The common peacock is a native of Southern and Southeastern Asia, but is now naturalized in many parts of the world. Its flesh was formerly employed for food; but, except when young, it is scarcely palatable. The white peacock is an albino of the ordinary



Male peacock, *Pavo cristatus*.

species. The name peacock is also sometimes applied to the species of the allied genera, *Polyplectron* and *Crossoptilon*.

Revised by F. A. LUCAS.

Peacock. THOMAS LOVE: author; b. at Weymouth, England, Oct. 18, 1785; entered the civil service of the East India Company 1818; was employed in the London office of that corporation until 1856; was a friend of Lamb and Shelley, and wrote a memoir of the latter. He was author of several volumes of poems and romances which met with favor at their first appearance, were forgotten for many years, and obtained a renewed popularity on their republication in 1875 by Lord Houghton, accompanied by a biographical sketch. Among his novels are *Headlong Hall* (1815); *Vivian Grey* (1815); *The M. phin* (1829); and *Gryll Grange* (1860). His principal poems are *Peacock* (1806); *The Green of the* (1815); and *Retribution* (1818). D. D. LUCAS.

Revised by H. A. BEERS.

Peacock-pheasant: any pheasant of the genus *Polyplectron*; so called from the fact that the plumage, and especially the tail-feathers, of the males are adorned with large eye-like spots, suggesting those of the peacock. The generic name is given on account of the two or more spurs which arm the tarsus of the males. F. A. L.

Peale, CHARLES WILLSON: painter and inventor; b. at Chestertown, Md., Apr. 16, 1741; was successively a saddler, silversmith, watchmaker, and carver; studied painting under Copley at Boston and at the Royal Academy, London, under Benjamin West; painted the first portrait of Washington as a Virginia colonel 1772; commanded a company at the battles of Trenton and Germantown; was a member of the Pennsylvania convention of 1777; painted the portraits of the most prominent officers of the Revolution; was a leading promoter of the Pennsylvania Academy of Fine Arts; opened the first American museum; was the first American manufacturer of enamel teeth; invented a great variety of machines, and published a number of scientific essays. D. in Philadelphia, Feb. 22, 1827.

Revised by RUSSELL STURGIS.

Peale, REMBRANDT: artist; son of Charles W. Peale; b. in Bucks co., Pa., Feb. 22, 1778; received an artistic training from his father; painted a portrait of Washington Sept., 1795; studied under West at London 1801-04; spent several years at Paris; returned to Philadelphia 1809; achieved eminence as a portrait-painter; executed the well-known pictures *The Roman Daughter* and *The Court of Death* (the latter was profitably exhibited in the chief cities of the U. S. for a number of years); lectured on the portraits of Washington, and published a *Biography of Charles W. Peale, Notes on Italy* (1831), *Portfolio of an Artist* (1839), and other works on art. D. in Philadelphia, Oct. 3, 1860.

Revised by RUSSELL STURGIS.

Peanut: See GOOBER.

Pear [O. Eng. *peru*, from Lat. *pīrum*, pear; cf. *pīrus*, pear-tree, probably akin to Gr. *ἄριος*, pear-tree]; a fruit of the rose family, widely cultivated in temperate climates. The common pear is *Pyrus communis*, and is native to Europe. In recent years the Chinese and Japanese pears, belonging to the species *Pyrus sinensis*, have been introduced into the U. S. in several varieties. This species is distinguished from *P. communis* by a more vigorous growth, larger and darker-colored leaves which are very sharply serrate, and especially by the long-stemmed apple-like fruits, which generally have a distinct depression about the stem. The fruits of this Oriental species are very much inferior to the common pears, being very hard and gritty, and lacking in agreeable flavor. The tree makes a good stock upon which to bud or graft other pears, however, and the hybrids with *P. communis*, like the Kieffer, Le Conte, and Garber, combine the vigor of the Chinese type with some of the edible qualities of the common type. *Pyrus nivalis*, the perry or snow-pear of Europe, is not grown in the U. S. The Russian pears recently introduced into the U. S. are simply very hardy and usually somewhat inferior types of the common *P. communis*. Dwarf pears are produced by grafting the common pears upon the quince-root. While all varieties of pears can be made to grow upon the quince, there are comparatively few which are considered to be profitable when so grown. Dwarf pear-trees are esteemed because they bear when young, and are usually very productive, and the small size of the tree renders the labor of picking and pruning easy. Pears can also be dwarfed by grafting them upon the thorn-trees (various species of *Crataegus*), but experience in this direction is so limited that the practice can not be recommended.

Pears are successfully grown over a wide territory in North America. In the southern parts of the U. S. derivatives of the Oriental stock, particularly the Le Conte, are now chiefly grown for commerce. Much of the Pacific slope is admirably adapted to pear-culture, and in that region the fruit attains a much greater size than it can be made to acquire in the older States. Of the Eastern States it is generally considered that New England and New York are best adapted to pears. The best pear lands are those which contain a liberal amount of clay. Standard pears—those grown upon pear-roots, in distinction from dwarfs—are commonly planted from 20 to 30 feet apart each way, and they are trained and pruned in essentially the same manner as apple-trees. The varieties of pears are very various in habit of growth, however, and the methods of pruning should be carefully adapted to the particular

variety in hand. Dwarf pears are set about 12 to 15 feet apart, although the distance should be adjusted to the method of trimming. If the trees are kept in a narrow form and allowed to grow rather high they may be set as close as 10 feet, but if they are trimmed in the flat-topped fashion a rod apart each way is not too great. It is essential to success in the culture of dwarf pears that the trees be kept low. The tops should never rise above 10 or 12 feet. This is accomplished by shortening in the annual growth a third or half its length every winter. Trees kept to this stature do not become top-heavy and break off at the union with the quince, and they do not make greater demands than the quince-root can meet. It is also important that the point of union between the pear and quince should be placed from 3 to 6 inches in the ground, in order to prevent the breaking apart of the two, and to protect the quince-stock from borers. If attention is given to these essentials dwarf pear-trees, contrary to the general notion, will continue to thrive and bear for more than half a century. The pear, whether upon the roots of pear or quince, is budded in the nursery during the summer season. Nurserymen in the U. S. commonly import pear-stocks or seedlings from France, because seeds are more easily obtained there, the labor required in growing them can be procured more cheaply, and the leaf-blight, which is a serious disease in the U. S., is not present. These stocks are commonly imported when a year old—that is, in the fall succeeding the sowing of the seeds. These are set in nursery rows, and are budded the following summer, when the stocks are in their second year. These buds start the following spring in the North, and when they have grown two or three years the trees are ready for sale. Dwarf pears are propagated in much the same manner. About 3,000 varieties of pears are described, but the number in general cultivation in the U. S. will not greatly exceed fifty. The most popular of all pears in North America is the Bartlett, which originated in England about 1770, and which is there known as Williams's Bonchretien, from one Williams, a nurseryman of Turnham Green, who obtained it from Wheeler, who raised it. This is nearly always grown as a standard. Other leading sorts are Howell, Sheldon, Flemish Beauty, Anjou, Clairgeau, Lawrence, Summer Doyenne, Seckel, Louise Bonne. Kieffer is also gaining rapidly in favor, because of its vigor and productiveness, although the fruit is low in quality. Le Conte, of the same type, is the most popular pear of the southern parts of the U. S. For dwarfs, Duchesse d'Angoulême is the most popular, although several other varieties thrive upon the quince. Pears improve in quality if picked before full maturity—but when fully grown—and are ripened in a dry, cool room.

The most serious disease of pears is the pear-blight, or fire-blight. This is a germ disease, the microbes residing in the wood, usually of the smaller limbs, and breaking down the starch contents of the cells. The germs probably enter the tree through the growing or expanding tips, as the apex of a shoot or the flowers. They do not enter through the roots. The symptoms of the disease are a uniform browning and finally blackening of the leaves and young shoots, and the death of the bark along the branches where the injury has proceeded. The only treatment is to cut off the affected parts and burn them. Pear-blight is peculiar to North America. This disease must not be confounded with the pear-leaf blight, which causes the leaves to become spotted and to fall, and which, when it attacks the fruit, makes the pears crack. This leaf-blight is caused by a parasitic fungus (*Entomosporium maculatum*), and it can be readily overcome by the use of Bordeaux mixture. (See FUNGICIDE.) The fungus which renders pears scabby is practically the same as that which produces the similar condition upon the apple, and the treatment is the spray of Bordeaux mixture. Among insects, the codlin-moth is probably best known. Its larva is the "worm" of apples and pears. This insect is combated by sprays of arsenites. (See INSECTICIDE.) There are also various borers in pear-trees, which should be dug out as soon as discovered. There are other insects which occasionally do great damage in certain localities or in particular years. For further information, the reader should consult the fruit manuals; also Field's *Pear-culture*; Quinn's *Pear-culture for Profit*; Parry's *Forty Years' Experience in Pear-growing*; and Waite's *Pollination of Pear Flowers* (Bull. 5, Div. Vegetable Pathology, Dept. Agr., Washington). L. H. BAILEY.

Pearce, CHARLES SPRAGUE: figure and portrait painter; b. in Boston, Mass., Oct. 13, 1851; pupil of Bonnat in Paris;

member Society of American Artists 1886; received honorable mention, Paris Salon, 1881; third-class medal, Paris Salon, 1883; Temple gold medal, Pennsylvania Academy, Philadelphia, 1885; medal of honor, Ghent Exhibition, 1886; second-class medal, Munich Exhibition, 1888; member of the international jury of awards, Paris Exposition, 1889; grand diploma, Berlin Exhibition, 1891. His works are notable for fine drawing and cleverness of execution. His *Fantaisie* is in the Temple collection, Pennsylvania Academy, Philadelphia, and pictures by him are in the Art Institute, Chicago, Boston Art Club, and the Massachusetts Charitable Mechanics Association, Boston. Studio at Auvers-sur-Oise, France.

WILLIAM A. COFFIN.

Pea Ridge: a range of hills in Benton co., Ark., near the northwest corner of the State, noted for the important battle fought there Mar. 6-8, 1862, between the Union forces under Gen. Curtis and the Confederates under Gen. Van Dorn, resulting in the defeat of the latter.

Pearlash: a term often applied to the commercial potassium bicarbonate. Pearlash, however, is properly the same substance as commercial potash, which has merely been subjected to a somewhat more careful preparation. The black salts, or crude black potash obtained by the boiling down of lye from wood-ashes, instead of being simply fused, is stirred for some time with an iron rod upon the hearth of a furnace in which a flame is made to play over the mass. The carbonaceous impurities are thus burned out, and the mass becomes of a more or less bluish-white color. See POTASSIUM.

Pear-leaf Blight: See BLIGHT.

Pearl-fisheries: the business or practice of taking shellfish which produce pearls, especially the pearl oyster, *Margaritophora margaritifera*, Lam., a species widely distributed throughout tropical seas, and subject to considerable local variation, some authorities recognizing three species instead of one. While originally prosecuted for the pearls alone, pearl-fisheries are now carried on equally for the sake of the pearl oyster shells, from 12,000 to 15,000 tons of these being annually employed for the manufacture of various articles. The earliest recorded fisheries were those carried on in the Persian Gulf and on the coast of Ceylon. Later the Red Sea furnished pearls for the Egyptians, and after the discovery of America large numbers were taken from the Gulf of Panama and along the northern coast of South America. At present the most important fisheries are in the Persian Gulf, the Gulf of Manaar—between Ceylon and the mainland—the Gulf of California, the Sulu Archipelago, and on the tropical coasts of Australia. The Gulf of Manaar has always been a famous ground, and as early as 1330 8,000 boats were engaged there. The extensive Australian fisheries are carried on principally for the sake of the shells, and have their headquarters at Thursday island, in Torres Straits, where the best shells are found. Before the discovery of the Australian grounds the price of the best pearl shell had reached \$2,000 per ton, but their immense yield has reduced the price to \$900 per ton for the best, the value ranging from that down to \$300. For a long time the only means of obtaining pearls was the primitive one of divers working from open boats without other equipment than a stone to aid them in their descent, and this method is still pursued. These divers stayed under from fifty to eighty seconds, gathering such shells as were at hand, and placing them in a basket to be pulled up by men in the boat above. A boat carried usually ten divers, who worked in pairs, the one above pulling up the sink-stone when his partner was at the bottom, and later on pulling him up also. At present the DIVING-DRESS (*q. v.*) is extensively employed, and by its aid the oysters can be taken in water 120 feet deep, although the majority are gathered in water from 40 to 50 feet deep. This apparatus necessitates the use of somewhat larger boats than were employed in the old style of fishery, and on the Australian coast the favorite boat is a lugger of about 10 tons burden. Dredging is also employed to gather shells in Australia. The use of the diving-dress temporarily increases the yield of pearl shells, but depletes the beds rapidly, and considerable attention is being given to the problems of regulating the fisheries and cultivating the pearl oyster. In Ceylon there has long been a close time, and the hours during which fishing may be carried on are also fixed by law. Information concerning the pearl-fisheries and statistics of their products are meager and not very reliable. The annual yield of the Gulf of California is said to be about

\$350,000, that of the Persian Gulf not far from \$2,000,000. In 1887 30,947,905 shells, value not given, were taken in Ceylon, and the product of the shell-fishery of Queensland averages £69,000.

Some gathering of unios for pearls has been done in the U. S., principally in Ohio, and there have been fisheries for these shells of some extent in Scotland. The industry is systematically carried on in parts of Europe, notably in Germany, and to a very much greater extent in China, where considerable attention is also given to the production of what may be termed sacred shells. This is done by introducing small figures of Buddha, or other divinity, stamped from tin or copper, between the shell and mantle. The mussel is then returned to the water, and in the course of from six months to two years retaken, when the figures are found coated with pearl uniform with the lining of the shell. F. A. L.

Pearl River: a river formed by several head-streams which unite in Leake co., Miss. It flows in a general S. course for 250 miles into the Mississippi, and is for some distance the eastern boundary of Louisiana. Its navigation is impeded by snags and sand-bars.

Pearls: secretions of the "mantle" or lining membrane of various kinds of shellfish, consisting, like the shell itself, of carbonate of lime united with animal matter. They are of the same color as the interior of the shell in which they are found—white, black, pink, etc., but generally "pearly," or *nacreous*, as it is termed, i. e. with a play of delicate tints. The quality of a pearl is termed its orient. They are often attached to the inside of the shell, or are irregular or distorted in form, and have then but little value, only those of finely rounded shape or pear-shaped being employed in fine jewelry. The pearls of commerce come chiefly from a large shellfish known as the pearl-oyster (*Meleagrina*), and are procured mainly in the Persian Gulf and on the west coast of Mexico. The shells themselves yield "mother-of-pearl." Along the California coast the brilliant pearly green *abalone* shells (*Haliotis*) are gathered in like manner for inlaid work and ornaments, and in them are found green pearls. Pink pearls, not *nacreous*, are obtained from the large pink conchs (*Strombus*) of the West Indies. The river-shells, or "fresh-water mussels" (*Unios*), yield pearls also, and they abound in the rivers of the U. S. Some of these have rich tints, and fine pink, cherry-colored, coppery, and other "fancy" pearls have been found in the rivers of Ohio and other States.

GEORGE F. KUNZ.

Pearl White: See BISMUTH.

Pearson, JOHN, D. D.: theologian; b. at Great Snoring, England, Feb. 28, 1613; educated at King's College, Cambridge, where he became fellow 1635; was afterward divinity professor and master of Trinity College (1662), and became in 1672 Bishop of Chester. D. at Chester, July 16, 1686. Author of *An Exposition of the Creed* (1659). His *Minor Theological Works* were published in 1844.

Peary, ROBERT E.: Arctic explorer; b. at Cresson Springs, Pa., May 6, 1856; educated at Bowdoin College; entered the civil engineer corps of the U. S. navy 1881. In 1886, with one companion, he penetrated the Greenland ice-cap for 100 miles in lat. 69° 30' N.; went, with six companions, to McCormick Bay, N. W. Greenland, 1891, to study the Eskimos; in 1892, in a brilliant sledge journey of 1,300 miles, discovered Independence Bay on the N. E. coast (lat. 81° 37' N.); partly outlined Peary Channel, supposed to be the northern limit of Greenland, which he proved to be an island; reached Independence Bay again in 1895 (after defeat by prolonged storms in 1894), but was unable, on account of failing supplies, etc., to explore the archipelago to the N. of Greenland. In 1896 he continued his work along the N. W. coast, and added greatly to his collections illustrating the geology, ethnology, and natural history of N. Greenland.

Peasants' War: the revolutionary rising of the peasants of Southern and Central Germany in 1525. The Reformation was the immediate occasion of this movement, but not its real cause. Similar risings on a smaller scale were of frequent occurrence previously to the Reformation everywhere in Germany, and the real cause of all these risings was the miserable social condition of the peasants. They were serfs; that is to say, they belonged to the soil on which they were born, and through that to the lord who owned the soil. The latter often appropriated for his own use the common pasture-grounds of the village, forbade his tenants to fish in the streams and hunt in the woods, and increased the ground-rent, the tithe, and the socage service to an op-

pressive degree. While these were the causes of the revolt the Reformation, with its sudden enkindling of religious fanaticism in crude and ignorant minds, supplied the occasion. In spite of the warnings, and even denunciations of Luther and Melancthon, several of the Reformers, such as Karlstadt, and many of their adherents among the nobility, aimed at once at a social and religious Reformation of the most radical nature. In 1524 a general fermentation spread among the German peasantry; and when, Jan. 1, 1525, the convent of Kempen was captured and plundered by a swarm of revolting peasants, this event became the signal for a general rising of the peasantry from the Alps to the Hartz and from the Rhine to the Bohemian frontier. With the exception of a few cases (as Thomas Münzer and Götz von Berlichingen) the peasants had no leaders and no organization. They gathered together in multitudes of from 8,000 to 30,000. Castles were burned, monasteries destroyed, cities plundered, and the most atrocious cruelties committed. As soon, however, as they fell in with regular armies—in the S. under Truchsess von Waldburg, in the N. under Philip of Hesse—they were routed or massacred in spite of their fierce resistance; and the revenge which the ruling classes took upon them was as cruel and as barbarous as their own behavior. Though the war lasted only a few months, it resulted in an enormous loss of life and property. The social position of the peasantry remained the same, or became even worse. See Oechsle, *Beiträge zur Geschichte des deutschen Bauernkriegs* (1829); Wachsmuth, *Der deutsche Bauernkrieg* (1834); Bensen, *Geschichte des Bauernkriegs in Ostfranken* (1840); Zimmermann, *Allgemeine Geschichte des grossen Bauernkriegs* (1841-43); Cornelius, *Studien zur Geschichte des Bauernkriegs* (1862); Schreiber, *Der deutsche Bauernkrieg* (1864).

Revised by F. M. COLBY.

Peaslee, EDMUND RANDOLPH, M. D., LL. D.: gynecologist; b. at Newton, N. H., Jan. 22, 1814; graduated at Dartmouth College in 1836, and in medicine at Yale in 1840; was appointed lecturer at Dartmouth in anatomy and physiology in 1841, and was professor of the same 1842-70; at Bowdoin College was lecturer on anatomy and surgery in 1843, and professor 1845-57, when he gave up anatomy, and remained Professor of Surgery till 1860; was Professor of Physiology and General Pathology in 1851 in New York Medical College, and Professor of Obstetrics 1858-60; was Professor of Gynecology at Dartmouth in 1872, at the Bellevue Hospital Medical College in New York in 1874. In 1858 he took up his residence in New York. The degree of LL. D. was conferred upon him by his *alma mater* in 1859. He had been president of the New Hampshire State Medical Society and of several other medical associations, and was an honorary member of gynecological or obstetrical societies in Boston, Berlin, Philadelphia, and Louisville. He published *Human Histology* (1857); *Ovarian Tumors and Ovariectomy* (1872); besides numerous articles in the medical journals. D. in New York, Jan. 21, 1878.

Revised by S. T. ARMSTRONG.

Peat: See FUEL.

Peat-mosses: See MOSSWORTS.

Pea-weevil, or **Pea-bug**: a small dark beetle (*Bruchus pisi*), well known for its ravages among dried peas. It may be destroyed by scalding the peas before planting. The insect lays her egg in the flower, and the grub passes into the pea while it is still growing.

Pebble [O. Eng. *papol-stān*, liter. (in form), *pebble-stone*, probably a loan-word from Latin *pa'pula*, pimple]: a small water-worn stone of any variety. Scotch pebble is simply agate. Brazilian pebble is a very transparent rock-crystal sometimes used by spectacle-makers as a material for their lenses. It is, however, much inferior to good glass. Most of the so-called pebble-spectacles are of common glass.

Pecan' (Fr. *pecane*): a tree, the *Carya oliviformis* (also known as *Hicoria pecan*), a species of hickory growing on river-banks from Indiana to Texas. The pecan is well known for its fine, delicious nuts, also called pecans, which constitute a considerable article of commerce. The tree is tall, slender, and has a hard timber. In the States bordering on the Gulf of Mexico it is planted in orchards for its nuts, and a score or more of named varieties are grown.

Revised by L. H. BAILEY.

Pec'ary [from native S. Amer. name; cf. Fr. *pecari*, Span. *pecar*]: any one of certain swine-like, artiodactylate ungulates, composing the family *Dicotylidae*. The peccaries

are of two species, both American. The collared peccary (*Dicotyles tajacu*) ranges from Arkansas southwestward through Mexico and over a great part of South America. It is 3 feet long and sometimes weighs 60 lb. It is of a dark-gray color, and has a gland upon the loins which secretes a fetid substance. It is gregarious, and is a dangerous animal to attack, as the herd often assails the offending huntsman most vigorously and persistently with their strong tusks. The white-lipped peccary (*Dicotyles labiatus*) is a larger South American species. Both kinds are very destructive to growing crops, both are swine-like in habits and appearance. Their flesh is somewhat like pork, but not so good.

Revised by F. A. LUCAS.

Pecchio, pek'ki-ō, GIUSEPPE, Count: publicist; b. at Milan, Italy, Nov. 15, 1785; d. at Brighton, England, June 4, 1835. After taking his degree in law at Pavia he returned to Milan, and in 1810 was given an important administrative post. In 1814 the overthrow of the old political conditions led to his retirement into private life. In 1819, however, he was elected to the provincial assembly; but he became implicated in the revolutionary movement, and the unhappy insurrection of Mar., 1821, caused him to flee to Switzerland. Thence he went to Spain, where he wrote down his impressions in his *Sei mesi in Spagna nel 1821* (Madrid, 1821). Having made the acquaintance of the English Dr. Bowring, he went with him to Portugal, writing there his *Tre mesi in Portogallo* (Lisbon, 1822). Thence he went to England and became a teacher of Italian in Nottingham. In 1825 he and Count Gamba were intrusted by the friends of Greece with the delivery of £60,000 that had been raised to help the cause of Greek independence. This mission resulted in his book, *Relazione degli avvenimenti della Grecia nella primavera del 1825* (1826). Returning to England, Pecchio became Professor of Modern Languages at Manchester (1826); but in 1828 he married a wealthy lady and went to Brighton to live. Besides the works already mentioned, we have from him: *Saggio storico sull'Amministrazione finanziaria dell'Es-regno d'Italia del 1802 al 1814* (1820; 2d ed. 1826); *L'anno 1836 dell'Inghilterra* (1827); *Storia dell'Economia Pubblica in Italia* (1829); *Vita di Ugo Foscolo* (1830); *Osservazioni semi-serie di un Esule sull'Inghilterra* (1831); *Storia critica della Poesia Inglese* (unfinished, 4 vols., 1833-35). See Ugioni, *Vita e Scritti di G. Pecchio* (Paris, 1836).

A. R. MARSH.

Pecht: See BUBASTIS.

Peck, GEORGE, D. D.: clergyman and author; b. in Middlefield, N. Y., Aug. 8, 1797; traveled and preached extensively; was principal of Oneida Conference Seminary 1835-39, then editor of *The Methodist Quarterly Review* (1840) and of *The Christian Advocate* (1848); wrote *Wyoming, its History, etc.* (1858); *Universalism Examined; History of the Apostles and Evangelists; Scripture Doctrine of Christian Perfection; Rule of Faith; History of Methodism within the Bounds of Old Genesee Conference; and Life and Times of George Peck* (1874). D. at Scranton, Pa., May 1, 1876.

Revised by A. OSBORN.

Peck, JESSE TRUESDELL, D. D.: bishop; b. at Middlefield, N. Y., Aug. 4, 1811; joined the Oneida Conference in 1832; became principal of the Methodist seminary at Gouverneur, N. Y., in 1837, and of Troy Conference Academy at West Poughkeepsie, N. Y., in 1841; in 1848 he was elected president of Dickinson College, Carlisle, Pa., but after four years' service returned to the pastorate. He occupied Foundry pulpit in Washington, D. C., 1852-54, and was secretary and editor of the tract society of his Church 1854-56. He subsequently served several years in pulpits in New York city and California, Peekskill, Albany, and in Syracuse, N. Y., where he was active in founding the Syracuse University. In 1872 he was elected bishop. He was author of *The Central Idea of Christianity* (New York, 1855); *The True Woman* (1857); *What must I do to be Saved?* (1858); and *The History of the Great Republic* (1868). D. at Syracuse, N. Y., May 17, 1883.

Revised by A. OSBORN.

Peck, JOHN MASON, D. D.: preacher; b. at Litchfield, Conn., Oct. 31, 1789; became a licensed Baptist preacher in Greene co., N. Y., in 1811; was ordained in 1813; removed in 1817 to St. Louis; was for forty years a successful pioneer preacher of Illinois and Missouri; organized in 1826 the first church of his denomination in St. Louis; was one of the founders of Shurtleff College, Upper Alton, Ill., and of the theological school at Covington, Ky.; received in 1852 the degree of D. D. from Harvard College. Author of

Guides for Emigrants (1831 and 1836); *Gazetteer of Illinois* (1834); *Life of Boone*, in Sparks's collection; *Father Clark, the Pioneer Preacher* (1855). D. at Rock Spring, Ill., Mar. 15, 1858.

Peck, Tracy, A. M.: classical scholar; b. at Bristol, Conn., May 24, 1838; graduated at Yale 1861, and Berlin University; Professor of Latin, Cornell University, 1871-80; became Professor of Latin in Yale College 1880; editor, with Prof. C. L. Smith, of Harvard, of a *College Series of Latin Authors*; author of various philological and critical papers, especially in the line of restoring to Latin its ancient pronunciation; president American Philological Association 1885-86.

Peck, William Guy, LL. D., Ph. D.: soldier and mathematician; b. at Litchfield, Conn., Oct. 16, 1820; graduated at the U. S. Military Academy in 1844; was promoted to the U. S. Corps of Topographical Engineers, and served on the survey of Portsmouth harbor, in Western explorations under Fremont, and at the Military Academy as Assistant Professor of Philosophy, till the breaking out of the war with Mexico. He was then assigned to duty with the Army of the West under Gen. Kearny, and served in that capacity till the end of the war, when he was detailed for duty as assistant instructor in mathematics at the Military Academy. After eight years of service at West Point he resigned his commission in Oct., 1855, and was for two years Professor of Physics and Civil Engineering in the University of Michigan. In 1857 he was called to Columbia College, New York, in which institution he thereafter served as Professor of Mathematics, Mechanics, and Astronomy. He was engaged with Prof. Charles Davies in compiling a dictionary and encyclopedia of mathematics; he was the author of a treatise on mechanics, and the American editor of Ganot's popular *Physics*, besides which he wrote and published a complete course of mathematical text-books. D. at Greenwich, Conn., Feb. 7, 1892. Revised by JAMES MERCUR.

Pecos: See TANOAN INDIANS.

Pecos River: a stream of New Mexico and Texas; rises in San Miguel co., N. M., and flows in a general S. S. E. course, falling into the Río Grande del Norte after a course of 800 miles. It flows through a broken country, and in summer is dry the greater part of its length.

Pecquet, pā'kā, JEAN: anatomist; b. at Dieppe, France, about 1620; studied medicine, and especially anatomy, at Montpellier; discovered and demonstrated the course of the lacteal vessels in the body; wrote *Experientia Nova Anatomica* (1651); *De Circulatione Sanguinis et Chyli Motu* and *De Thoracis Lacteis* (1651). Pecquet's discovery, which soon proved to be of the greatest practical importance, and has exercised a great influence on the development of physiology, immediately found many ardent adherents, but also many vehement opponents. D. in 1674.

Pectase: a substance of the class of ferments found in association with PECTOSE (*q. v.*) in the tissues of fruits and vegetables. The special function of pectase is to transform the pectose of unripe fruits, in the process of ripening, to PECTIN (*q. v.*). Pectase is producible from the fresh juice of a plant—the carrot, for example—by precipitating with alcohol. This converts it into an insoluble modification, without, however, depriving it of its peculiar fermentive action upon pectosic substances. It has not been obtained in a crystalline form, being doubtless a colloid substance, like diastase, synaptase, and ferments generally.

Revised by IRA REMSEN.

Pectic Acid: an insoluble gelatinous substance produced by the action of alkaline solutions upon the PECTIN (*q. v.*) of ripe fruits and vegetables. Frémy calculates its composition as $C_{16}H_{22}O_{16}$, but this is not regarded as settled. The pectates of the alkalies are soluble, but all other bases form jelly-like insoluble masses, almost impossible to wash pure. Pectic acid, pectosic acid, and pectin are the principal constituents which give the gelatinous character to preserved fruits, fruit and vegetable jellies, etc.

Revised by IRA REMSEN.

Pectin, or Plant-jelly [*pectin* is from Gr. *πηκτός*, curdled, congealed, deriv. of *πηγνύσαι*, make fast or stiff]; a substance existing naturally in ripe fruits and vegetable juices generally, being a product, during the ripening, of the peculiar ferment called PECTASE (*q. v.*) on the PECTOSE (*q. v.*) of unripe vegetables and fruits. It was obtained by Braconnot, its discoverer, by precipitating ripe-apple juice with alcohol, after boiling to coagulate the albumen, and

filtering. Frémy improved upon this by first precipitating lime with oxalic acid. Pure pectin is white, amorphous, and soluble in water. The composition of pectin is somewhat uncertain. Frémy computes the formula $C_{16}H_{24}O_{16}$, but others have obtained figures differing a little from his.

Revised by IRA REMSEN.

Pectinibranchia: See MONOTOC ARTHRA BRANCHIOPODA.

Pectoriloquy [Lat. *pectus*, *pectoris*, breast + *loqui*, speak]: in auscultation of the chest, a preternatural distinctness in the sound of the patient's speech, as propagated to the auscultator's ear through the air-passages and pulmonary tissues. Pectoriloquy is either cavernous or amphoric, according to the quality or timbre of its sound. It does not always, however, indicate a cavity in the lung, as was once supposed. It may arise from the solidification of a portion of the lung.

Pectose [deriv. of *pectin*]: a highly important proximate principle of vegetable bodies, from which proceed all the gelatinous constituents of fruits and vegetables. It exists largely in unripe fruits and roots, being, like cellulose, one of the "plastic" constituents, and giving, for instance, the hardness to green fruits. It is, however, a substance not only wholly insoluble, like cellulose, but, unlike the latter, extremely perishable or easily alterable. Therefore we have found no way of isolating and purifying it, so as to determine its composition. It is surmised to be a carbohydrate, like cellulose—that is, containing its hydrogen and oxygen in the proportions that form water. It exists in all parts of vegetable bodies, and is always accompanied by a peculiar ferment substance called PECTASE (*q. v.*), which has the power to transform it, during the ripening of the fruit or maturation of the plant, into the plant-jelly or PECTIN (*q. v.*). This substance and its derivatives are of great interest, and demand much further investigation—an investigation surrounded, however, with great difficulties, from the non-crystalline or colloid nature of these compounds.

Revised by IRA REMSEN.

Pectosic Acid: an intermediate product of the action of the ferment pectase upon PECTOSE (*q. v.*). Like pectin, the principal product, it is highly gelatinous in its character, forming a frequent constituent of artificial fruit-jellies. Its composition is yet uncertain.

Peculiar, or Peculiaris: the name given to a church or churches exempt from the jurisdiction of the bishop of the diocese in which the peculiar is situated: (1) as being subject to the jurisdiction of some other bishop, or (2) entirely exempt from episcopal jurisdiction. Chapels royal were exempt from episcopal jurisdiction. Battle Abbey, Bocking, Guernsey, Jersey, and Stamford are peculiaris, and are entitled to their respective deans. Westminster Abbey and St. George's chapel, Windsor, are royal peculiaris. W. S. P.

Pedagogics [from Gr. *παῖδαγωγός*, a slave who acted as attendant and protector of a child, and instructed him in behavior and good manners; he attended him especially when he went to the school or palaestra. In Rome later the title was applied to the Greek slave who while acting as an attendant also taught the child Greek. Hence the transfer of signification]: the science of education; a body of educational doctrine pertaining to the mental and moral training of the young. Being a derived science, however, and depending mostly upon psychology for guidance as to ends and means, it is developed in various ways according to the psychological standpoint of the author. Some writers make much of what may be called the *a priori*, or rational, phase of psychology, deducing maxims for instruction and moral training from the original constitution of mind. Rosenkranz, in his *Philosophy of Education*, is perhaps the best exponent of this method of treatment. He deduces the laws or principles of education from a formal consideration of man as a self-realizing being in a process of development. The nature, form, and limits of education are all discussed from this standpoint, as are the special phases of physical, intellectual, and moral education. The subject-matter of the studies is assumed, but not discussed in detail. Dr. Harris, U. S. commissioner of education, points out the fact that there are five windows of the soul to be opened by these studies. In the elementary school arithmetic and physics open the soul to a quantitative knowledge of inorganic nature; geography and natural history to organic nature. History gives the mind an insight into the will of man as it has manifested itself in institutions; literature, drawing, and the like cultivate the æsthetic or emotional

sides of the soul; while grammar helps the mind to look within at its own processes, since in grammatical study the distinctions of thought are objectively examined. Thus three windows reveal what is within, viz., intellect, sensibilities, and will, while two reveal what is without, viz., organic and inorganic nature.

Another class of educational writers ignore largely the necessary and original laws of mind, as seen in rational psychology, adopting as their standpoint the *a posteriori* or concrete phase of mental life. They inquire, not what is the original equipment of the mind, but how does it grow? with what contents is it and ought it to be filled? In this view all the facts revealed by rational psychology and the self-realization of the mind are assumed but scarcely mentioned, attention being focused upon the concrete studies, their choice, sifting, sequence of topics, and co-ordination; also their treatment as to methods of presentation. Everything is examined from the empirical, or experience, side of psychology. There is little interest in the abstract terms arising from the refinement of psychological distinction, but a great deal of interest in the contents of children's minds, their natural interests and dispositions, their capacities in the acquisition of knowledge; in short, in the *growth* of their minds. Education, viewed from the standpoint of rational psychology, deals more with *static* relations of faculty and knowledge, whereas the same subject, seen from the standpoint of empirical psychology, concerns itself mostly with knowledge processes, hence is chiefly *dynamic* in its tendencies. *Apperception*, or mental assimilation, furnishes in this case the key to matter and methods for all departments of education.

A third standpoint from which to investigate educational questions is child-study upon a physiological basis. The senses are the medium through which the child gains his experience of the outer world, and the physical side in general is a constant factor in mind-growth. It follows, therefore, that a large number of important topics in education have a physiological aspect. The tonic and quantitative relations between external stimuli and the corresponding response of the mind in sensations are carefully investigated by hundreds of experiments in the domain of touch, taste, smell, hearing, and vision. The contents of children's minds are determined, as are also their fancies, falsehoods, tastes, ideas of justice, powers of graphic representation, conceptions of religion, and the like. Their capacities for apperception, association, memory are investigated by experimentation. Likewise, on the other hand, the conditions of health and disease for the various senses and the nervous system, as well as for digestion, circulation, and respiration, are carefully studied, and deductions made as to light, temperature, ventilation, size of type for books, bodily position, etc. It is chiefly from these three standpoints—rational psychology, the psychology of experience, and child-study upon a physiological basis—that the specific problems of education are examined. To some of the most important of these we may now turn our attention.

1. *What shall constitute the Subject-matter of Education?*—This question is answered by each age and race according to the varying standard of civilization. The Persian taught his son to ride the horse, shoot with the bow, and tell the truth. The Greek taught his son literature and gymnastics; the Roman boy had to learn the tables of the law and how to swim. Education for gentlemen and for the professions may be quite different from the curriculum designed for the masses. Till late in the nineteenth century higher education was confined mostly to classic languages and mathematics. Herbert Spencer, however, in his *Education*, asks earnestly what knowledge is of most worth, and finds the answer in science. For the most part, American schools teach the studies that have become traditional, reading, writing, spelling, arithmetic, grammar, geography, and history, together with such branches as social or professional pressure may force upon them, such as scientific temperance and bookkeeping or stenography. Dr. Harris, as shown above, has sought to demonstrate that the standard studies now found in the common-school curriculum have a right to their place, because of their value in opening up the windows of the soul. It is only in recent times that any serious attempt has been made to determine upon rational grounds what subjects shall be selected and upon what principle the sequence of their various parts shall proceed. Concerning the latter topic Prof. Ziller, of Leipzig, pointed out the fact that there are two general methods of sequence for the parts of a study, one being the concentric method and

the other the historical method, or progress according to *culture-epochs*. By the concentric method he means the selection of a few central facts of a subject, which are to be learned in the early grades, and then expanded like a series of concentric rings each succeeding year. Thus in Bible history a few facts about the life of Christ would be first taught, and this knowledge widened year by year by the addition of new facts. The other or historical method assumes that the child's mind in its development goes through in miniature substantially the same culture-epochs that the race passed through in its progress to the present stage of civilization, and that, consequently, if we would adjust the matter of our instruction most perfectly to the child's understanding and spontaneous interests, we must let him pass through ideally the stages that the world passed through really. For all subjects, therefore, having a human element, like Bible history, profane history, literature, art, languages, we must arrange our topics according to the important culture-epochs. The latter are sufficiently indicated by the great authors who have treated them. "Periods which no master has described, whose spirit no poet breathes, are of little value for education" (Herbart). Ziller claims that the concentric method sacrifices the interest of the pupils to a considerable degree, and that it produces educational waste, in that the same things have to be learned over again year after year in new combinations, whereas the historical method according to culture-epochs promotes natural interest through the freshness of material and its ideal adaptation to the growing mind of the child. Furthermore, he would avoid tediousness by presenting these topics as treated by masters, just as Greek boys were inspired by the writings of Homer. As for non-culture subjects, like the sciences, it may be pointed out that here we find two principles of advance, the first being that of the logical development of subjects as completed sciences, for instance, the order of evolution in biology from monera to man, and the psychological development as determined by the ability and knowledge of the child at any given stage. The latter order is the true one for the school, because knowledge exists for the child, not the child for knowledge.

2. *How shall Studies be Articulated or Co-ordinated?*—This question is supplementary to that of sequence of topics in the various subjects, for before studies can be intimately associated there must be some definite order of sequence established. This query, like the other, is a new one in American education. In the past it has hardly been raised, except perhaps in connection with the specific training of the "faculties." It has been assumed, for example, that "memory studies" precede "reason studies," but these faculties were not regarded as having any very intimate relations, so that the problem of the co-ordination of studies could hardly arise under these conditions. Each study developed its own independent line of ideas. Even history and geography, reading and spelling, were often taught as quite distinct and separate subjects, while efforts to find natural and easy associations between geography and science or history and literature were unheard of. Active interest, however, now exists for this phase of education, it being held that such associations as lead the studies to re-enforce one another enhance the pupil's interest in his work, promote his understanding, and develop his volitional power. The numerous plans for the co-ordination of studies may be reduced to three types, as follows: (1) The subordination of most branches to a few important ones. Ziller says that since the dominating ends of education are the moral ones we should select the culture studies, literature and history (profane and biblical), as the core of concentration around which the other studies should cluster like iron filings to a magnet. Others say that *real* knowledge as contained in the sciences is more important, and that these should be the central subjects for correlation. (2) The acceptance of universal scientific law, or philosophical unity of knowledge, as the guide to the concentration of studies. (*Talks on Pedagogics*, Col. I. W. Parker.) According to this plan the central, or knowledge, subjects are mineralogy, geology, geography, astronomy, meteorology, biology, zoology, anthropology, ethnology, and history. Out of these real studies all formal ones, like reading, writing, drawing, painting, modeling, number-work, and the like, are to grow. The central subjects being logically connected, and formal studies growing out of the concrete ones, it will be seen that there is a basis for weaving all series of ideas arising from the various branches into a connected whole. As may be seen, the emphasis falls upon the science studies, yet civilization developed without

science; it is, moreover, open to question whether the logical philosophical unity of the separate sciences is one that the teacher can see, or seeing teach. (3) The co-ordination of equal or independent branches through their natural relations. This plan grants to every important group of subjects its own principle of development. Thus culture subjects may follow the historical sequence where that seems advantageous without subordinating natural history to a principle of sequence not its own. Natural science, on the other hand, is free to develop according to its own laws, without dragging literature and history out of their natural channels. Dr. Frick (see *Herbart and the Herbartians*) presents a skeleton programme for a classical school with pupils ranging from ten to nineteen or twenty years of age. In this programme the historical interest is the backbone of the whole body of higher education, but not history as taught by the culture-epochs. This principle of Ziller is here modified on the ground that the environment of the pupil furnishes as good a bridge to his understanding and interest as the culture-epochs can furnish. Consequently, interest in national history comes first, and that in ancient history second. This is in accordance with the declaration of William II., that he wanted from the schools young Germans, not young Greeks and Romans. The reading-matter in the mother-tongue is depended upon to preserve the unity of the course through the studies touching the home environment of the child. There is the literature of culture and history (biography), and that of nature and occupation. Judicious selection will bind the studies together through close associations. In a similar manner these unions may be strengthened through art and music, which may emphasize now the natural, now the human elements. Geography touches three great realms, history, science, and economic occupation. It is the seat of history, the condition of animal and plant life, and in commercial geography the revelation of the modern commercial world. Frick agrees with Ziller and Herbart that only the important epochs of history should be studied. There are enough such to occupy the attention of children without wasting their time on non-essentials. Co-ordination is still further promoted by preserving within each important subject or group of subjects a unity of treatment. Thus, for instance, the whole of natural science is to be taught with its manifold relations clearly in view, a technical isolation of the various topics, like botany, zoölogy, geology, etc., being avoided. Furthermore, the search for and selection of organic bodies of knowledge pertaining to individuals, to communities, and states are to be constant; so, too, emphasis must be laid upon middle or turning points in the events pertaining to individuals or communities, to whole historical epochs, or to the development of important ideas.

3. *How shall Subjects be Taught?*—It may be well at the outset to make a distinction between that phase of method which can ignore the subjective or psychological element and proceed upon strictly logical lines to the exposition of knowledge, and that phase, mostly belonging to elementary education, which must take full account of limitations in knowledge, aptitude, and interest. The first method is seen in its perfection in the university, the latter in the primary school. Were the second phase of method not a real and necessary one the normal school would hardly have an excuse for existence. This is the department of method brought to view most clearly by empirical psychology and physiological child study. Here again we must distinguish between special and general methods—between devices for individual subjects or topics and the laws for all sound methods. The science of education can hardly busy itself with devices whose name is legion, but must content itself with an exposition of fundamental principles. With the apperception of the child in view (see Lange's *Apperception*) we may distinguish three grand phases in every sound method: (1) That of the assimilation of individual facts; (2) that of inductive approach to generalization, or rules and principles; and (3) the practical application of these principles, or the return from general principles to individual facts. This exposition gives rise to what the Herbartians call the *Formal Steps of Instruction*. (See McMurry, *General Method*, or De Garmo, *Essentials of Method*.) The term *formal* as here used signifies *universal*, since these steps must be recognized more or less clearly in all devices.

4. *How shall Moral Training be Effected?*—Some educators regard religious instruction as essential to this end; others try to engraft an ethical system more or less objectified upon the minds of the pupils, while Herbart advances

the thought that through the school studies themselves, provided they are well selected, well articulated, and well taught, we may reveal to the child the moral order of the world, both as it will appeal to him as an individual and as a member of a social, family, civil, or business group. This thought is one of the most fruitful of modern pedagogics, and well worthy the closest attention of every teacher. (See *Herbart and the Herbartians*.)

The following-named works in English are of importance to the student of pedagogics: Lange, *Apperception* (Boston); Parker, *Theory of Concentration* (New York); Rosenkranz, *Philosophy of Education* (New York); Bain, *Education as a Science* (New York); Rein, *Outlines of Pedagogics* (Syracuse, N. Y.); Herbart, *Science of Education* (Boston); De Garmo, *Essentials of Method* (Boston); De Garmo, *Herbart and the Herbartians* (New York); Ufer, *Introduction to the Pedagogy of Herbart* (Boston); Rosmini, *Method in Education* (Boston); Spencer, *Education* (New York); McMurry, *General Method* (Bloomington, Ill.); Preyer, *The Development of the Intellect and The Senses and the Will* (New York); Pickard, *School Supervision* (New York); Froebel, *The Education of Men* (New York); Radestock, *Licht and Education* (Boston). CHARLES DE GARMO.

Pedee River: See GREAT PEDEE RIVER.

Pedersen, KRISTERN: writer; b. in Svendborg, Denmark, about 1480; studied in Paris; returned (1517) and settled in Lund; became Christian II.'s secretary, and followed him into exile (1526). After the king's imprisonment he received permission (1532) to settle in Malmö, where he established a printing-office. Some time after this he joined the Lutheran Church. He is the first Danish prose-writer of prominence, and well deserves the title of father of Danish literature. His style is pure and direct, and all his writings are filled with a true national spirit. His translation of the New Testament (1529) and of the Psalms (1531) is superior to any then produced. His publication of *Saxo* (1514) undoubtedly saved that work from destruction, as no MS. has been preserved. His works, historical and religious, have been edited by C. J. Brandt and J. F. Fenger (5 vols., Copenhagen, 1850-56). D. Jan. 16, 1554. D. K. DODGE.

Pedianus: See ASCONIUS PEDIANUS.

Pedicula'ti [Mod. Lat., plur. of *pedicula'tus*, pedicled, deriv. of *pedi'culus*, stem, pedicle, from Lat. *pedi'culus*, dimin. of *pes, pedi's*, foot]: an order of fishes whose representatives are distinguished by their grotesque forms. The skull is constructed in nearly the same manner as in the typical fishes; the epiotics united behind the supraoccipital; the intermaxillary and supramaxillary bones well developed and distinct; the first vertebra is united to the cranium by suture; the scapular arch is, as in ordinary fishes, composed of a great external bone (proscapula) and two internal bones (hypercoracoid and hypocoracoid), but coalescent with the proscapula; with these are articulated the actinosts, which are remarkable for their length; between the proscapula and the skull intervenes a post-temporal, which is not bifurcate, but connects by a squamous suture with the skull; the branchial aperture is thrown backward in or near the axilla of the pectoral fin; the ventral fins are more or less jugular; the dorsal fin is divided into a spinous and a soft portion; the latter is normal; the former modified, and in some of the representatives of the order represented by a filament in or near the nasal region: The order thus distinguished is composed of several families—viz., *Malthæidæ*, or the bat-fishes; *Lophiidæ*, or the anglers; *Ceratiidæ*; and *Antennariidæ*. Revised by F. A. LUCAS.

Pediment: See GABLE.

Pedipal'pi [Mod. Lat., from Lat. *pes, pedi's*, foot + Mod. Lat. *palpus*, tactile organ, from Lat. *palpare*, to feel]: an order of Arachnida embracing a few tropical forms for which the common names of whip-scorpions and scorpion-spiders have been proposed. As these terms imply, they present general resemblances to both scorpions and spiders. Thus they have the second pair of appendages strong and sometimes furnished with pincers, the abdomen is plainly jointed, and in *Thelyphonus* is terminated with a many-jointed whip-like tail. In all the first pair of true legs terminates with a many-jointed whip-like portion. About thirty species are known. Comparatively little is known of their habits, but they have the reputation of being very poisonous; but a single species of *Thelyphonus* has been reported from the U. S. S. K. KENNEDY.

Pedometer: See ODOMETER.

Pedra'rias: the name commonly given by historians to Pedro Arias Dávila or de Ávila; soldier and governor; b. in Spain about 1442. He was of good family, and served with distinction in the conquest of Granada and in Africa. In 1513 he was nominated governor of Castilla del Oro, on the coast of the Isthmus of Panama, including the colony of Darien, where Balboa had come into power. (See BALBOA and DARIEN.) Pedrarias sailed from San Lucar Apr. 12, 1514, with a large fleet and 1,500 men. On his arrival at Darien (June 30), Balboa readily acknowledged his authority, but Pedrarias, a man of suspicious and violent character, imprisoned him on various charges. Subsequently, through the interposition of the bishop, the rivals were reconciled. Pedrarias promised Balboa his daughter in marriage, and lent his aid for the exploration of the South Sea; but on reports (probably false) of Balboa's treachery, he seized and executed him (1517). In 1519 he founded a new capital at Panama. Under his rule Spanish power was rapidly extended on the isthmus. He did all he could to prevent the exploration of Nicaragua by Gil Gonzalez Dávila (1522), and endeavored to forestall him by sending Córdoba to colonize that country. Córdoba rebelled, and Pedrarias captured and beheaded him (1526). In consequence of numerous complaints Pedrarias was superseded in 1526, but he was made governor of Nicaragua, where he died at Leon, Mar. 6, 1531. HERBERT H. SMITH.

Pedro I. (DOM ANTONIO PEDRO DE ALCANTARA BOURBON): first Emperor of Brazil; b. near Lisbon, Portugal, Oct. 12, 1798. He was the second son of Dom João, afterward John VI. of Portugal; was taken with the royal family to Brazil (1807), received a somewhat limited education there, and in 1818 was married to the Archduchess Leopoldina of Austria. His father was crowned King of Portugal at Rio de Janeiro in 1816, but returned to Lisbon in 1821, leaving Dom Pedro as regent. The prince was now heir to the throne, his elder brother having died. At this time the movement for the separation of Brazil from Portugal assumed active form, and the prince regent favored it more or less openly. He at length sent a refusal to the peremptory order of his father to return to Portugal, and on Sept. 7, 1822, he definitely declared for independence. He was proclaimed emperor in October, and crowned Dec. 1. The Portuguese authorities made little active resistance, except in the northern provinces, where they were soon driven out. At first the emperor was enthusiastically supported; but in 1823 he assumed a reactionary policy, dismissed and banished the liberal Andrada ministry, and forcibly dissolved the constituent assembly. In Mar., 1824, he promulgated the constitution (prepared by a council of state) which was in force during the empire. The empress died in 1826, and in 1829 he married Princess Amelia of Leuchtenberg. Uruguay, which had been attached to Brazil, became independent, after a rebellion of several years, in 1828. The opposition to the emperor increased when, in 1826, he fell heir to the Portuguese throne. In the impossibility of reuniting the two countries he transferred his claim to Portugal to his daughter, Donha Maria da Gloria, but the distrust continued, and at length broke out in popular tumults. To prevent bloodshed, the emperor abdicated in favor of his son on Apr. 7, 1831, and soon after sailed for England. On his arrival there he at once assumed the leadership of a movement for the restoration of his daughter, who had been deprived of the Portuguese throne by the usurpation of Dom Miguel. The latter was deposed after a civil war, and Donha Maria was crowned. Dom Pedro died two days after, in Lisbon, Sept. 24, 1834. HERBERT H. SMITH.

Pedro II. (DOM PEDRO DE ALCANTARA): son of Pedro I. and Emperor of Brazil; b. at Rio de Janeiro, Dec. 2, 1825. As he was a child when his father abdicated in his favor, Brazil was governed by regents until July 23, 1840, when his majority was proclaimed at the request of the parliament. He was crowned July 18, 1841, and in 1843 married Thereza Christina, sister of the King of the Sicilies. From the first he proved himself an intelligent, liberal, and humane ruler, and during his reign Brazil made great advances in civilization and material prosperity; he was the honored protector of science, the arts, and literature, for which he had marked tastes, and he was universally respected at home and abroad. On the other hand, important questions were sometimes neglected for minutiae, and he showed, perhaps, a want of strength in great crises. He was strongly attached to constitutional forms, and governed entirely through his ministers. Rebellions in São Paulo

and Minas Geraes, 1842, in Rio Grande do Sul, 1842-45, and in Pernambuco, 1849, were suppressed. In 1864-65 Brazil successfully supported the revolutionist Flores against the Government of Uruguay, which had refused satisfaction for injuries done to Brazilian subjects. Lopez, president of Paraguay, made war on Brazil, ostensibly on account of the Uruguayan question, Dec., 1864; this led to the Triple Alliance between Brazil, the Argentine Republic, and Uruguay, May 1, 1865, and a bloody war of five years. (See LOPEZ, FRANCISCO SOLANO.) The emperor took a personal part in the first campaign. Traveling as a private gentleman, he visited Europe 1871-72, attended the Centennial Exposition in the U. S. 1876, going thence to Europe and the East, and in 1886-89 again went to Europe. By a law passed in Sept., 1871, children born of slave parents were freed under certain conditions, and an emancipation fund was established. Subsequently the abolition movement became a popular uprising, and culminated in the law of May 13, 1888, by which all slaves were freed. The emperor personally favored emancipation, and early freed the crown slaves, but he did not lead the movement nor greatly influence it; and it excited unfavorable comments that the laws of 1871 and 1888 were passed during his absence. Republican principles had been slowly but steadily gaining ground, and were fostered by the perfect freedom of the press; in 1885 republican deputies were first elected to parliament. The Princess Isabel was heir to the throne, and during her father's trips abroad had acted as regent; the republicans opposed her for alleged subversion to the Church, and because she was married to a foreign prince, the Count d'Eu. It was generally supposed that a decided republican movement would be deferred until the emperor's death; but it was precipitated by discontented army officers, who excited a mutiny of the troops at Rio de Janeiro, and proclaimed a revolution Nov. 15, 1889. The emperor abdicated without resistance, and was at once sent with his family to Portugal; there the empress died from the effect of the excitement and shock, Dec. 28, 1889. The ex-emperor declined a pension which was offered to him by Brazil. D. in Paris, Dec. 5, 1891. HERBERT H. SMITH.

Pee'blesshire: an inland county of Scotland; on both sides of the Tweed (hence sometimes called *Tweeddale*); consists mostly of low, well-wooded mountains. Area, 354 sq. miles. Pop. (1891) 14,750. Rearing of sheep and cattle is the chief occupation; coal is mined, and manufactures of woollens are carried on. The only royal burgh in the shire is PEEBLES, on a peninsula at the confluence of the Eddleston with the Tweed, 22 miles S. of Edinburgh, and the seat of a county administration (see map of Scotland, ref. 12-H). It is the birthplace of William Chambers, who in 1859 made a gift to the town of a spacious suite of buildings for educational purposes, the Chambers Institution. Pop. of town (1891) 4,704. The counties of Peebles and Selkirk send one member to Parliament.

Peekskill: village; Westchester co., N. Y. (for location, see map of New York, ref. 8-J); on the Hudson river, and the N. Y. Cent. and Hudson River Railroad; 43 miles N. of New York city. It contains 12 churches, 2 union public schools, St. Gabriel's boarding-school for young ladies (Protestant Episcopal), St. Joseph's Home and Franciscan Convent (Roman Catholic), a military academy, a House of the Good Shepherd (Roman Catholic), a free public library, several high-grade boarding-schools, a national bank with capital of \$100,000, a savings-bank, and 4 weekly newspapers. There are water-works, electric-light and sewerage systems, and important manufactories, including iron-foundries, stove-works, cigar-factories, steam flour-mill, blank-book and book-binding establishment, and shirt-factories. The village has much scenic and historic interest. Pop. (1880) 6,893; (1890) 9,676.

W. J. CHARLTON, BOARD OF TRADE.

Peel, ARTHUR WELLESLEY, D. C. L.: statesman; b. in 1829; youngest son of Sir Robert Peel (1788-1850); educated at Eton and Balliol College, Oxford; was secretary to the Poor Law Board 1868-71; secretary to the Board of Trade 1871-73; and secretary to the Treasury 1873-74. He was first elected Speaker of the House of Commons in 1884, and since then he has been re-elected three times. Retired Apr. 7, 1895. He was member for Warwick 1865-85, and since for Warwick and Leamington.

Peel, Sir ROBERT: statesman; b. near Bury, Lancashire, Feb. 5, 1788; was educated at Harrow and Christ Church, Oxford, where he passed B. A. as double first-class, the first

who ever had the distinction. In 1809 he entered Parliament for Cashel: was made Under-Secretary for the Colonies 1811, and was (1812-18) Chief Secretary for Ireland, where his Tory principles led to the most severe criticisms from the opposition. He established the Irish constabulary. Peel represented Oxford University in Parliament 1818-22; introduced and carried (1819) a bill to return to specie currency; was Home Secretary 1822-27, 1828-30; introduced and carried important reforms in the administration of criminal law; remodeled the London police; moved the bill for Catholic emancipation (1829), and thus broke with the Tory leaders. Previously Peel's name, with no special justice, had been associated with the leadership in the opposition to this cause, doubtless because he had held an important post in Ireland as a Tory. The University of Oxford rejected him in the new election; he re-entered Parliament for Westbury, and again represented Tamworth 1832-50; was First Lord of the Treasury and Chancellor of the Exchequer 1834-35, and afterward headed the Conservative opposition, having resisted the parliamentary reform of 1831-32 with all his power; was again Premier 1841-46, during which time his position drifted slowly from that of a protectionist and strict Conservative to that of a free-trader, and he at last supported the repeal of the corn-laws. He afterward acted generally with the Whigs. D. in London, July 2, 1850, in consequence of a fall from his horse. Peel was a man of thorough patriotism and high moral principle. His hereditary conservatism, although strengthened by a dislike of too hasty changes, was ever held subject to feelings of justice and humanity. He refused the Garter and the peerage, and was universally respected for honesty, truthfulness, and ability. See *Sir Robert Peel*, by Guizot (Paris, 1859), and *Sir Robert Peel*, by Henry Lord Dalling and Bulwer (London, 1874); and monographs by F. C. Montague (1888), Justin McCarthy (1891), and J. R. Thursfield (1891).

Peel, Sir ROBERT, G. C. B.: b. in London, May 4, 1822; was educated at Harrow and Christ Church, Oxford; was 1844-46 an *attaché* at Madrid; was secretary of legation 1846, and *chargé d'affaires* at Berne 1846-50; a lord of the admiralty 1855-57; Chief Secretary for Ireland 1861-65; was a Liberal member of Parliament for Tamworth 1850-80; was sworn of the Privy Council 1861; was made G. C. B. 1868; married in 1856 the eighth daughter of the Marquis of Tweeddale. D. at Brighton, May 8, 1895.

Peele, GEORGE: dramatist; b. in Devonshire, England, about 1553; graduated at Broadgate's Hall (now Pembroke College), Oxford, 1579; settled at London as a theatrical writer; was an associate of Nash, Marlowe, and Greene, and author of half a dozen plays, the best of which is *David and Bethsabe*. They were republished by Dyce, together with his poems and miscellaneous writings (3 vols., 1828-39). D. about 1598. Revised by H. A. BEERS.

Peepul: See BO-TREE.

Peerlkamp, PETER HOFMAN: classical scholar; b. in Groningen, Holland, in 1786; professor at Leyden in 1822; retired in 1849. D. in Hilverzum, near Utrecht, Mar. 29, 1865. Peerlkamp may be called the father of a wanton method of textual criticism which rejects as spurious or emends whatever seems not to conform to a preconceived standard of poetic perfection and propriety. This perniciously subjective principle was rigorously applied by Peerlkamp particularly to the *Odes* of Horace, of which scarcely one remained intact. The ingenuity of his analysis, his fervor of conviction, and the brilliancy of his Latin style secured him many followers; but at the present time this atheizing mania possesses at best but a pathological interest. Among his writings may be mentioned: *Horace, Odes, Satires, Ars Poetica*; *Tacitus, Agricola*; *Verul. Ennod.*; *Xenophon of Ephesus*; and his own *De vita, doctrina et facultate Nobilitatum quæ carminum compositionem* (2d ed. 1838). ALFRED GOODMAN.

Peers [Fr. *pair*, from the Latin *par*, equal]: noblemen having a special dignity or privilege. The meaning of the term has varied widely at different times. Thus in England the earlier usage, as in the phrase of Magna Charta, "judgment of his peers" (*judicium parium*), gives it merely the general meaning of equals, while at present it is used in a special sense to denote the members of the nobility and those prelates of the Church of England who are entitled to a seat in the House of Lords. The members of the nobility entitled to be called peers include dukes, marquises, earls,

viscounts, and barons. In France Louis XVIII. created in 1814 a house of peers, but this peerage comprised only a very limited number of the whole class of the nobility. The attempt to make it hereditary failed, and in 1848 the Chamber of Peers ceased to exist.

Peet, STEPHEN DENISON, A. M., Ph. D.: anthropologist; b. at Euclid, O., Dec. 2, 1830. In 1837 the family removed to Green Bay, Wis., which was a center of trade for various Indian tribes. Young Peet entered Beloit College, and while a student had his curiosity awakened with respect to the mound-builders, whose mounds were numerous in Beloit and its vicinity. He studied theology at New Haven, Conn., and at Andover, Mass., where he graduated in 1851, and returned to Wisconsin, where he was a missionary for several years. Subsequently he took charge of important churches at Racine, Wis., and Ashtabula, O. From 1878 to 1888 he edited *The American Antiquarian*, and he was largely instrumental in organizing the Ohio Archaeological Society and the American Anthropological Association. In 1878 he returned to Wisconsin, and held the pastorate at Clinton for eight years thereafter. His principal works are *The Ashtabula Disaster* (Chicago, 1879); *History of Ashtabula County, Ohio* (Cleveland, 1879); *Ancient Architecture in America* (Chicago, 1884); *Picture Writing* (1885); *History of Early Missions in Wisconsin* (Madison, 1886); *Primitive Symbolism* (Chicago, 1887); *The Effigy Mounds of Wisconsin* (1888).

Peewit: See LAPWING.

Peg'asus (in Gr. Πήγασος): in Grecian mythology, a winged horse, who, together with Chrysaor, was begotten by Poseidon and the Gorgo Medusa at the sources of Oceanus, whence his name Pegasus from πηγή, fountain. He sprang from the headless trunk of Medusa after she had been slain by Perseus. He first touched the earth on the Acropolis of Corinth, where Bellerophon caught him while he was drinking from the fountain Pirene. Mounted on his back Bellerophon performed many hazardous deeds (see CHIMÆRA), but when he attempted to fly to heaven he fell off and became lame and blind. Pegasus flew to heaven, where he thenceforward dwelt in the palace of Zeus. When Mt. Helicon, under the influence of the songs of the Muses, was soaring to heaven, its progress was stayed by a stamp of the hoof of Pegasus. On the smitten spot the spring Hippocrene (the fountain of the steed) burst forth, and hence he was called the horse of the Muses. J. R. S. STERRETT.

Pegmatite [from Gr. πῆγμα, anything fastened together]: a name originally suggested by Haüy for coarse-grained granitic rocks in which the quartz and feldspar are intergrown, each having a continuous crystallographic structure over considerable areas. The rocks have gradually come to be called *graphic granites* (Germ. *Schiffgranit*), although their characteristic structure, whether microscopic or macroscopic, is still called pegmatitic. The petrographical term *pegmatite* now includes all very coarse granites and granitic vein-stones. See GRANITE. G. H. WILLIAMS.

Pegu: a name of geographical and historical interest associated with the northwestern part of the Indo-Chinese peninsula, adjoining the Bay of Bengal, and especially about the Gulf of Martaban. It has sometimes been a separate kingdom, sometimes a dependency of Burma, and the territory covered has extended as far N. as Ava, sometimes as far S. as the Peninsula of Kra. It is now a British governmental division of Burma, occupying the lower valleys of the Irawadi and Salween rivers from Tenasserim to Southern Arrakan. The town of Pegu, formerly a capital and important city, is now a small town and a railway station, 45 miles N. E. of Rangoon, on the Pegu river, an affluent of the Hlaing (see map of S. India, ref. 3-1).

MARK W. HARRINGTON.

Peh-chele, or Pechili: an old name for the province of China now known as CHIHLI (q. v.); also the shallow gulf which lies between Chihli and the Yellow Sea.

Peh-la, or Pela [Chinese; literally, white wax]: a kind of wax prepared by the Chinese from the secretions which an insect of the cochineal family (*Coccus sinensis*) deposits on the twigs of a species of ash (*Fraxinus chinensis*), called by the Chinese *tah-shoo*, or wax-tree. The insect resembles a louse, and is said to be taken indoors to be cared for during the winter, and put back on the trees in spring. The peculiar secretion which it voids about the end of summer is collected and melted by the natives, and forms a hard, white, translucent body, like spermaceti, which melts at a temper-

ature of 180° to 186° F., and is largely used for candle-making. It is extensively produced in Sze-chuen and in the northern provinces.

R. LILLEY.

Pehlavi Language: See PAHLAVI.

Pei-ho, pīhō, or pāhō (literally, white river): the most important river of China N. of the Yellow River. It rises near the Great Wall, flows in a southeastern direction through the province of Chihli, and falls into the Gulf of Pechili at Taku. Its course is very tortuous, especially below Tientsin, which is 80 miles by water from its mouth, but only 35 by land. It is navigable for more than three-fourths of its course, but at its mouth there is a bar of stiff, tenacious clay, which makes the entrance very difficult.

Peine Forte et Dure [Fr. and O. Fr., hard and severe penalty], called also **Pressing to Death**: formerly, in England, the punishment of those who refused to plead or stood mute upon their arraignment for felony. The victim was stretched naked upon his back and had "iron laid upon him as much as he could bear and more," and he was so kept and fed on bread and stagnant water on alternate days (bread one day and water the next) until he yielded or died. The object in submitting to death by this penalty was not infrequently to avoid the forfeiture of lands consequent upon conviction for a felony. This punishment came into use about 1400, and is said to have been last employed in 1741. It was virtually abolished by 12 Geo. III., c. 20, which made standing mute in case of felony equivalent to a conviction. In 1827 (7 and 8 Geo. IV., c. 28, § 2) it was enacted that a plea of "not guilty" should be then entered. In 1692, at Salem, Mass., Giles Cory, a supposed witch, stood mute upon his trial, and was pressed to death. This is believed to be the only instance of the infliction of this penalty in America. See Stephen's *History of the Criminal Law of England*, and Pike's *History of Crime in England*.

Revised by F. STURGES ALLEN.

Pe'ipus: a large lake in Northwestern Russia, 87 miles long, 30 miles broad. It communicates with the Gulf of Finland through the Narova. It is deep, easy to navigate, and rich in fish, which are sent to the market of St. Petersburg. Its shores are low, marshy, or sandy, and in many places covered with forests. It occupies an area of about 1,500 sq. miles, and consists of two lakes connected with each other by a narrow strait. The southern lake is sometimes called Lake Pskow, after the city of Pskow, situated at its southeastern extremity.

Peirce, BENJAMIN, LL. D., F. R. S.: mathematician and astronomer; b. at Salem, Mass., Apr. 4, 1809; a son of Benjamin Peirce (1778-1831), librarian of Harvard University. The son was a pupil of Nathaniel Bowditch, and read the proof-sheets of the translation of Laplace's *Mécanique céleste* while yet a mere youth; graduated at Harvard in 1829; taught 1829-31 at Round Hill, Northampton, Mass.; became mathematical tutor in Harvard College 1831; Professor of Mathematics, etc., 1833-42; Professor of Astronomy, etc., 1842-67, and aided the construction and equipment of the observatory; superintendent of the U. S. Coast Survey 1867-74; became in 1849 consulting astronomer to the *Ephemeris and Nautical Almanac*; was a member of the leading American and foreign scientific societies; author of a series of mathematical text-books 1835-70, and of many scientific papers; prepared a volume of lunar tables in 1852 for the use of the American *Nautical Almanac*; published in 1857 his work *System of Analytical Mechanics*. His *Linear Associative Algebra* was reprinted in the *American Journal of Mathematics* in 1882. His work in pure and in applied mathematics is noteworthy for its novel, original, and remarkably direct and satisfactory methods. D. at Cambridge, Mass., Oct. 6, 1880. Revised by R. A. ROBERTS.

Peirce, BRADFORD KINNEY, D. D.: author and journalist; b. at Royalton, Vt., Feb. 3, 1819; graduated at Wesleyan University 1841; entered the New England Conference 1842; was editor of *The Sunday-school Messenger* and the *Sunday-school Teacher*; was a State Senator for Norfolk County 1855-56; obtained the establishment of the State Industrial School for Girls at Lancaster, of which he became superintendent; was chaplain of the House of Refuge, Randall's island, N. Y., 1863-72, after which he returned to Boston, and was editor of *Zion's Herald* 1872-88. Author of Sunday-school question-books, a *Bible Scholar's Manual*, *The Eminent Dead*, *Notes on the Acts*, *The Word of God Opened* (1868); *A Half Century with Juvenile Delinquents* (1869); *Trials of an Inventor*, being an account of the career of Charles

Goodyear, and *Audubon's Adventures* (1890). D. at Newton, Mass., Apr. 19, 1889.

Revised by A. OSBORN.

Peirce, CYRUS: educator; principal of the first normal school in the U. S.; b. at Waltham, Mass., Aug. 15, 1790; graduated at Harvard 1810; studied theology; pastor of Congregational church at North Reading 1819-27; turned from conviction to the work of teaching, and opened a school at North Andover; removed in 1831 to Nantucket, where his great achievement was the grading of the public schools. In June, 1839, he was engaged by Horace Mann as principal of the Normal School at Lexington, Mass., which had been established by the Massachusetts board of education Dec. 28, 1838. At the end of three years Mr. Peirce's health failed. He resigned, and was succeeded by Rev. Samuel J. May, who in turn resigned in 1844 to make way for the re-appointment, Sept. 1, 1844, of Mr. Peirce, the school having meantime been moved to West Newton. Ill-health again led to his resignation in 1849. D. Apr. 5, 1860, at West Newton, Mass. To him more than to any one else is due the successful establishment of normal schools. See Barnard, *American Teachers and Educators* (New York, 1861); Gordy, *Rise and Growth of the Normal School Idea in the United States* (Washington, U. S. Bureau of Education, 1891).

C. H. THURBER.

Peixoto, pā-shōtō, FLORIANO: soldier and politician; b. in the province of Alagoas, Brazil, Apr. 30, 1842. He was one of the generals who supported Fonseca in the deposition of the emperor Nov. 15, 1889; was elected vice-president of the republic 1890; and by the resignation of Fonseca, Nov. 23, 1891, became president for the remainder of the term, or until Nov. 15, 1894. In 1893 he vetoed a bill which was intended to prevent his re-election; this, and the general opposition to a military president, caused much ill-feeling. A rebellion in Rio Grande do Sul gained ground, and a portion of the navy supported it, but was soon reduced to obedience. A more formidable revolt, involving the whole naval force, broke out in the Bay of Rio de Janeiro, Sept., 1893; the navy held the bay for many months and repeatedly bombarded Rio de Janeiro, besides taking Santa Catharina and other places on the coast. In this crisis President Peixoto showed much firmness; ships were ordered from Europe and North America, and on their arrival (Mar., 1894) the rebellion collapsed. Meanwhile the elections had resulted in the return of a civilian, Prudente Moraes, for the succeeding term. Marshal Peixoto died June 29, 1895.

HERBERT H. SMITH.

Peixoto, IGNACIO JOSÉ DE ALVARENGA: poet; b. in Rio de Janeiro about Dec., 1748. He graduated in canon law in Lisbon, and was appointed a judge in Minas Geraes, Brazil; there he was involved in the alleged revolutionary movement called the conspiracy of Tiradentes, was arrested in 1789, and in 1792 was condemned to death; the sentence was commuted to penal servitude at Angola, where he died Jan. 1, 1793. His odes and sonnets are esteemed among the finest in the Portuguese language.

H. H. S.

Pekin': a form of the name *Peking*, derived from *Pekin*, the French spelling of the Chinese name.

Pekin: city; capital of Tazewell co., Ill. (for location, see map of Illinois, ref. 5-D); on the Illinois river, and the Atch., Top. and S. Fé, the Chi., Peoria and St. L., the Cleve., Cin., Chi. and St. L., the Peo. and Pekin Union, and the Peo., Decatur and Evansville railways; 10 miles S. of Peoria, 56 miles N. of Springfield. It is in an agricultural and coal-mining region, has large shipping interests by rail and water, and is an important grain-market. The city has a water front of over 3 miles, 2 national banks, with combined capital of \$200,000, a private bank, and numerous industrial works, including 4 distilleries, 3 foundries and machine-shops, 2 grain elevators, 2 brick and tile works, organ-factory, 2 malt-houses, a roller-mill, marble-works, 3 lumber-yards, planing-mill, and header, wagon, plow, barrel, and soda-water factories. There are 13 churches, 4 public and several private schools, public library, and 2 daily, 4 weekly, and 2 monthly periodicals. Pop. (1880) 5,993; (1890) 6,347.

EDITOR OF "EVENING POST."

Pe'king', sometimes (but less correctly) **Pekin**, locally **Peiching** (literally, Northern Capital): the capital of China, and chief city of the department of *Shun-t'ien-foo*, in the province of Chih-li (but not within the jurisdiction of the Viceroy of Chih-li); in the basin of the Pei-ho river, but about 12 miles from that stream and 100 from Taku, at its mouth (see map of China, ref. 3-J). The latitude of the Russian ob-

servatory, near the northeast corner of the city, is 39° 56' 48" N., its longitude 116° 28' 36" E. On the eastern wall of the Northern or Manchu city is the ancient observatory, sometimes considered the origin for Chinese longitudes. It is 2° 17' S. and 12° E. of the Russian observatory. The altitude of the latter is 121 feet above sea-level. The length of the city from N. to S. is 5½ miles, and its average breadth a little over 4 miles. The area within the walls is 24½ sq. miles, but much of this is occupied by public buildings, parks, ruins, and, in the Southern city, open fields. The suburbs are small and unimportant. The population is not given by census, and has been variously estimated. The old estimates were very high, and were either greatly exaggerated or the city has decreased—perhaps both. Conservative estimates by foreign residents now put the population at only 500,000.

The city consists of three distinct parts or cities, each with its own walls—viz., the Northern, Manchu, or Tartar city, within this the Imperial city, and adjacent to it the Southern or Chinese city. The first, though called the Tartar city, is now largely occupied by Chinese; the second contains the palaces, and public offices, and temples. The Southern city to a great extent consists of open fields, or is occupied by ruins.

The Tartar city is a regular rectangle (except that its northeast angle is somewhat depressed), about 4 miles N. and S. and 3 miles E. and W. The wall is 30 feet high, 25 feet thick at the base, 12 feet across at the top, and surmounted by a parapet. It is made of earth, faced with large brick laid in lime and clay, or, near the gates, with stone. Square buttresses, surmounted by towers, occur at frequent intervals, and there is always one on each side of each gate. There are nine gates, two for each side, except into the Chinese city to the S., where there are three. The gates are surmounted by small forts. This great structure was practically impregnable to native modes of warfare, but offers no serious resistance to modern artillery. The whole is surrounded by a ditch, fed by the waters of the Tung-hwei creek, a branch of the Pei-ho; but it is neglected, and is partly filled up, and often dry. The Tartar city is the finer of the two (Tartar and Chinese), has more and handsomer dwellings, is better cared for, and is the part in which foreigners live. It is crossed from side to side by several very broad streets, along which the shops are arranged. From these branch out innumerable alleys, along which are the dwellings. These are always surrounded by high walls and entered through closed gates, so that there is on the street little sign of the wealth or comfort to be found within. An old and imperfect system of sewerage has been allowed to go to decay. There are no public water-works, and the streets are not lighted at night. Sanitary arrangements, or others devoted to public comfort, are practically unknown. The city is on an alkaline plain, over which rain falls only two months in the year, and the climate is fairly healthful.

The inner or Imperial city is guarded by a wall almost as high and elaborate as that of the Tartar city. It is about 2 miles long by 1 broad; is entered by three gates, one each on the E. and W., and one on the S. The gates are carefully guarded, and no one is admitted except those having business within. The temples and palaces within are roofed with yellow tiles, and this city is consequently sometimes called the Yellow city. It contains considerable parks, and at its northern end is a high artificial hill surrounded by its own wall—an imperial pleasure-ground. Inside the Yellow city, and occupying perhaps a quarter of its space, is again an inclosure surrounded by a wall and containing the imperial residence. It is tiled with red, and is called the Red or Prohibited city.

The Southern or Chinese city abuts on the Tartar city on the S. It was originally a suburb, but was later surrounded by a wall, which is lower than that about the Tartar city. It has ten gates, three of them in common with the Tartar city. It is of a rectangular shape, about 6 miles E. and W. and 2½ N. and S. It contains the Temple of Heaven and that of Agriculture, representing the early and patriarchal religion of the empire. The emperor, representing his people, worships here with much ceremonial once every year.

Outside Peking, and but a short distance E. and W., are the temples of the Sun and Moon, and on the N. that of the Earth. About 8 miles N. W. is a very fine imperial park, called Yuen-ming-yuen, containing about 12 sq. miles and having many pleasure-houses; put in ruins by the allies in 1860. In the environs of the city are many temples, convents, and tombs, generally in ruins.

Peking is thoroughly policed, and is very safe under ordinary circumstances. Its industries are small and unimportant. The country immediately around it is relatively infertile, and its provisions come from some distance. The chief trade-route is by the Pei-ho to Tungchow, 12 miles distant, thence by cart or porter to the city. From the S. and W. carriage is largely by camels.

A city has occupied from time immemorial the present site of Peking, or one near by. The Chinese believe that it is the city K'z, known 1,000 years before the Christian era, and from time to time a royal or departmental capital until the fourth century A. D. From that time the name was frequently changed. In 1264-67 A. D. it was rebuilt about 3 li N. E. of its previous site, and the Mongol emperors used it as a capital. In the latter part of the thirteenth century it was well known to Marco Polo, who called it Cambaluc (improperly written *Cámbalú*). It continued an imperial residence until the fall of the Mongols (1368). The new (Ming) dynasty first took up their residence at Nanking (i. e. South Capital), but the second emperor of that dynasty returned to the northern capital, which was now called Peking. It was restored and reduced in size in 1409, and the part then constructed is the present Tartar city. The walls were completed in 1437, and the Southern city inclosed in 1544. There has been little change since then. In 1860 it was captured by the Anglo-French army. M. W. HARRINGTON.

Pela'gianism: a system of anthropological doctrine which takes its name from Pelagius, but owes its shape rather to bolder if not abler men. Pelagius is spoken of by several of his contemporaries as a Briton, which is likely enough, in spite of his familiarity with Greek authors; but that his British name was Morgan (sea-born), rendered into the Latin *Pelagius*, is without sufficient ancient warrant. He was also called a monk, but perhaps this indicates only ascetic habits. At any rate, he was only a layman. He was born about 370; went to Rome about 400. Shocked by the degeneracy in morals there he set about their correction, and won good repute among his contemporaries by his intelligent zeal. In 409, to avoid Alaric's siege of Rome, he escaped with his convert and pupil, Cælestius, to Northern Africa, and had gone from there to Palestine before the meeting of the Council of Carthage in 411 (some say 412), which condemned Cælestius. In Palestine two councils (at Jerusalem and at Diospolis, the ancient Lydda, in 415) declared him orthodox. He is not heard of after 418, but there is a tradition that he was seventy years of age when he died in some obscure town of Palestine. In the controversy to which his peculiar views gave rise he may not have acted quite frankly, but otherwise he appears to have been a very good man, of more than common moral strictness and purity, if not a man of any great spiritual depth or intellectual grasp. The impulse to his alleged heresy was a practical one. He had been scandalized by hearing Christians plead human infirmity as an excuse for shortcomings in the religious life. He is said to have been greatly roused by hearing a bishop repeat the well-known prayer of Augustine, *Da quod jubes, et jube quod vis* (Give what Thou commandest, and command what Thou wilt). His convert, Cælestius, who appears to have been more of a Pelagian than Pelagius himself, had been an advocate in Rome, and was, perhaps, an Irishman by birth. He was younger and more impulsive than Pelagius. It was his application for ordination as a presbyter at Carthage (in 411 or 412) which led to the council already referred to. His application was denied, on the ground of these seven heretical opinions: (1) Adam would have died if he had not sinned; (2) Adam's sin injured himself only, not the race; (3) children are born as pure as Adam was before he fell; (4) men neither die because Adam fell, nor rise again in consequence of Christ's resurrection; (5) unbaptized, as well as baptized, infants are saved; (6) the law, as well as the gospel, leads to heaven; (7) even before Christ's advent there were sinless men. The answer of Cælestius, that these were matters merely of speculation, availed him nothing; he was excluded from the fellowship of the Church. He then went to Ephesus for ordination, and was a presbyter there from 412 to 417, when he returned to Rome, and for a time had the Bishop Sozimus (417-418) on his side, but fled from Rome in 418. Sozimus having turned against him; was banished from Constantinople in 429; appears in Rome again in 430; and is not heard of after 431, when he was condemned by the Œcumenical Council of Ephesus. Meanwhile, a still younger man, of still greater boldness, Julian, Bishop of Eclanum, in Italy, comes

upon the stage. Deposed in 418, with eighteen other bishops, for sympathy with the opinions of Cælestius, he literally carried the war into Africa, assailing the Carthaginian anthropology with all his might. Augustine had already entered the lists on the other side. Julian went to Constantinople in 418, spent some years with Theodore of Mopsuestia, was in Constantinople again in 428, sought restoration to the Church in 439, but was refused, and died a schoolmaster in Sicily at some time between 440 and 453. Pelagianism, which was understood to be a denial both of original sin and of supernatural grace, was everywhere condemned. Semi-Pelagianism, 100 years later, shared the same fate. By a curious blunder the principal writings of Pelagius were attributed to Jerome, and are found among his printed works (ed. Vallarsius, vol. xi.). See *The Anti-Pelagian Writings of Augustine*, in English (New York, 1887), with historical introduction by Prof. B. P. Warfield; *Jerome's Dialogue against the Pelagians*, in Eng. trans. by W. H. Fremantle in *St. Jerome's Letters and Select Works* (New York, 1893). See G. F. Wiggers, *Versuch einer pragmatischen Darstellung des Augustinismus und Pelagianismus* (1831-33), vol. i. on *Pelagianism*, translated by Prof. Emerson of Andover (1840); J. L. Jacobi, *Die Lehre des Pelagius* (1842); A. Dorner, *Augustinus* (1873); W. G. T. Shedd, *History of Christian Doctrine* (1863); F. Wörter, *Der Pelagianismus* (1866; 2d ed. 1874). See ANTHROPOLOGY; also see CALVINISM and REGENERATION. Revised by S. M. JACKSON.

Pelagius: See PELAGIANISM.

Pelagius I: pope; of Roman birth; archdeacon and legate to Constantinople under Vigilius, his immediate predecessor, and, like him, a mere creature of the Byzantine emperor, Justinian. He was with Vigilius when he died at Syracuse on his way home from Constantinople (where he had been since 547), June 7, 555, and at once assumed the pontificate, as he had previously been authorized to do by Justinian. He was suspected of having hastened the death of Vigilius, and after his consecration at Rome, by two bishops and a presbyter, he thought it necessary solemnly and publicly to deny the charge. He had a troubled pontificate, owing to the refusal of many of his bishops to accept the decrees of the fifth oecumenical council, convened by Justinian in Constantinople 553, upon the Monophysite controversy, which sanctioned the formula, "God was crucified," or "One of the Trinity has suffered." D. in Rome, Mar. 3, 560. His literary remains are in Migne, *Pat. Lat.*, lxxix.—**PELAGIUS II**, also of Roman birth, the immediate predecessor of Gregory the Great in the papal chair, and the first independently elected pontiff after the Byzantine conquest of Rome in 536. He was consecrated Nov. 27, 578; and, in consequence of a plague which followed an inundation of the Tiber, died about the middle of January, and was buried Feb. 8, 590. His literary remains are in Migne, *Pat. Lat.*, lxxii.

Revised by S. M. JACKSON.

Pelargonic Acid [from Mod. Lat. *Pelargonium*, a genus of geraniums in which this acid is found]: a member of the fatty acid series, of the composition $C_{15}H_{25}O_2$. It occurs naturally in the volatile oil of rose-geranium, *Pelargonium roseum*, whence its name, and is obtainable artificially by several methods, one being the oxidation of essential oil of *Ruta graveolens*, or rue. It is a colorless liquid, oily, and freezing by cold to a fatty mass, which melts at $12.5^{\circ}C$; odor like that of butyric acid; boils at 253° – 254° ; slightly soluble in water and very soluble in alcohol. By keeping it becomes yellow.

Revised by IRA REMSEN.

Pelargonic Ether: the ethyl ether of pelargonic acid. It is a colorless oil, boiling at 216° – $219^{\circ}C$. Quinces owe their characteristic odor to the presence of this substance. It can be made by treating pelargonic acid with alcohol.

Pelargonium: See GERANIUM.

Pelasgians: a people uniformly spoken of by all ancient Greek authors as the oldest inhabitants of Greece. The detailed information which has come down to us about them is vague and contradictory. Some authors, Homer and Herodotus, describe them as an extensive race, the parent-stock from which sprung the Hellenes, occupying not only Greece proper, but Asia Minor to the E., Macedonia, Thracia, and Illyria to the N., and Italy to the W. Others, Thucydides and Strabo, consider them only one of the many kindred tribes which inhabited Greece, like the Leleges and Dolopes. Of the Pelasgian language nothing has been preserved. Certain names, such as Larissa and Argos, are considered as pertaining to it. A Greek tradition designated

the Albanian dialect as directly descended from it. Herodotus speaks of it as barbarous, but whether that means foreign or corrupted is not evident. Of architectural monuments found in Greece, certain constructions of an enormous massiveness and strength are ascribed to them. They consist of huge blocks of stone placed one above the other, and held together by their own weight, without any mortar; on account of their size these structures are called cyclopean. Of the history of the Pelasgians not one fact has as yet been ascertained, even that of the transition from the Pelasgian to the Hellenic period. Some modern Egyptologists, however, have described them as a seafaring people in frequent communication with Egypt. Of the stocks settled in Italy, the Japygians and Etruscans are generally considered as branches of the Pelasgian race, but the hypothesis is at once hazardous and barren. Revised by J. R. S. STERRETT.

Pelecan'idæ [Mod. Lat., named from *Pelecanus*, the typical genus, from Lat. *pelecanus* = Gr. *πέλεκας*, woodpecker, also pelican, liter., hewer, deriv. of *πελεκάν*, hew, deriv. of *πέλεκυς*, ax]; a family of birds of the order *Steganopodes*, whose species are familiarly known as pelicans. They are of large size; have a rather long flexible neck, moderate head, a long, nearly straight, and rather broad bill, whose culmen is rounded at the base, and at the end produced into a strong hook; the lower mandible is broader than the upper, and provided with a naked membrane, which extends backward on the throat and is capable of great extension; nostrils lacking; wings long and pointed; tarsi short and robust; toes four, connected together by a membrane, the three anterior largest, the fourth interno-posterior and smallest.

Revised by F. A. LUCAS.

Pelecyppoda (Mod. Lat.; Gr. *πέλεκυς*, hatchet + *πούς*, ποδός, foot): a term used by a few writers for the group of molluscs, better called LAMELLIBRANCHIATA (q. v.), in allusion to the compressed "foot."

Pe'lens (in Gr. *Πηλεΐς*): in Grecian mythology, son of Æacus, brother of Telamon and father of Achilles by Thetis, a daughter of Nereus, and therefore immortal. He was King of Phthia in Thessaly; took part in the Calydonian boar-hunt and the Argonautic expedition. At his marriage to Thetis in the cave of the centaur Chiron the gods appeared and brought goodly gifts, only Eris threw among the assembled guests the golden apple inscribed, "To the Fairest," a circumstance which gave rise to the Trojan war, in which the issue of this marriage (Achilles) was to be the leading figure.

J. R. S. STERRETT.

Pelew Islands: a group of twenty-six little islands W. of the Carolines in the Pacific; also called the Western Carolines. They belong to Spain, and are hilly and surrounded by coral reefs. The soil is fertile, and produces breadfruits, bananas, sugar-cane, and oranges. Pop. about 10,000, of the Malay race. See Semper, *Die Palau Inseln* (Leipzig, 1873).

C. C. A.

Pelican [O. Eng. *pellican*, from Mod. Lat. *pelecanus*, a pelican]: any one of several water-birds of the family *Pelecanidæ*, having all four toes connected by a web, and distinguishable at a glance by their extremely long bill, beneath which is a large skinny pouch. The tail is short, and consists of numerous (twenty or more) feathers; the wings very long; the bones are all permeated by air, and numerous air-sacs are present about the body. Pelicans are gregarious, and dwell both on the seacoast and by inland waters in temperate as well as tropical countries. They nest on the ground or on low trees and bushes, and lay from one to three eggs, like chalk in appearance. There are ten or a dozen species. The pouch is used for catching fish, on which these birds feed. They either plunge down upon the fish, like the brown pelican, or drive them into shallow water and scoop them up. It has been denied that the pelican carries fish to its young in its pouch, but it certainly does this occasionally. The common pelican of Europe (*Pelecanus onocrotalus*) has black primaries, the rest of the body being white suffused with a rosy or salmon tint; the young are grayish. This bird reaches a length of 5 feet, with a spread of wing of nearly 9. The



White pelican, *P. trachyrhynchus*.

white pelican of North America (*P. trachyrhynchus*), a bird of the size of the common pelican, is remarkable from the fact that during the breeding season a horny ridge or excrescence is developed on the upper mandible. This bird is found on the Gulf coast and extends inland to Great Salt Lake. The brown pelican of North America (*P. fuscus*) extends along the coast of the U. S. from Carolina to Texas, and a similar species (*P. californicus*) occurs on the Pacific coast. These birds are striped with black and white, while the neck of the male is of a rich reddish brown. F. A. LUCAS.

Pelides: See **ACHILLES**.

Pelion (in Gr. *τὸ Πήλιον ὄρος*): the ancient name of the modern Plessidi, a mountain on the eastern coast of Thessaly, in the province of Magnesia. On the summit of its highest peak stood the temple of Jupiter Actæus, and near this was the cave of Chiron. It is still celebrated for its magnificent forests of oak, chestnut, elm, and pine, and the deep impression which the ancients received of its lofty peaks found a fit expression in the myth of the giant sons of Aloeus, who in their wars against the gods placed Ossa on the top of Olympus and Pelion upon Ossa; or, as Vergil relates, piled Ossa on Pelion and rolled Olympus upon Ossa. See Mezières, *Sur le Pelion et l'Ossa* (Paris, 1853); Tozer, *Researches in the Highlands of Turkey* (London, 1869, vol. ii, pp. 98-139). Revised by J. R. S. STERRETT.

Pélissier, *pā'lee'si-ā'*, JEAN JACQUES AMABLE: Duke of Malakoff, marshal of France; b. at Maromme, near Rouen, Nov. 6, 1794; was educated at Brussels, afterward at the military schools of La Flèche and St.-Cyr; entered the artillery as sub-lieutenant in 1814; served in Spain in 1823, in the Morea in 1828, and in Algeria in 1830. Commanding in 1845 a corps as colonel, he entered the territory of the Ouled Rihah, defeated them, and shut them up in a cave. As they refused to surrender, and even fired at his messengers, he applied burning fagots to the mouth of the cave, and about 600 Arabs were suffocated. This atrocity excited general indignation, and he was saved only by the declaration of Marshal Bugeaud, commander-in-chief in Algeria, that he had simply obeyed a positive order. In 1855 he was made commander-in-chief of the army in the Crimea, and took the Malakoff. He was governor-general of Algeria from 1860 to his death May 22, 1864.

Pel'la (in Gr. *Πέλλα*): the ancient capital of the Macedonian empire and the birthplace of Alexander the Great. It was a large and magnificent city in the days of Philip and Alexander, but lost its importance under the Romans, and disappeared altogether during the Middle Ages. Some few remains of it are still traceable near Pel. It is said to have had over 80,000 inhabitants. See Tozer, *Researches in the Highlands of Turkey* (London, 1869, i, p. 153); Heuzey and Daumet, *Mission archéologique de Macédoine* (Paris, 1876). J. R. S. STERRETT.

Pella: city; Marion co., Ia. (for location, see map of Iowa, ref. 6-H); on the Chi., Rock Is. and Pac. Railway; 47 miles E. S. E. of Des Moines, the State capital. It is in an agricultural and stock-raising region, is the seat of the Central University of Iowa (Baptist), and has stone quarries, vineyards, lime-kilns, flour-mills, grain elevators, and other industrial works, and a monthly and three weekly periodicals. Pop. (1880) 2,430; (1890) 2,408; (1895) 2,606.

Pella'gra [Ital., deriv. of *pelle*, skin; cf. Gr. *ἐγγρα*, a catching]; a form of nervous disease with a peculiar skin eruption. It occurs in Italy, especially in Lombardy, in Spain, and in other parts of Europe, and sometimes becomes extremely prevalent. The symptoms refer to the stomach, the nervous system, and the skin. The disease is apt to be chronic, growing in severity with succeeding years. It is likely that poverty, hunger, overwork, and filth combined are the causes alike of the scaly eruption and of the other attendant evils. Revised by WILLIAM PEPPER.

Pelletier, *pelti-ā'*, CHARLES ALPHEONSE PANTALON, C. M. G.: Senator; b. at Rivière Ouelle, Province of Quebec, Canada, Jan. 22, 1837; graduated B. C. L. at Laval University in 1858, and was admitted to the bar in 1860. He represented Kamouraska in the Dominion Parliament 1867-77; was Minister of Agriculture 1877-78; president of the Canadian commission for the Paris Universal Exhibition of 1878; for his services was made (1878) a Companion of the Order of St. Michael and St. George; and was called to the Senate in 1877. He was thrice elected president of the Société de St. Jean Baptiste, and commanded a battalion during the Fenian raid of 1866. NEIL MACDONALD.

Pellico, SILVIO: poet and writer; b. at Saluzzo, province of Coni, Italy, June 24, 1789. He studied at Turin, and then spent four years at Lyons, chiefly studying French literature. In 1810, his family having removed to Milan, he became Professor of French in the Milanese Collegio degli Orfani Militari. Here he made the acquaintance of Monti and Foscolo (whose *Carmin de' Sepolcri* had deeply stirred him), and was soon in the midst of the best spirits of the city. During this period he wrote the first of his tragedies, *Laodicea* and *Francesca da Rimini*, the latter of which, acted in 1819, was a great success. In 1819, with a group of friends, among them Manzoni and Berchet, he established a periodical, *Il Conciliatore*, intended to represent the new romantic and patriotic tendencies they all felt so strongly. The Austrian administration looked with great disfavor upon this; and Pellico had difficulties also about his new tragedy, *Eufemio di Messina* (1820). In this same year the periodical had to be abandoned, and not long after Pellico, with several others, was arrested. He was confined first at Milan, then at Venice, but in 1822, on a false charge of Carbonarism, he was condemned to death. The sentence was commuted by the emperor to fifteen years of confinement at the Spielberg in Moravia. At last, in 1830, stirred by the July revolution in Paris, the Austrian Government released him, broken in health and impaired in mind. He went at once to Turin, and passed the remainder of his life in retirement as secretary and librarian to the Marchioness Barolo. His tragedies, *Iginia d'Asti* and *Ester d'Engaddi*, had been the fruit of his confinement in Venice, while at the Spielberg he composed *Leoniero da Dertona*. On his release he prepared the book chiefly associated with his name, *Le mie Prigioni: Memorie, etc.* (Turin, 1832), which first revealed to Europe the iniquities of the Austrian rule in Italy, and powerfully aided the movement for Italian independence. The book was speedily translated into all the cultivated European languages, as was also the little treatise *Dei Doveri degli Uomini, discorso ad un giovane* (1834). Besides the tragedies mentioned above, he composed three others—*Tommaso Moro*, *Eradiadi*, and *Grismonda da Mendrisio*—as well as a number of briefer dramatic pieces. (See his *Rappresentazioni drammatiche inedite*, edited by G. Lanza, Turin, 1886.) His master in the drama was Alfieri, but there is little strength and too much sentimentality in his style. D. at Turin, Feb. 1, 1854. There is no good complete edition of Pellico's works. The chief are in the so-called *Opere Complete* (2 vols., Leipzig, 1834-48; 3 vols., Paris, 1836-37; 1 vol., Milan, 1857). Other editions of importance are his *Opere* (2 vols., Padua, 1831) and *Opere inedite* (2 vols., Turin, 1837). His *Epistolario* has been edited by G. Stefani (Florence, 1856). See P. Giuria, *Silvio Pellico e il suo tempo* (1854); and *Nel Centenario della Nascita di Silvio Pellico. Sua vita, memorie, e componimenti inediti* (Turin, 1889). A. R. MARSH.

Pel'litory [M. Eng. *paritorie*, from O. F. *paritoire* < Lat. *parietaria*, peltitory, deriv. of *parietarius*, belonging to walls, deriv. of *paries*, *parietis*, wall]: common name of an urticaceous herb. (1) The *Parietaria officinalis*, or wall peltitory of the Old World, resembling outwardly the common nettle. It is used as a diuretic in domestic practice. *Parietaria pennsylvanica* is its North American representative. (2) More commonly this name is given to *Anacyclus pyrethrum*, a composite plant the root of which is brought from the Levant. It is much used by dentists to relieve toothache and benumb the nerves of the teeth, and is a valuable and powerful sialagogue and local stimulant in tic douloureux and facial paralysis; is often incorrectly called Spanish peltitory.

Pelop'idas (in Gr. *Πελοπίδας*): a man of great wealth and an intimate friend of Epaminondas; b. at Thebes; was expelled in 382 B. C. from his native city by an oligarchic party supported by Sparta, but returned in 379 B. C., slew the Spartan leader with his own hand, established a thoroughly democratic government, and broke the Spartan influence not only in Thebes, but in Greece. He distinguished himself in the battle of Leuctra, 371 B. C., and on a diplomatic mission to Susa he baffled the Spartan and Athenian intrigues at the Persian court, and Thebes was acknowledged as the first city of Greece. Sent in 368 B. C. as ambassador to Alexander of Phœræ, he was seized and imprisoned by the tyrant, but rescued by Epaminondas. In the year 364 B. C. he defeated Alexander at Cynoscephalæ in Thessaly, but was killed while pursuing the enemy.

Revised by J. R. S. STERRETT.

Pelopium: See COLUMBIUM.

Peloponnesus [= Lat. = Gr. Πελοπόννησος; Πέλοπος, of Pelops + νήσος, island]; the ancient name for the southern division of Greece, the peninsula, which now generally is called the MOREA (*q. v.*). It was divided into six districts or states—namely, Achaia, in the N., along the Corinthian Gulf; Argolis, in the E., between the Saronic Gulf and the Gulf of Argolis; Laconia, in the S. E., between the Gulfs of Argolis, Laconia, or Colocytia, and Messenia or Koron; Messenia, in the S. W., on the Gulf of Messenia; Elis, in the W.; and Arcadia in the middle. See the articles on GREECE and its divisions; Curtius, *Peloponnesos* (Gotha, 1851–52); Clark, *Peloponnesus* (London, 1858); Beulé, *Études sur le Péloponèse* (Paris, 1875); Gell, *Itinerary of the Morea* (1827) and his *Journey in the Morea* (1823); Leake, *Travels in the Morea* (London, 1830) and his *Peloponnesiaca* (London, 1846); Blouet, *Expédition de Morée* (Paris, 1831–38); Ross, *Reisen im Peloponnes* (Berlin, 1841); Wyse, *Excursion in the Peloponnesus* (London, 1865); Bursian, *Geographie von Griechenland* (Leipzig, 1872, vol. ii, 1–343). For the Peloponnesian wars, see GREECE, HISTORY OF ANCIENT. Revised by J. R. S. STERRETT.

Pe'lops (in Gr. Πέλοψ): in Grecian mythology, the son of Tantalus (King of Phrygia), brother of Niobe and the father of Atreus and Thyestes; married Hippodamia, a daughter of King Enomaus of Elis; became king after the death of his father-in-law; renewed the Olympian games, and gave his name to the southern division of Greece by sending a colony thither. Many and very different myths are connected with his name. Revised by J. R. S. STERRETT.

Pelo'tas: a town in the state of Rio Grande do Sul, Brazil; on the river São Gonçalo, which connects the Lagoa dos Patos with the Lagoa Miri (see map of South America, ref. 8–F). It is built on flat ground, with wide, regular streets, and is one of the richest and handsomest cities of Southern Brazil; railways connect it with Rio Grande do Sul and with the interior of the state, and vessels which can pass the Rio Grande bar ascend easily to this place. Pelotas is the principal cattle-market of the state and the center of the meat-drying industry, whence most of the states are supplied with jerked beef. The exports, besides jerked and salt beef, are hides, tallow, horns, etc. Pop. (1894) about 25,000. HERBERT H. SMITH.

Pels, ANDRIES: Dutch poet and critic. Almost nothing is known of his life except that he lived at Amsterdam as a juriconsult during the second half of the seventeenth century. He is, however, historically a rather important figure in Dutch literature. The first production from his pen of which we know is his tragedy *Didoos dood* (1668). Soon after this he became the central figure of that group of men who undertook to regulate and discipline the Dutch language and the forms of Dutch poetry. The group took for its motto the words *Nil volentibus arduum*, and is commonly known by this name. Its inspiration came from France, and it dreamed of a work like that of the recently established Académie Française. The manifesto of the movement was written by Pels, and entitled *Horatius Dichtkunst op onze tijden en zeden gepast* (1677); and this was followed by a second treatise with a similar purpose, *Gebruik en misbruik des tooneels* (1681). The effect of the movement on Dutch letters was very unhappy. The would-be legislators had no real inspiration, and conceived of reform as a purely mechanical and exterior business. Hence their own works are now almost unreadable, as may be seen in Pels's *Minneliederen en Mengelzangen* (1684). A. R. MARSH.

Pelu'sium [= Lat. = Gr. Πηλούσιον; Egypt. *am*; probably identical with *Ha-uar*, Avaris or Abaris; Heb. *Sin*]; an Egyptian fortified city and outpost near the Mediterranean, on the Pelusiac branch of the Nile, at the northeast corner of the Delta region, on one of the main lines of travel to the East. Its history can not be traced except in the geographical lists on temple walls, since the present remains are very few and much weatherbeaten. Avaris was the final stronghold of the Hyksos, from which they were driven by Ahmes I. (See EGYPT.) It was also the scene of the overthrow of the native dynasty under Psammetichus III. by Cambyses. At present the site is nearly level with the surrounding marsh, the lowering of the mounds being due in part to denudation, but mainly to the gradual sinking of the northern portion of the isthmus. See Petrie, *Tanis* (part ii., p. 100 f.); Dümichen and Meyer, *Gesch. des alten Aegyptens*; Lipsius, *Letters from Egypt* (p. 429 ff.); Meyer;

Gesch. des Altertums; Amélineau, *Géographie de l'Égypte* (p. 317 f.). CHARLES R. GILLET.

Pelvis [= Lat. *pel'vis*, basin, laver]: the lowest of the three great divisions of the trunk, or, more properly, the bony ring or framework, connecting the column of the spine with the lower extremities, and transferring the weight of the former to the latter. It consists of four bones. The front and sides are formed by the two *ossa innominata*, large irregular bones which have received their name from their not resembling any other body in form; behind, the circle is completed by the *sacrum* and *coccyx*. The pelvis varies somewhat in the male and female skeleton, and also in the skeletons of different races. See OSTEOLOGY.

Pemberton, JOHN CLIFFORD: soldier; b. in Philadelphia, Pa., Aug. 10, 1814; graduated at the U. S. Military Academy, and became second lieutenant of artillery July, 1837; served in Florida against the Seminoles; in the war with Mexico on the staff of Gen. Worth, gaining the brevets of captain and major for Monterey and Molino del Rey; in Florida hostilities against the Seminole Indians, and in garrison principally in the Southern States until Apr. 29, 1861, when he resigned, being at the time a captain of artillery. Joining the Southern cause, he was appointed a colonel of cavalry, and attached to the staff of Gen. Joseph Johnston; rose to the rank of lieutenant-general, and in 1863 commanded in Mississippi, where he was defeated, May 16, at Champion Hills and Big Black (May 17); falling back on Vicksburg, he defended it against assault, but being besieged was compelled to surrender the city and garrison July 4, 1863. (See VICKSBURG, SIEGE OF.) He subsequently served as inspector of artillery; after the war farmed at Warrenton, Va., but in 1876 removed to Philadelphia. D. at Penlynn, near Philadelphia, July 13, 1881.

Revised by JAMES MERCUR.

Pembroke: town; in Pembrokeshire, South Wales; on an inlet of Milford Haven; 9 miles W. of Tenby (see map of England, ref. 12–C). At Pembroke Dock or Pater, 2½ miles N. W. of Pembroke, is a fortified dock-yard and arsenal. Pop. of Pembroke proper (1891) 14,978.

Pembroke: town; capital of Renfrew co., Ontario, Canada; on Allumette Lake, a part of Ottawa river; 100 miles above Ottawa (see map of Ontario, ref. 1–G). It is a great center of the lumber business. Water-power is furnished by the falls of Muskrat river. Beside the county buildings, Pembroke has several branch banks and mills. There are two weekly newspapers. Pop. (1890) 4,401.

Pembrokeshire: county of Wales; bounded N. and W. by the Irish Sea and S. by the Bristol Channel. Area, 617 sq. miles. The coast is rugged, but inland the surface is undulating, valleys alternating with hills, which reach a height of 1,754 feet in Cwm-Crwyn in the Precelly range. The principal rivers are the Teifi, the two branches of the Cleddan, and the Nevern. Mines of anthracite coal and lead are worked. In the southern part the soil is fertile, and barley, oats, and potatoes are raised; while in the more northerly regions more attention is given to cattle-rearing and dairy-farming. Over more than half its area English is spoken, though it is the farthest Welsh county from England. Pembrokeshire returns one member to Parliament. Pop. (1891) 89,133.

Pem'mican [the Cree Indian name]: a kind of concentrated food, originally made by the North American Indians by drying and powdering the lean meat of the buffalo or deer, mixing it with service-berries, stirring all into boiling fat, and making it into cakes. The name is also given to a very different form of meat-biscuit used by Arctic voyagers.

Pemphi'gus [Mod. Lat., from Gr. πέμφις, πέμφιγος, bubble]: a skin disease in which successive crops of watery or turbid blisters appear upon the patient. Two varieties are described: *P. vulgaris*, which may be acute or chronic, and *P. foliaceus*, which is always chronic. In the former the blebs are well distended, at first with clear serum, later with pus; in the latter, the vesicles are large, only partly filled, and purulent from the first. Moreover, they rupture early and leave a rough, red surface. Pemphigus often comes on suddenly, with chills and fever and great constitutional depression. It may be epidemic in certain localities, especially the form occurring in the new-born, *P. neonatorum*. The acute form lasts from two to six weeks, and may occasion severe constitutional symptoms, with the local heat or itching common to all forms. The chronic form

lasts from six months to a year or more, consisting, as a rule, of several distinct attacks, separated by an interval. The treatment consists in the internal administration of arsenic and of remedies to restore the general systemic tone, such as strychnia, quinine, and iron. Local treatment with dusting-powders or alkaline sedative lotions gives great relief, and in very severe cases patients have been kept in warm baths continuously for months. WILLIAM PEPPER.

Pen [viâ O. Fr. from Lat. *pen'na*, feather]: an instrument for writing. Among the earliest references to pens are those found in Judges v. 14, Psalms xlv. 1, Isaiah viii. 1, chiefly referring, no doubt, to the iron stylus which cut out characters in the tablets of limestone or soapstone. These may have been made of other metals, and were in some instances pointed with diamonds, as referred to in Jeremiah xvii. 1. Another reference is made in Jeremiah viii. 8, and if taken in connection with the mention of a penknife—xxxvi. 23—it would seem to imply that a reed was in use at that period. Later, tablets were made of the plastic clays of Central Asia, which, after receiving inscriptions, were dried in the sun or baked in ovens. The style used in Persia, Greece, and Syria was sharp at one end for writing and flattened at the other for the purpose of making erasures on the tablets, which were covered with wax, and were made of metal, bone, or ivory.

In the Third Epistle of John, 13th verse, written about A. D. 85, mention is made of "ink and pen," probably alluding to the custom of writing upon skins or other flexible material. Although the first reference in the Bible was made about B. C. 1296, Mariette discovered an inscription in one of the crypts of the Temple of Denderah in Upper Egypt which says that the great fundamental ordinance of Denderah was found written upon goat-skin in the inside of a brick wall during the reign of King Pepi (about B. C. 3650), and in the same crypt was another inscription stating that the restoration of the great fundamental ordinance of Denderah was made in accordance with what was found written in ancient writing of the time of King Khufu (about B. C. 3766).

At Bubastis, in Lower Egypt, Naville discovered on the walls of the Hall of Festival, among the processional subjects, the sacred scribe with *pen and palette*, and in the tombs of Gizeh, which are contemporaneous with the pyramids, the reed pen and inkstand, and scribes employed in writing, appear among the sculptures. In the supposed tomb of Aristotle, in Greece, a metal pen about 2 inches long was found, cut and slit like a quill pen, and a bronze one of undoubted Roman origin, made from sheet-metal bent and forged on a mandril, and with its point neatly cut and slit like a quill pen, was excavated in a field at Pré-Saint-Didier at a depth of 10 feet.

After the stylus, pens were doubtless made in tubular forms from sheet-metal of a required length for holding in the hand, the point being formed by filing away a portion of the tube or barrel; later, holders of many materials were introduced, and the metal part was of only sufficient length to give a flexibility to the point and to slip over the holder about $1\frac{1}{2}$ inches. Metallic pens resembling modern patterns were generally supposed to have been unknown before the early part of the eighteenth century, but that theory was exploded when in excavating at Pompeii a pear or almond shaped one was found with a sort of ring at the stem, now preserved in the Museum at Naples, that certainly must be older than A. D. 79, when the city was buried by the eruption of Vesuvius.

Dr. Martin Lister, in 1698, in his *Journey to Paris*, describes an ancient writing implement of thick silver wound up like a screw, with both ends pointing one way and at a distance so that a man might easily put his forefinger betwixt the two points, one of which was sharp to write on wax tablets, the other shaped like the upper beak of a cock; the point was divided like that of our steel pens.

Quill Pens, etc. In the far East, and perhaps in Egypt, the camel's-hair pencil was substituted for metal implements, and characters were painted on the bark of trees and skins of animals, very much as the Chinese draw them on paper, but the quills of geese and crows were discovered to be more useful than either the reed or brush, and were introduced, it is thought, about A. D. 56. For centuries the quill was the favorite instrument of the rapid writer, and continued to be so until the steel pen superseded it. Quills were most successfully prepared in Russia and Holland by clarifying them in hot sand and by dipping them in boiling

alum-water or diluted nitric acid. Many writers made their own pens from these prepared quills, but the art was an acquired one after much instruction and practice. Every teacher was expected to be proficient in this part of his profession. Early in the nineteenth century they were made for sale, and boxes of them, also nibs for fastening upon holders, were vended by all stationers.

Notwithstanding the impression that the quill pen produces only coarse writing, as beautiful specimens of penmanship have been produced by it as by any other instrument in use, not excepting the engraver's tool. The demand for something more durable than quills led to a variety of experiments with horn, tortoise-shell, glass, steel, silver, and gold, resulting in the almost exclusive use of steel. The glass pen was more of a stylus than a pen, it being merely a ground stick. The horn and shell ones softened under the action of the ink and were no improvement on the quill, though they were pointed with diamonds and rubies. Silver pens, because of their elasticity and ductility, were thought to be a success, but their susceptibility to wear at the point and a failure to temper them properly caused them to be finally abandoned.

Steel Pens.—The invention of making steel pens from sheet-metal has so many claimants that it is difficult to decide to whom belongs the honor. The first manufacturer of steel pens is unknown. Arnoux, a French mechanic, made metallic pens with side slits in 1750. A New York city jeweler, working in Baltimore in 1800, made for his own use a steel pen with three slits. The Shakers, in 1819, made silver pens with one slit. Joseph Gillott, Sir Josiah Mason, John Mitchell, and James Perry, all Englishmen, began to manufacture by machinery about the same time. Patents were granted to Perry in 1830 and to Gillott in 1831, and the evidence of Perry's precedence seems to be cumulative.

The manufacture of steel pens is a delicate and laborious process. The raw material is produced in sheets 6 feet long, 17 inches in length, 23 wire-gauge thickness, which is cut into strips of convenient width and placed in air-tight iron boxes which are put in a muffle, where they remain until they gradually attain a dull-red heat, when the muffle is allowed to cool gradually. To rid the strips of an excrescence they are immersed in a vat of diluted sulphuric acid to loosen the scales, and then tumbled in a revolving barrel with pebbles and water. The steel is then rolled until reduced to the required gauge with such exactness that a variation of the one-thousandth part of an inch is not permitted. These strips are now punched into blanks of the same shape of the patterns of the pens desired, two-thirds of the material being used, one-third being scrap. Marking the blanks singly, with the name and number, by a stamp is the next process, and so dexterously are they handled that one girl can stamp 250 gross in a day. To obtain elasticity and to devise a method which shall cause the ink to attach itself to the smooth surface, the blanks are pierced by a delicate punch in a fly-press.

Before the blanks are shaped the dust and grease are removed by tumbling again; then to anneal or soften the metal the blanks are heated in a muffle once more to a dull red, and when cool moulded by a die into form, and then hardened by heating them to a bright-red heat in round pans, after which they are put into perforated buckets to be plunged into vats of oil, which drains from the buckets as they are raised. The oil is removed by rapid revolving in perforated, centrifugal cylinders, but as the pens are still greasy and as brittle as glass, they are cleansed in a bath of boiling soda-water and tempered by being rolled in cylinders over a charcoal fire. Another bath in a pickle of diluted sulphuric acid frees them from any extraneous substance, and another tumble for from five to eight hours in a revolving barrel with ground iron, followed by a tumble in a barrel of dry sawdust, gives them a bright silver color and points nicely rounded. They are then ground on leather buffs, dressed with emery, and made ready for slitting with a tool having the delicacy of the cutting edge of a razor. After slitting they are tumbled again with powdered iron for six hours to smooth the inside edges of the slit, then polished in sawdust and, after being colored, are varnished to prevent rust. First quality pens undergo a rigid examination, one at a time, by expert girls, who reject every pen that shows an imperfection; afterward the pens are counted and boxed, generally in one gross packages.

Pens are manufactured chiefly in Birmingham, England, thirteen firms, employing 4,600 persons, using about 56,000 lb. of steel per week, producing a weekly average of 250,000

gross. There are four or five manufacturers in France and Germany, and but six recognized manufacturers in the U. S., situated in New Jersey, Pennsylvania, New York, and Connecticut, and employing about 400 people. The average weekly production is about 20,000 gross. The many names given by the venders of steel pens to the material from which they are made are but fancy names and do not indicate the quality of metal. The demand for steel pens is almost confined to Europe and America. The great Asiatic nations still write with pens made from reeds or with camel's-hair pencils.

The first gross of pens sold in England in 1820 brought at wholesale about seven guineas or \$36 in U. S. money. In 1825 they were sold at 31 cents, and in recent years pens as good as those sold in 1820 were disposed of at 10 cents per gross.

Gold Pens.—Although the U. S. has failed to compete successfully with Great Britain in the manufacture of steel pens as to quality of metal and workmanship, the reverse may be said of gold ones. In this manufacture, requiring a higher degree of skill, the U. S. has for some years been foremost, and the product is now sold largely in Great Britain, France, and Germany. The first attempt at making gold pens was made in England about 1825. The metal, though alloyed, is too soft to make a durable point, therefore it became necessary to protect the points with diamonds or rubies; but John Isaac Hawkins, a citizen of the U. S. residing in England, was led by accident to use the native alloy of iridium and osmium, one of the hardest and most refractory of all metallic alloys. Hawkins's rights were purchased by a clergyman, who in 1835 induced a watchmaker in Detroit to engage in the manufacture of gold pens. These were first made by hand, and were very poor substitutes for the quill. In 1840 he removed to New York and enlarged his business. One of the men in his employ, John Rendell, invented a number of machines for the making and tempering of the pens, giving them the elasticity of the quill and the permanency of the metal. About 1850 it was discovered that by bedding the iridium points in the gold instead of soldering them the corrosive influence of the ink on the two metals, the solder and the gold, was avoided and a firmer hold on the pen was given to the points. The elasticity was increased and the temper regulated by a series of rolls and other processes. The cost of gold pens makes it absolutely necessary that every one should be perfect and durable, therefore only experts are allowed to inspect and test them before they are offered for sale. The rejection of at least four in a dozen is a result of this severe scrutiny and test. About 150 persons are employed in the manufacture of gold pens in the U. S. by fourteen makers; the annual product has a value of about \$500,000.

Fountain or Stylographic Pens.—These pens have a reservoir handle, carrying a supply of ink of sufficient quantity to last several days or, if constantly used, for several hours' continuous writing. A removable cap is usually provided to cover the point, so that the instrument may be carried about like an ordinary lead-pencil. In 1860 an attempt was made to produce fountain pens, but not until 1879 were they constructed to operate successfully. The early attempts at making reservoir pens were generally confined to contrivances embraced in the use of internal tubes, ducts, valves, or springs operated upon by the action of the nibs, which forced the ink from a feeding-pipe upon the pen, assisted by air admitted at the top of the holder, to take the place of the exhausted ink. This mechanism was very erratic in its work, the ink flowing either too slow or too fast. The best results were obtained by providing a tubular holder tightly closed at its upper end, while at the lower end is inserted, usually, an ordinary nib pen made of gold, with an ink-feeder lying adjacent to the pen to attract the ink from the reservoir. Air is admitted at the lower end of the reservoir, whereby a constant automatic feeding is secured by capillary action between the feed-plate and the pen. As the ink is withdrawn air enters at the lower end of the column and ascends in globules through the column of ink to fill the space made vacant by the use of the ink. There are many patents for fountain pens, which were invented in the U. S., but the principle involved seems to be the retention of the ink by atmospheric pressure and the furnishing of a supply ready for use for hours of continuous writing without the necessity of dipping constantly into an ink-well.

THEODORE E. SMITH.

Penalty [from Fr. *pénalité*, punishment, from Lat. *pœnalis*, pertaining to punishment, deriv. of *pœna*, punishment,

loan-word from Gr. *πῶνις*, fine, and represented by Fr. *peine*, Eng. *pain*]; the imposition of the payment of a sum of money or of some personal suffering. It may be imposed by the law, as in criminal or punitive cases, or by contract. The eighth amendment of the U. S. Constitution forbids the imposition of excessive fines or pecuniary penalties and the infliction of cruel and unusual punishments by the Federal Government. In the absence of constitutional restraint the infliction of penalties and the disposition of the proceeds are matters of legislative discretion. A statutory penalty must be clearly imposed; it will not be implied. The legislative imposition of a penalty on a specific act or omission is treated generally as equivalent to its prohibition. It may appear, however, from the entire statute that the legislature intended not to render the act or omission absolutely illegal, but to punish the offending party. *De Mers vs. Daniels*, 39 Northwestern Reporter 98; 39 Minn. 158.

A party may subject himself to a penalty by contract, as in the case of an ordinary bond or of an agreement not to engage in a particular business or profession. At common law the penal sum named in such a contract was recoverable in case the contract was broken, but equity intervened early and reduced the recovery to the actual damages caused by the breach. This beneficent policy received the approval of Parliament in 1697 (8 and 9 William III., c. 11, § 8), and soon became the prevailing rule in common-law courts. In many cases, however, the parties to a contract are allowed to stipulate the amount to be paid by either upon his breach of its provisions as liquidated damages. If such a stipulation is made because of the uncertainty of the damages, it will be sustained; but if it is resorted to for the purpose of securing the performance of the contract by the threat of a punishment for its breach, it will be treated as a penalty, and the injured party will be allowed to recover such damages only as he can prove the breach has caused him. The language of the contract is not treated by the courts as conclusive of the intention of the parties. They may declare the sum stipulated for to be liquidated damages, while the court, looking at all of the contract provisions, will declare it a penalty. On the other hand, they may refer to the sum as a penalty, while the entire transaction discloses that they intended to agree upon and abide by it as their rating of damages instead of leaving them to be assessed or guessed at by a jury or a court.

FRANCIS M. BURDICK.

Penance [from O. Fr. *penance* < Lat. *pœnitentia*, repentance (whence Eng. *penitence*), deriv. of *pœnitel*, makes repent]: in general, the atonement for sin. Roman Catholic theology treats penance both as a virtue and as a sacrament. The virtue of penance includes sorrow for sin, amendment, and the performance of expiatory works. The sacrament of penance is that in which the forgiveness of sins committed after baptism is granted, by the absolution of a duly authorized priest, to those who repent, confess, and perform satisfaction. This sacrament was instituted by our Saviour in the words, "Receive ye the Holy Ghost; whose sins ye shall forgive they are forgiven them, and whose sins ye shall retain they are retained" (John xx. 22). The power thus conferred is double; the priest, acting as God's minister, may grant absolution or withhold it. Also it is a judicial power: the priest must know what the sins are before he can remit them or retain them. Hence the necessity of confession. The mere fact, however, of declaring one's sins does not procure their pardon. The chief condition on the part of the penitent is sincere contrition. If this be wanting, the absolution is null, and the confession, instead of removing guilt, adds to it the crime of sacrilege. Nor does the penitent's obligation, when he is properly disposed, end with the priest's absolution. For though this releases him from sin and, in case of grievous offenses, from their eternal punishment, it does not always cancel the temporal reparation required by divine justice. This satisfaction, as it is termed, the priest imposes in the form of prayer, almsdeed, fasting, or other good works to be done by the penitent. In no case does the sacrament of penance imply a "permission to commit sin."

This is the teaching not only of the Latin Church, but also of the Eastern Churches, of those even which at an early period severed their connection with Rome. The sacramental character of penance was acknowledged more-over by those sectarians who held peculiar views regarding the power of forgiving sins. Though the Novatians and Montanists excepted certain grievous sins from this power, few of them denied it absolutely. The Donatists claimed

that it could be exercised only by worthy ministers; the Waldenses, that it belonged to the laity as well as to the priesthood; Huss and Wycliffe, that its efficacy depended upon the worthiness of those who exercised it, and that perfect contrition rendered the sacrament unnecessary. The Reformers spoke, it is true, of an *absolutio*; but as they considered this a mere declaration of forgiveness, and forgiveness itself a revival of baptismal grace—*repressus ad baptismum*—they virtually rejected the sacrament of penance.

The practice of the Church in administering the sacrament and in dealing with penitents has varied from time to time. During the first four centuries auricular confession was often followed by a public confession when it was thought that this would be edifying. As, however, the opposite effect was sometimes produced, the public confession was abandoned toward the middle of the fifth century. Similar vicissitudes appear in the history of the *penitential discipline* or process by which the sinner after due reparation was reconciled to the Church. The offenses for which public penance was enjoined—*peccata capitalia*—were adultery, idolatry, and murder. The penalty was excommunication, and this in the latter half of the second century was perpetual. Later on it was limited to a period longer or shorter according to the nature of the offense. In the East the penitents were divided into four class. The Προσκαιόντες, *flentes*, or weepers, remained outside the church during divine service and implored the prayers of the faithful. The Ἀκροώμενοι, *audientes*, or hearers, entered the church but remained behind the catechumens, and like them left when the more solemn part of the service began. The Ὑποπίπτοντες, *substrati*, were dismissed after the bishop's blessing, which they received kneeling or prostrate. The Συντάκτες, *consistentes*, were present during the whole service, but did not communicate. This classification was not in vogue in the West, where penitents were treated in the same way as catechumens, but were obliged to wear a peculiar dress, to abstain from all luxuries, and to practice various austerities. The nature of the penance and its duration were decided by the bishop, who also presided at the public reconciliation.

In the East this discipline disappeared along with public confession at the close of the fourth century. The Western Church relaxed its discipline gradually from the seventh century until the thirteenth or fourteenth. As a substitute for public penance fasts, almsdeeds, and pilgrimages were enjoined. The crusades, especially, served to relax the penitential rigor. In the sixteenth century efforts were made to restore the ancient practice, but these had neither a widespread nor a lasting success. At the present day, though excommunication is the penalty for certain crimes, the performance of public penance is rare.

LITERATURE.—Bingham's *Christian Antiquities*, bk. xvii. f. (Oxford, 1855); Pelliccia, *De Christianæ Ecclesiæ Politia* (Cologne, 1829); Probst, *Sakrament und Sakramentalien* (Tübingen, 1872).

Penang': an island in the Strait of Malacca, forming a part of the Straits Settlements, a crown colony of Great Britain. Area, 107 sq. miles. The ground is high and mountainous, but the soil is very fertile, and eminently well adapted to the cultivation of pepper, cloves, nutmegs, and other spices, which are largely exported. Sugar, coffee, indigo, and cotton are also raised, and tin is one of the chief exports. Province Wellesley, a narrow, very fertile coast strip on the mainland opposite the island is a part of Penang Settlement. The chief town is George Town, with a good harbor and considerable trade. Revised by C. C. ADAMS.

Pena'tes [= Lat.; cf. *pe'nus*, store, closet, *pe'nitus*, inwardly, prepos. *penes*, with]: in Roman mythology, the gods of the household, originally the guardians of the storeroom, i. e. those who care for the daily bread of the family. They were gods of the hearth, and were worshiped by offerings of food and drink at the daily meals in a manner similar to the worship of the LARES (*q. v.*). The designation Penates is often used in a loose way, and may include, as Servius says, all gods who are worshiped in the home. Their name was to the Roman synonymous with home; they were the gods of his fathers and of his race, and, in short, formed the point about which religious conceptions concerning the family centered. The community, as being but an extension of the family, had also its Penates, associated with the cult of Vesta, by whose priests, the Vestal virgins, they were worshiped in much the same manner as the Penates of the household.

G. L. HENDRICKSON.

Pencil [from O. Fr. *pinzel* > Fr. *pincean*, painter's pencil, brush (with *i* on analogy of *pingere*, paint) < Lat. *penicillus*, collateral form of *peniculus*, brush, painter's brush, liter., dimin. of *penis*, tail]: an instrument for painting, drawing, or writing. The oldest pictures were no doubt produced simply by lumps of colored earth or chalk cut in forms convenient for holding in the hand; but in the fourth century B. C. Greek artists began to use wet brushes, which were laid on with fine hair brushes. For such brushes or pencils the hairs of camels, badgers, sables, minks, kolinskis, fitches, goats, and the bristles of hogs are used. They are tied up in bundles terminating in a perfectly smooth cone, well pointed, and either drawn through goose-quills or fastened in metallic holders provided with wooden handles. The manufacture of such a pencil, especially of the finest kinds used by artists, requires great skill and care.

Ancient writers mention the use of lead for ruling on papyrus, as well as documents ruled with graphite, and probably fragments of different colored minerals were used previous to all historic mention. Even as late as the nineteenth century pencils made of soft lead hammered into convenient forms were used and known as "plumets." Now graphite, sometimes called plumbago or blacklead, mixed with a soft grittyless clay, has superseded all other materials.

Graphite is one of the three principal forms of carbon, and is obtained in innumerable localities. (See GRAPHITE.) In the sixteenth century a mine of very pure graphite was discovered in Cumberland, England, and became famous as the Borrowdale mine. The graphite was so soft and pure that it was readily sawed into thin strips which were glued into slabs of wood, properly grooved, and then sawed into pencils. After the exhaustion of the Borrowdale mine powdered graphite mixed with clay was used. This method was the invention of the Comte de Paris. The mixture of graphite and clay while in the soft state was placed in grooved wood, and, after hardening, a thin veneer of wood was glued on and the slabs sawed into pencil form.

The present practice is briefly as follows: Powdered graphite freed from all grit and impurities is mixed with clay, the quantity of clay depending upon the degree of hardness required. The harder leads can be made in smaller diameter than the soft leads. The mass, made thoroughly homogeneous, is then spun through dies by pressure, and the leads cut into lengths desired. Afterward the leads are baked to make them strong, and then placed in grooved cedar slabs. The slabs are formed by machinery into pencils and finished into various styles. Red, blue, and other colored leads are made of colored pigments and wax. They can not be subjected to the toughening process of baking on account of the nature of the materials, but in other respects the method of manufacture is the same.

Lead-pencils are manufactured in France, Bavaria, Austria, and the U. S. The wood used is obtained chiefly from the forests of Bohemia and Florida.

GEORGE E. LONG.

Pendentive: a piece of masonry which supports a cupola or dome, and rests in its turn on arches below. Each pendentive is somewhat triangular in shape, for it is bounded on each side by the curving extrados of an arch, and at top by the lowest ring of the cupola. Pendentives may be either parts of a larger cupola which is penetrated by the great arches, or may be composed of small arches built across from one great arch to another, or of a system of corbels.

R. S.

Pendleton: city (laid out in 1869, named after George H. Pendleton); capital of Umatilla co., Ore. (for location, see map of Oregon, ref. 1-II); on the Umatilla river, and the Union Pac. and the Wash. and Col. River railways; 231 miles E. of Portland. The limits of the city were enlarged in 1884 under a special act of Congress by the addition of 640 acres of the Umatilla Indian reservation. The city is on both sides of the river, which is here spanned by three bridges and affords good power for manufacturing. A levee nearly 2 miles long has been constructed on the south bank of the river at a cost of \$40,000. Pendleton has a court-house, built in 1889 at a cost of \$90,000, a graded public-school building built in 1886 at a cost of \$20,000, St. Joseph's Academy (Roman Catholic), Pendleton Academy, 7 churches, 2 national banks, a savings-bank, 4 hotels, electric-light plant, flour-mills, machine-shops, and other manufacturing, and 2 daily and 2 weekly newspapers. Pop. (1880) 130; (1890) 2,506.

EDITOR OF "EAST OREGONIAN."

Pendleton, EDMUND: statesman; b. in Caroline co., Va., Sept. 9, 1721; became a lawyer when twenty-one years old;

was one of the leaders of the Virginia Legislature, and often its Speaker; as a conservative he was the political antagonist of Patrick Henry; was in the first Continental Congress 1774-75; drew up the resolutions by which Virginia instructed her delegates to propose the Declaration of Independence; though maimed for life by an accident in 1777, he continued to take an important part in public affairs, and afterward presided over the courts of chancery and of appeals, and over the convention of 1788, by which Virginia indorsed the U. S. Constitution. He was distinguished as a debater. D. at Richmond, Va., Oct. 23, 1803.

Pendleton, WILLIAM KIMBROUGH, LL. D.: educator; b. in Louisa co., Va., Sept. 8, 1817; educated in the University of Virginia, where he graduated from the law school and was admitted to the bar. In 1841 he married a daughter of Alexander Campbell, and, moving to Bethany, took part in the founding of Bethany College, in which institution he was professor until Mr. Campbell's death, when he succeeded him as president. He was a member of the West Virginia constitutional convention, and was four years State superintendent of public schools. J. H. GARRISON.

Pendleton, WILLIAM NELSON: soldier; b. in Richmond, Va., Dec. 26, 1809; graduated at West Point in 1830; promoted brevet second lieutenant of artillery, served a year in the Augusta arsenal and as Assistant Professor of Mathematics at West Point 1831-32. Resigned Oct. 31, 1833, and became Professor of Mathematics at Bristol College, Pennsylvania, and subsequently at Delaware College, Delaware. Having been ordained a minister in the Episcopal Church in 1837, he became rector of the Episcopal diocesan school of Virginia, in Alexandria, in 1839. At the outbreak of the war he returned to his former military occupation, and was chief of artillery in the army of Northern Virginia. He was with Gen. Lee's command when the latter surrendered in 1865. After the war he was made rector of Grace Memorial Protestant Episcopal church in Lexington, Va., where he died Jan. 17, 1883. He was author of *Science a Witness for the Bible* (London, 1860). Revised by JAMES MERCUR.

Pendulum [Mod. Lat., liter., neut. of Lat. *pendulus*, hanging, swinging, deriv. of *pendere*, hang]: a suspended body oscillating under the action of gravity. In order to investigate the laws of its motions we abstract from its material qualities, and consider a heavy point suspended by a right line without weight from a fixed point, about which it is free to move. This is called a *simple pendulum*; by an *oscillation* is meant its motion from one extreme of the arc to the other extreme on the opposite side of the vertical. When the arc of vibration is small, the following relation is found to obtain between the length l of the pendulum and the time t of one vibration, viz., $t^2 = \frac{\pi^2 l}{g}$, g denoting the

force of gravity, or the squares of the times are proportional to the lengths. Hence a pendulum making one oscillation in two seconds must have four times the length of one that oscillates once in one second of time. By g is meant the velocity acquired in one second by a heavy particle falling from rest by the action of the earth's gravity, the space fallen through being $\frac{1}{2}g$. Hence we see also by putting $t = 1$ in the above equation, that $g = \pi^2 l$, or that the velocity acquired in one second is $\pi \times$ the length of a simple seconds pendulum. That length having been found to be, at New York, 39.10 inches, it follows that $g = 32.16$ feet at that place. This is the most accurate way of measuring the force of gravity at any place.

It thus appears that the time of vibration is independent of the length of the arc, so long as the arc is very small—an important property in the application of the pendulum to the regulation of time-keepers which was first made use of for that purpose by Huyghens. (See CLOCKS.) When a simple pendulum, being at the extremity of its arc of vibration, receives an impulse at right angles to the plane of its vibration, the heavy point will describe a curved path about the vertical, and it is then called a *conical pendulum*. Its path will be circular, with a certain impulse; a greater or less impulse will cause it to describe elliptic arcs. This property is made use of in regulators for steam-engines and other machinery.

When instead of a simple pendulum we have a material or *compound pendulum*—consisting, for instance, of a rod with a disk or ball attached to its lower extremity—the same laws can be applied by conceiving the whole mass of the pendulum united in one point, called the *center of oscillation*, whose distance from the line of suspension is equal

to the length of a simple pendulum vibrating in the same time as the given compound pendulum. When the line of suspension has a considerable length, and bears a very small proportion to the suspended mass, the center of oscillation is very near the center of gravity of the latter.

When we desire to ascertain the absolute length of a seconds pendulum, it becomes necessary to measure the distance between its point of suspension and its center of oscillation. Accurate experiments to this end were first made in 1790 at Paris by Borda, who employed a spherical platinum ball suspended by fine wire 12 feet in length, and found, after applying all due corrections, 3 feet 8.5593 lines (old French measure). The method devised by Huyghens and first employed by Kater is, however, that which affords the simplest means of ascertaining the length of an equivalent simple pendulum. It consists in using a *reversible pendulum*; that is, a rod with opposite knife-edges near either end, and so weighted with two *unequal* weights that the time of vibration is the same whichever of the two knife-edges the pendulum is suspended from. In such case each knife-edge is in the center of oscillation of the other, and the time of vibration is therefore the same as that of a simple pendulum whose length is equal to the distance between the two. When the times of vibration are not exactly, but very nearly, equal, the requisite reduction can be deduced from the relative distances of the two knife-edges from the center of gravity. By having the two weights of equal size, one of them being hollow and placed at equal distances from the nearest knife-edge, the resistances and other variable circumstances affect the vibrations alike in both positions of the pendulum. Such is the form of the reversible pendulum used by Plantamour in Switzerland, which has also been adopted by the European Geodesic Association. The times of oscillation are observed by means of a telescope, and are compared by the electro-chronographic method with a standard clock regulated by astronomical observations. The knife-edges rest on agate planes supported by a firm frame, and about 3,000 consecutive oscillations are observed in each of the four positions in which the pendulum can be suspended. From the combination of a great number of observations at various latitudes, Helmert found that, at a place in latitude B , the length of a seconds pendulum in meters is $0.990918 (1 + 0.00531 \sin^2 B)$. Revised by S. NEWCOMB.

Penelope [in Gr. Πηνελόπη]: in the Greek legend, the daughter of Icarius, the wife of Odysseus (Ulysses), and the mother of Telemachus. When Odysseus was in Sparta as one of the suitors of Helen, he fell in love with Penelope, Helen's first cousin. In return for Odysseus's advice with regard to the suitors of Helen, Tyndareos agreed to prevail upon his brother Icarius to give Penelope in marriage to Odysseus. While Odysseus was absent at Troy Penelope was beset by numerous and eager suitors, whom she put off by declaring that she must first finish weaving the shroud of Laertes. Accordingly, she wove by day and unwove by night, and thus prolonged the work. Detected in her noble deceit, she was hard pressed by the villains, but was relieved by her husband's timely return after an absence of twenty years. Revised by J. R. S. STERRETT.

Penelop'idæ [Mod. Lat., named from *Penelope*, the typical genus, from Gr. Πηνελόπη, wife of Odysseus]: a family of gallinaceous birds (also called *Cracidæ*) including the curassows and guans of South America. The bill is moderate; the wings moderate and round; tail elongated and broad; tarsi robust, with the toes three before, connected together by a basal web, and a long hinder one on the same plane as the front ones. The sternum has its lateral elements (*Metostea*) united by a broad margin with the central part (*Lophosteon*), the single notch being half as long as the sternum itself. The species are "strictly confined to the forests of the New World, and extend from the Rio Grande of Texas on the N. to the wooded region of Paraguay on the S. They do not occur in the Antilles, with the exception of Trinidad and Tobago, and on the western side of the Andes do not pass southward of the Gulf of Guayaquil." See also CURASSOW and GUAN. Revised by F. A. LUCAS.

Peneplain: See PHYSIOGRAPHY.

Penguin [said to be a corruption of pinwing]: a name originally applied to the great auk (*Alca impennis*) from the fact that it was as flightless as if pinwinged or pinioned, i. e. had its wings locked over its back. At an early date the name was transferred to the flightless birds of the southern seas, and is now used as a popular name for any

member of the family *Spheniscidae*, a group of birds peculiar to the southern hemisphere, incapable of flight, and having the wings modified as swimming paddles. The body and



King penguin.

wings are evenly covered with short, scale-like feathers, the feet are stout and but little used in swimming. These birds sit erect, resting on their tarsi, and in this attitude walk, or rather waddle, although when hurried they frequently lie flat and scramble with feet and wings. They are wonderful swimmers, and some species progress at times by a series of leaps much like those of a porpoise. There are about a dozen species, ranging in size from the great king penguin (*Apeludytes forsteri*), which is over 3 feet in length, to the little *Eudyptes minor*, which is about half that length.

Penguins feed on fishes, shellfish, and small crustaceans. They dwell in communities, and the fe-

males, according to the species, lay one or two white eggs in a burrow, or in a slight depression of the ground. Most of them inhabit the colder regions of the southern hemisphere, and species have been found in the Antarctic seas as far S. as vessels have penetrated. The Falkland islands appear to be their center of distribution, half the known species occurring there.

The upper part of the plumage in nearly all species is dark bluish, or bluish gray, lower parts white. The king penguin has a band of yellow under the neck, and the members of the genus *Eudyptes* are decorated with a tuft of flowing yellow feathers on either side of the head.

F. A. LUCAS.

Penikese Island: See ELIZABETH ISLANDS.

Peninsular War: See SPAIN (*History*), and WELLINGTON, ARTHUR WELLESLEY, DUKE OF.

Penitentiaries: See PRISONS.

Penn, WILLIAM: founder and first legislator of the State of PENNSYLVANIA; b. in London, Oct. 14, 1644. He was a son of Admiral Sir William Penn, and received a very careful education. He studied at Christ Church, Oxford, but having met here with Thomas Loe, he was converted to Quakerism, and shortly after expelled from the university. His father sent him on travels in Holland and France, and on his return in 1666 he was ordered to manage the estates of the family in the county of Cork, Ireland. He fulfilled this task with great success, but in Cork he met for the second time with Thomas Loe. He was imprisoned for attending a Quaker meeting, and although he was very soon liberated he had to leave Ireland. On his return to London he began to preach and work in different ways for the society to which he belonged, and after the publication of *The Sandy Foundation Shaken* (in 1668) he was thrown into the Tower. Here he wrote *No Cross, no Crown*, and *Imaginary with her Open Face*, but by the interference of the Duke of York he soon obtained his freedom. The good relations between father and son were several times disturbed on account of the religious views of the latter, but after every rupture a reconciliation soon followed; and when the admiral died (in 1670) he left his estates and all his property to his son. Penn continued to preach and work for what he considered to be the highest truth, and in 1671 he was once more thrown into prison. As he would not take an oath at his trial, he was sent to Newgate for six months, and while here he wrote the celebrated defense for toleration, *The Great Cause of Liberty of Conscience*. Having been liberated, he made a

tour to Holland and Germany, and on his return in 1672 he married Gulielma Maria Springett. From his father he had inherited a claim on the Government for £16,000. In settlement of this claim the Government granted him large territories in North America, the present State of Pennsylvania, with right to found a colony or society with such laws and institutions as expressed his views and principles. In 1682 he went over to America. A great number of settlers, not only Quakers, but members of all denominations, Englishmen, Swedes, and Germans, gathered together; a charter of liberties was issued, and a democratic government instituted; the city of Philadelphia was planned, and the colony soon came into a most flourishing condition. Penn returned to England toward the close of the reign of Charles II., intent on bettering the social position of the Quakers in that kingdom, in which plan he partly succeeded. During the reign of James II. his connection with the court became very intimate—so much so that he was suspected of being implicated in certain disgraceful measures of the king. After the overthrow of James he was twice accused of entertaining treasonable communications with the exiled king, and an order of council (Mar. 14, 1692) deprived him of his title to the Pennsylvania government. After a most searching trial he was fully acquitted in 1693, and another order of council restored his title to him in 1694. After the death in 1693 of his first wife, he married (in 1695) Hannah Calowhill, and went in 1699, for the second time, to Pennsylvania (Philadelphia), where he stayed till 1701. His return to England was chiefly caused by the deranged state of his affairs there. The mismanagement and villainy of his agent had brought him to the verge of bankruptcy. He was even thrown into the Fleet for some time in 1708. These vexations affected his health; in 1712 he was struck with apoplexy, and although he recovered, his mental faculties were greatly impaired after that time. D. at Rusecombe in Berkshire, July 30, 1718. His contemporaries, even such as were not his friends, testify to the correctness and justice of his character, and although he was savagely attacked by Macaulay in the *History of England*—the charges being modified, but not withdrawn in later editions—Penn's vindication at the hands of Paget (*Paradoxes and Puzzles*, Edinburgh, 1874) and W. E. Forster (*Reply to Macaulay*, reprinted in Philadelphia, 1850) has been recognized as completely successful. For Penn's own life, see biographies by S. M. Janney (Philadelphia, often reprinted) and J. Stoughton (London, 1882). A less ambitious but entertaining work is Maria Webb's *The Penns and Peningtons* (London, 1867). For Penn's part in the founding of Pennsylvania, see Winsor's *Narrative and Critical History of America*, iii., 469 ff. Penn was a voluminous writer; for a list of his works, see Joseph Smith, *Descriptive Catalogue of Friends' Books* (2 vols., London, 1867). Revised by F. B. GUMMERE.

Pennacook Indians: See ALGONQUIAN INDIANS.

Pennant: See FLAG.

Pennant, THOMAS, LL. D., F. R. S.: zoölogist and archaeologist; b. at Downing, Flintshire, Wales, June 14, 1726; studied at Queen's and Oriol Colleges, Oxford, but did not take a degree; produced a large number of folio and quarto volumes containing his travels in various parts of the British islands, which possess few graces of style and little scientific accuracy, but have preserved from oblivion some valuable facts. D. at Downing, Dec. 16, 1798. Among the more important of his works are *British Zoölogy* (4 vols., 1765-77); *History of Quadrupeds* (2 vols., 1771); *Tours in Scotland* (3 vols., 1771-75); *Tours in Wales* (2 vols., 1778-81; new ed. 3 vols., 1883); *Arctic Zoölogy* (3 vols., 1784-87); *Antiquarian and Historical Account of London* (1790), of which many editions have been published, and his amusing autobiography, *The Literary Life of the Late Thomas Pennant, Esq.*, written by himself (1795).

Pennsylvania: one of the U. S. of North America (North Atlantic group); the second of the original thirteen States that ratified the Federal Constitution; popularly known as the Keystone State.

Location and Area. It lies between lat. 39° 43' and 42° 15' N., and lon. 74° 43' 36" and 80° 31' 36" W.; is bounded on the N. by Lake Erie and the State of New York, on the E. by Chautauqua and Delaware cos., N. Y., and the Delaware river, on the S. by Delaware, Maryland, and West Virginia, on the W. by West Virginia, Ohio, and Lake Erie; extreme length from E. to W., 302-34 miles; extreme breadth from N. to S., 175-6 miles; area, 45,215 sq. miles (28,937,600 acres), of which 230 sq. miles are water surface; capital,

Harrisburg. According to the census of 1890 the State ranked first in mineral production and second in population and value of manufactures.

Physical Features.—The surface falls into three divisions—viz.: (1) The southeastern section or district extending from Delaware river to the Blue or Kittatinny Mountains; near the river a narrow plain of level land, but a few miles inland a rolling or undulating tract with gently rounded hills. This region, while containing much mineral wealth, is admirably adapted for the growth of cereals. (2) The mountain district adjoining this, which crosses the State in a belt varying in width from 75 to 160 miles, and trending from N. E. to S. W. All the mountain chains which go to make up the Appalachian system are here in their full breadth, though not attaining a great altitude. The mountains of the Appalachian system in the State, aside from their general division in two great ranges, the Blue or Kittatinny and the Alleghany range, are subdivided into a host of minor chains, intersected by numerous valleys, broad and fertile, with the precipitous east face of the Alleghany range overhanging them. (3) The western tableland, which occupies about half the area of the State, is a broad, rolling plateau, with occasional ranges of hills, but sloping N. and W. toward New York, Lake Erie, and Ohio river. It extends from the summits of the Alleghanies W. to the northwestern and western boundaries of the State. The northwestern portion has several isolated summits. It is the region of pine and hemlock lands, and furnishes vast amounts of lumber to Eastern markets.

Rivers.—There are six distinct water-basins, which, with their tributaries, drain the entire State—viz., the Delaware and its affluents, the Susquehanna and its tributaries, the Genesee, the Potomac, Lake Erie, and the Ohio with its large and numerous affluents. The Ohio is formed by the union of two large rivers, the Alleghany and Monongahela,

The following summary from the census reports of 1880 and 1890 shows the extent of farm operations in the State:

FARMS, ETC.	1880.	1890.	Per cent.*
Total number of farms.....	213,542	211,557	0.9
Total acreage of farms.....	19,791,341	18,364,370	7.2
Total value of farms, including buildings and fences.....	\$975,689,410	\$932,240,333	5.5

* Decrease.

The following table shows the acreage, yield, and value of the principal crops in the calendar year 1893:

CROPS.	Acreage.	Yield	Value.
Corn.....	1,273,418	31,198,741 bush.	\$15,287,383
Wheat.....	1,310,822	18,351,508 "	11,928,480
Oats.....	1,141,832	30,601,098 "	10,710,384
Rye.....	316,147	4,647,361 "	2,648,996
Barley.....	18,529	352,051 "	176,026
Buckwheat.....	218,580	3,081,978 "	1,818,367
Tobacco.....	27,715	27,715,000 lb.	3,741,525
Potatoes.....	198,922	15,118,072 bush.	9,070,843
Hay.....	3,085,850	3,178,426 tons	45,769,334
Totals.....	7,591,815		\$101,151,338

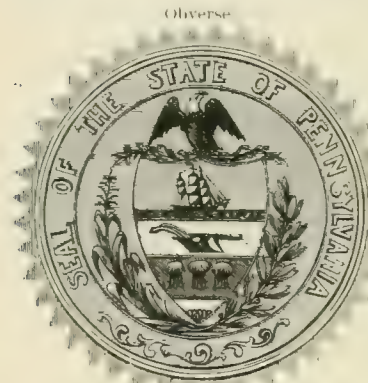
On Jan. 1, 1894, the farm animals comprised 659,484 horses, value \$42,053,101; 36,513 mules, value \$2,989,014; 938,382 milch cows, value \$23,975,660; 737,919 oxen and other cattle, value \$15,965,972; 1,473,494 sheep, value \$4,530,700; and 1,033,517 swine, value \$9,077,483—total head, 4,879,309; total value, \$98,591,930.

Minerals.—Gold, silver, copper, tin, and sulphur in a native state have been discovered in Pennsylvania, but none of them in quantities to make their working profitable. Iron does not exist in a native state, but the iron ores embrace every known ore and many not found elsewhere. The most valuable mineral, economically, is coal, bituminous and anthracite.

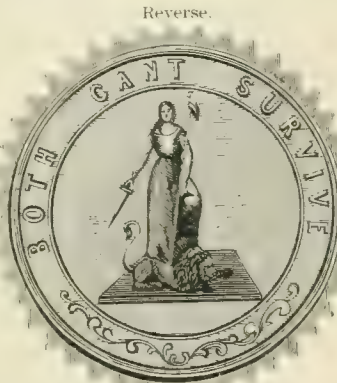
Of bituminous, the production in 1893 was 44,070,724 short tons, valued at \$35,260,674. Of the total product, 33,322,328 tons were loaded at the mines for shipment, 1,934,429 tons were sold in local trade and used by employees, 426,122 tons were used at the mines for steam and heat, and 8,387,845 tons were made into coke. The production of anthracite was 53,967,543 short tons, valued at \$85,687,078, of which 48,266,174 tons were loaded at the mines for shipment, 1,202,655 tons were sold in local trade and used by employees, and 4,498,714 tons were used at the mines for steam and heat.

The total production of both kinds was 98,038,267 short tons, valued at \$120,947,752. Crude petroleum showed a marked falling off in production in 1893, viz.: Production in 1892, 27,149,034 barrels (42 Winchester gallons each), valued at \$15,302,968; production in 1893, 19,283,122 barrels, valued at \$12,563,893. In the production of iron ores the State ranked fourth in 1893 with 57,633 long tons of red hematite, 158,376 tons of brown hematite, 480,164 tons of magnetite, and 1,812 tons of carbonate—total product, 697,985 long tons, valued at \$1,374,313. In 1883 natural gas began to be used extensively for fuel, and the value of the amount so consumed reached its highest point in 1888 (\$19,282,375). The value of the consumption has since steadily decreased, being in 1893 only \$6,488,000. The consumption in Pennsylvania alone in 1888 exceeded the entire consumption in the U. S. in 1893. Quarrying was much restricted by the labor and financial troubles in 1893. The productions were: Granite, \$206,493 (\$550,000 in 1892); slate, \$1,472,275 (\$2,330,000 in 1892); marble, \$27,000 (\$50,000 in 1892); sandstone, \$622,552; and limestone, \$1,552,336. The salt product in 1893 was 280,343 barrels (280 lb. each), value \$136,436; metallic paint, 8,300 short tons, value \$143,875. There are numerous mineral springs, some of them of great medicinal value. Of the minerals possessing only scientific value the number is very great, embracing almost every mineral of note in the largest catalogues.

Climate.—There are considerable differences in the climate of different portions of the State. The mean annual



Seal of Pennsylvania.



at Pittsburg. Both have numerous tributaries. The Monongahela receives the Youghiogheny and several smaller streams. Aside from Lake Erie there are no lakes of importance. There are several islands in the Delaware, and two or three in Lake Erie, belonging to Pennsylvania.

Soil and Productions.—The soil of the valleys and plains is generally fertile, and some of it very rich, yielding large crops for a succession of years. There is a large area in forests. The trees include several species of pine, hemlock, spruce, fir, and cedar, as well as some other coniferous trees; six or seven species of oak and four of hickory, the black walnut and butternut, three or four species of maple, the chestnut, chinquapin, beech, buckeye, linden, tulip-tree, dogwood, hornbeam, birch, ash, willow, elm, aspen, sycamore, American poplar, mulberry, persimmon, gum, sassafras, locust, wild cherry, papaw, catalpa, magnolia, crab-apple, etc. The flora is varied. The number of wild animals is quite large—bears, panthers, wildcats, lynxes, wolves, otters, the red and the gray fox, the raccoon, marten, mink, weasel, skunk, opossum, musk-rat, porcupine, woodchuck or groundhog, and occasionally the beaver; the flying, red, striped, and gray squirrel, the hare or rabbit, and among the larger game the Virginian deer, and rarely the elk. Birds are numerous—of prey, the bald and the golden eagle, the turkey-buzzard, fish and other varieties of hawk, owls, the whippoorwill, the night-hawk, the swallow, etc.; these and the reptiles are the same as those of New York and New Jersey.



temperature, which is 52° in the southeastern counties, decreases to 48° in the central counties and 44° in the north and northwest. The amount of rainfall is usually greatest in the southeast and decreases north and west.

Divisions.—For administrative purposes Pennsylvania is divided into sixty-seven counties, as follows:

COUNTIES AND COUNTY-TOWNS, WITH POPULATION.

COUNTIES.	* 1861.	Pop. 1880.	Pop. 1890.	COUNTY-TOWNS.	Pop. 1890.
Adams	6-F	32,455	33,486	Gettysburg	3,221
Allegheny	5-B	355,869	551,959	Pittsburg	238,617
Armstrong	4-B	47,641	46,747	Kittanning	3,095
Beaver	4-A	39,605	50,077	Beaver	1,552
Berks	6-D	34,929	38,644	Bedford	2,342
Berks	5-I	122,597	137,327	Reading	58,661
Blair	5-D	52,749	70,866	Hollidaysburg	2,975
Bradford	2-G	58,541	59,393	Towanda	4,169
Bucks	5-J	68,656	70,615	Doylestown	2,519
Butler	1-D	52,536	55,338	Butler	8,734
Cambria	5-D	46,811	66,475	Elensburg	1,202
Cameron	3-D	5,159	7,298	Emporium	2,147
Carbon	4-I	31,923	38,624	Mauch Chunk	4,101
Centre	4-E	37,922	43,269	Bellefonte	3,946
Chester	6-I	83,481	89,377	West Chester	8,028
Clarion	3-C	40,328	36,802	Clarion	2,164
Clearfield	4-D	43,408	69,565	Clearfield	2,248
Clinton	3-E	26,278	28,055	Lock Haven	7,358
Columbia	4-H	32,409	36,832	Bloomsburg	4,635
Crawford	2-A	68,507	65,324	Meadville	9,520
Cumberland	6-F	45,977	47,371	Carlisle	7,620
Dauphin	5-G	76,148	96,977	Harrisburg	39,385
Delaware	6-J	56,101	74,683	Media	2,746
Elk	3-D	12,800	22,239	Ridgway	1,903
Erie	1-A	74,688	86,074	Erie	40,434
Fayette	6-B	58,842	80,006	Uniontown	6,359
Forest	3-C	4,385	8,482	Tionesta	677
Franklin	6-E	49,855	51,433	Chambersburg	7,863
Fulton	6-E	10,149	10,137	McConnellsburg	594
Greene	6-A	28,273	28,935	Waynesburg	2,101
Huntingdon	5-E	33,954	35,751	Huntingdon	5,729
Indiana	5-C	40,527	42,175	Indiana	1,963
Jefferson	3-C	27,935	44,005	Brookville	2,478
Juniata	5-F	18,227	16,655	Mifflintown	877
Lackawanna	3-I	89,269	142,088	Scranton	75,215
Lancaster	6-H	139,447	149,095	Lancaster	32,011
Lawrence	4-A	33,312	37,517	New Castle	11,600
Lebanon	5-H	38,476	48,131	Lebanon	14,664
Lehigh	5-I	65,969	76,631	Allentown	25,228
Luzerne	3-H	133,065	201,203	Wilkes-Barre	37,713
Lycum	3-F	57,486	70,579	Williamsport	27,132
McKean	2-D	42,565	46,863	Smethport	1,150
Mercer	3-A	56,161	55,744	Mercer	2,138
Mifflin	5-E	19,577	19,996	Lewistown	3,357
Monroe	4-I	20,175	20,111	Stroudsburg	2,419
Montgomery	6-I	96,494	133,200	Norristown	19,791
Montour	4-G	15,468	15,645	Danville	7,998
Northampton	4-J	70,312	84,220	Easton	14,481
Northumberland	4-G	53,123	74,698	Sunbury	5,930
Perry	5-F	27,732	26,276	New Bloomfield	737
Philadelphia	6-J	847,150	1,046,994	Philadelphia	1,046,994
Pike	3-J	9,662	9,412	Milford	793
Potter	2-E	12,737	23,778	Coudersport	1,540
Schuylkill	5-H	129,954	154,452	Pottsville	14,117
Snyder	4-F	17,707	17,351	Middleburg	420
Somerset	6-C	33,110	37,317	Somerset	1,713
Sullivan	3-G	11,023	11,620	Laporte	1,735
Susquehanna	2-H	40,364	40,093	Montross	1,735
Taupo	2-F	45,814	52,434	Wellsboro	2,061
Tioga	4-F	16,905	17,820	Lewisburg	3,248
Union	3-B	43,670	46,640	Franklin	6,221
Warren	2-C	27,984	37,585	Warren	4,332
Washington	5-A	55,418	71,155	Washington	7,063
Wayne	2-J	31,513	31,010	Honesdale	2,816
Westmoreland	5-B	78,036	112,819	Greensburg	4,202
Wyoming	2-H	15,798	15,891	Tunkhannock	1,253
York	6-G	87,841	99,489	York	20,793

Totals . . . 4,282,891 | 5,258,014

* Reference for location of counties, see map of Pennsylvania.

Principal Cities and Towns, with Population in 1890.

—Philadelphia, 1,046,994; Pittsburg, 238,617; Allegheny, 105,287; Scranton, 75,215; Reading, 58,661; Erie, 40,634; Harrisburg, 39,385; Wilkes-Barre, 37,713; Lancaster, 32,011; Altoona, 30,337; Williamsport, 27,132; Allentown, 25,228; Johnstown, 21,805; York, 20,793; McKeessport, 20,741; Chester, 20,226; Norristown, 19,791; Shenandoah, 15,944; Lebanon, 14,664; Easton, 14,481; Shamokin, 14,403; Pottsville, 14,117; Pottsville, 13,285; Hazleton, 11,872; New Castle, 11,600; and Mahanoy City, 11,286.

Population and Races.—1860, 2,906,215; 1870, 3,521,951; 1880, 4,282,891; 1890, 5,258,014 (native, 4,412,294; foreign, 845,720; males, 2,666,331; females, 2,591,683; white, 5,148,257; colored, 109,757, of whom 107,596 were persons of African descent, 1,146 Chinese, 32 Japanese, and 983 civilized Indians).

Industries and Business Interests.—In 1890 the census

returns showed that 39,336 manufacturing establishments reported. These had a combined capital of \$990,999,375; investment in plants, \$505,400,180, including value of machinery, tools, and implements, \$258,427,613; persons employed, 620,484; paid for wages \$40,788,793; for materials used \$773,530,105, for miscellaneous expenses \$74,833,862; and had products valued at \$1,331,523,101. The principal industry reported was the manufacture of iron and steel, which had 417 establishments, employed 103,976 persons, paid \$57,435,000 for wages and \$180,803,312 for materials, and had products valued at \$295,358,622. Other leading industries, with the value of their products, were: Machinery, \$67,587,025; sugar and molasses, \$46,599,754; lumber and its products, \$46,171,522; clothing, \$42,552,794; flour and grist mill products, \$39,478,076; leather, \$39,011,518; carpets, \$22,886,416; and cotton goods, \$18,431,773. No census report was issued on the ship-building industry. In 1893 the iron and steel industry had 199 furnaces, of which 109 were anthracite, 76 bituminous, and 14 charcoal; 221 rolling-mills; 90 steel-works, of which 20 were Bessemer, 2 Clapp-Griffiths, 1 Robert-Bessemer, 42 open hearth, and 25 crucible; 25 tin-plate works; 10 forges and bloomeries; 1,392 cut-nail machines; and 9 wire-nail works. The production of pig-iron aggregated 3,643,022 long tons; Bessemer-steel ingots, 2,126,220 tons; Bessemer-steel rails, 639,431 tons. There were 102 coking establishments, which had 25,744 ovens, burned 9,386,702 short tons of coal, valued at \$5,738,798, and produced 6,229,051 short tons of coke, valued at \$9,468,036.

Finance.—The revenue of the State is mostly derived from special taxes on corporations, including bank stock, foreign insurance companies, corporation stock, gross receipts, incomes, commutation of tonnage, licenses, etc., and in 1893 aggregated \$13,252,727. The total public debt Dec. 1, 1893, was \$8,288,061; sinking funds, \$5,883,065—net debt, \$2,404,996. The assessed valuations were, real estate, \$2,351,190,037; personal, \$607,585,757—total, \$2,958,775,794. Real estate is not taxed by the State, but is reserved for taxation by the counties for county purposes.

Banking.—In Dec., 1893, there were 399 national banks, with capital of \$73,695,490, individual deposits \$215,389,338, and surplus and profits \$48,348,038; 80 State banks, with capital of \$8,461,559, individual deposits \$38,841,538, and surplus and profits \$5,859,792; 16 savings-banks, with total depositors 252,980, aggregate deposits \$66,025,821, and surplus and profits \$8,946,593; and 68 investment, loan, and trust companies, with aggregate authorized capital of over \$35,800,000—showing a total banking capital of nearly \$118,000,000, and deposits of over \$320,000,000.

Building and Loan Associations.—The numerous building and loan associations have been an agency of immense value in enabling the people to provide themselves with homes. In June, 1894, the State bureau of statistics presented the following estimates for 1,239 such associations: Assets, \$103,943,364; cash income, one year, \$44,432,686.57; matured shares and withdrawals, one year, \$12,933,970.56; average assets per association, \$83,892.14; total expenses, one year, \$381,636.78; salaries, one year, \$328,636.78; total membership, 272,580; total borrowers, 81,658; and total shares, 1,651,814.

Post-offices and Periodicals.—On Jan. 1, 1894, there were 4,939 post-offices in the State, of which 248 were presidential (10 first-class, 58 second-class, 180 third-class) and 4,691 fourth-class, with 1,485 money-order offices, 52 money-order stations, and 18 postal-note offices. There were 1,408 newspapers and periodicals, of which 183 were daily, 3 tri-weekly, 21 semi-weekly, 925 weekly, 8 bi-weekly, 23 semi-monthly, 216 monthly, 8 bi-monthly, and 21 quarterly publications.

Means of Communication.—On June 30, 1892, there were in operation 9,022.87 miles of direct railway, with a total of 16,177.31 miles of track. The five companies (operating wholly or partly within the State) that showed the greatest earnings from freight traffic were the Pennsylvania, \$47,619,280.40; Philadelphia and Reading, \$26,792,121.20; New York, Lake Erie and Western, \$24,895,983.96; Lake Shore and Michigan Southern, \$14,884,871.53; and the Pittsburg, Cincinnati, Chicago and St. Louis, \$10,950,876.38—making a total of \$125,143,133.47. The five companies showing the greatest passenger earnings were the Pennsylvania, \$19,636,075.77; Lake Shore and Michigan Southern, \$7,421,844.48; Philadelphia and Reading, \$5,866,711.24; New York, Lake Erie and Western, \$6,530,134.27; and Philadelphia, Wilmington and Baltimore, \$4,591,661.68. There are in the State 9 canal and navigation companies, with a capital of

\$58,114,258, and a funded and floating debt of \$39,851,005.56. The cost of canals and fixtures was \$30,125,578.21; gross receipts of the year, \$2,803,953.82; expenses, \$607,416.

The number of street-railway companies reporting in 1892 was 221, with a capital of \$45,462,262, and a funded and floating debt of \$22,091,385. The cost of roads and equipment was \$41,636,011; mileage of road, 819,015; cars in use, 3,050, horses and mules, 10,878; cars propelled by electricity, 660, by cable, 324; passengers carried, 260,655,234; total receipts, \$14,629,704; expenses, \$8,188,745; and value of real estate, \$2,849,578. The number of telegraph and telephone companies was 23, with a capital of \$99,578,652, and a funded and floating debt of \$19,327,469. The cost of lines and equipments was \$4,920,327; length of lines in Pennsylvania, 13,538.87 miles; receipts in Pennsylvania, \$1,355,914; expenses in Pennsylvania, \$424,143.

Churches.—The census of 1890 gave the following statistics of the religious bodies having a membership of 5,000 and upward in the State:

DENOMINATIONS.	Organiza- tions.	Churches and halls.	Members.	Value of church property.
Roman Catholic	654	660	551,577	\$10,068,770
Methodist Episcopal	2,042	2,041	232,886	12,642,104
Presb. in the U. S. of America....	939	1,101	161,386	15,491,680
Lutheran, General Council.....	616	515	124,163	4,993,355
Reformed in the U. S.	754	624	122,944	5,121,328
Baptists, Regular.....	634	690	83,122	5,984,322
Lutheran, General Synod.....	596	562	78,938	3,672,650
Protestant Episcopal	369	446	54,720	10,854,151
Evangelical Association.....	662	660	42,373	1,590,895
United Presb. of N. A.	281	290	39,204	2,552,450
United Brethren in Christ	536	520	33,951	1,026,135
Dunkard, Conservative.....	101	251	14,194	354,008
Disciples of Christ	125	116	12,007	533,147
African Methodist Episcopal.....	87	117	11,613	605,000
Methodist Protestant	172	169	10,081	641,575
Mennonite	114	113	10,077	221,100
Friends, Hicksite.....	65	74	10,001	546,700
Congregational	108	108	9,818	672,588
Church of God.....	162	156	9,344	375,185
African Meth. Epis., Zion.....	62	62	8,689	256,150
Lutheran Synod. Conference....	26	26	6,559	284,915
Cumberland Presb.	52	50	6,210	257,500
Jews, Reformed.....	18	18	5,582	552,500
Lutheran, Joint Syn. of Ohio, etc	32	32	5,552	206,100
German Evan. Synod of N. A.	12	12	5,293	132,150

Schools.—The public-school system is under the direction of a State superintendent appointed by the Governor for four years, and a county superintendent, elected by the school directors for three years. The whole number of schools (1892-93) was 24,012; superintendents (county, city, and borough), 128; male teachers, 8,245; female teachers, 17,718; and pupils, 994,407. The total expenditures were \$16,410,976; local tax levied (outside of Philadelphia), \$7,866,101; State appropriation, \$5,000,000; estimated value of school property, \$42,679,504. There were 14 normal schools, maintained partly by the State and partly by fees, to which, since their organization, the State has appropriated an aggregate of \$1,892,000. Text-books in all public schools are free. There are 34 colleges and universities, including 6 business colleges, with 750 instructors and professors, and 10,257 students, 1,559 of whom were in Girard College and 866 in business colleges. There were also from 40 to 50 seminaries, academies, institutes, and other secondary schools. Theological seminaries were maintained by the Moravians, Lutherans, Unitarians, Presbyterians, and other denominations. The various medical schools in Philadelphia had nearly 250 instructors and professors and about 2,500 students. The State was a pioneer in providing soldiers' orphans' schools, and three such schools are still maintained.

Libraries.—According to a U. S. Government report in 1891 on public libraries of 1,000 volumes and upward each Pennsylvania had 351 libraries, which contained 2,318,456 bound volumes and 387,511 pamphlets.

Charitable, Reformatory, and Penal Institutions.—The State supports a great number of charitable institutions, including five hospitals for the insane, a newly erected special hospital for the chronic insane, and institutions for the blind, for the deaf and dumb, and for the feeble-minded. There are two penitentiaries, the Eastern and the Western, two reform schools for wayward youth, and an industrial reformatory for persons convicted of first offenses. An effort is made in all the penal and reformatory institutions to provide educational and industrial training.

Political Organization.—The Legislature is called a General Assembly, and consists of a Senate of 50 members,

chosen for four years (one-half every two years), and a House of Representatives of about 200 members (in 1895, 204), chosen for two years. The membership of both is based on population, and the State is divided into districts after each U. S. census. Senators must be twenty-four years of age and representatives twenty-one years; both must have been citizens of the State four years and of their districts one year next before election, and must reside in their districts during term of service. All laws must be passed by bill, and no bill save the appropriation bill can contain more than one subject, which must be clearly expressed in its title. The purpose of a bill can not be changed during its passage. Each bill must be referred to a committee, be reported therefrom, and printed for the use of the members before it can be considered. It must be read at length on three different days in each house, and on its final passage must receive the affirmative votes of a majority of all the members elected to each house. Amendments made by either house must be concurred in by a majority of all the members of the other, and reports of conference committees must be adopted by a majority of the members of each house. All bills for raising revenue must originate in the House of Representatives, but the Senate may amend such bills. All bills and resolutions passed must be signed by the presiding officer of each house, in its presence, after the titles have been publicly read, and the fact of signing must be publicly entered on the journals. The chief executive is the Governor, elected for four years; salary, \$10,000 per annum. Besides exercising the usual administrative powers he may veto any bill (or, in an appropriation bill, any separate item), which to become operative must be re-enacted by a vote of two-thirds of the members of each house. He appoints (with the advice and consent of the Senate) a secretary of the commonwealth, attorney-general, and adjutant-general, to serve at his pleasure; a superintendent of public instruction for four years, a commissioner of insurance for three years, a superintendent of public printing for four years, and a State librarian for three years. Other administrative officers are elected—viz.: a State treasurer for two years, auditor-general for three years, and secretary of internal affairs for three years. The treasurer and auditor-general can not serve two successive terms. A Lieutenant-Governor is elected at the same time and for the same term as the Governor. He presides over the Senate, has a vote only in case of a tie, and succeeds to a vacancy in the office of Governor, in which event the president *pro tem.* of the Senate becomes Lieutenant-Governor. The judicial power is vested in a Supreme Court, courts of common pleas, orer and terminer, general jail delivery, quarter sessions of the peace, orphans' courts, magistrates' courts, and such others as the Legislature may establish, and in aldermen and justices of the peace. The Supreme Court is the highest court of both original and appellate jurisdiction. It consists of seven judges, elected for twenty-one years, and ineligible to reelection, the oldest in commission sitting as chief justice; salary, \$8,000 per annum. The State is divided into judicial districts, varying in number according to population, for the courts of common pleas. Each county containing 40,000 or more inhabitants forms a separate district; those containing less are combined. Districts are fixed by the Legislature within limits prescribed by the constitution. The judges are elected for a term of ten years. Special provisions exist for the two most populous counties, Allegheny and Philadelphia.

The right to vote at all elections is possessed by every male citizen, twenty-one years of age, who has been a citizen of the U. S. at least one month, has resided in the State one year (six months if, having previously been a qualified elector, or native-born citizen of the State, he shall have removed therefrom and returned), immediately preceding the election; has resided in the election district where he shall offer to vote at least two months immediately preceding the election; and, if twenty-two years of age or upward, has paid within two years a State or county tax, which shall have been assessed at least two months and paid at least one month before the election. Women twenty-one years of age and over are eligible to every office of control or management under the school laws of the State. General elections are held on the Tuesday next following the first Monday in November. All regular municipal elections (for city, ward, borough, and township officers) are held annually on the third Tuesday in February.

History.—The first settlement within the bounds of Pennsylvania was at Tinicum island by Swedish colonists, under

John Printz's administration. In 1655 the Dutch from New Amsterdam marched upon these Swedish settlements and took formal possession of the country. In 1660 a Dutch settlement was planted at the Minisinks, the settlers being colonists from New Amsterdam. When the English captured New Amsterdam, in 1664, the colony on the Delaware followed its fortunes, and remained under the government of New York (except for a part of 1673-74, when the Dutch recaptured it) until Mar. 4, 1681, when Charles II. granted to William Penn the "tract of land in America lying N. of Maryland, on the E. bounded with Delaware river, on the W. limited as Maryland, and northward to extend as far as plantable." Penn landed at New Castle (now in Delaware) Oct. 27 (o. s.), 1682. During 1683 he organized his new government and provided places for the many immigrants (mostly Friends) who began to flock thither. He returned to England in 1684 for the settlement of the boundary between Pennsylvania and Maryland. In 1699 he again visited his province, remaining till 1701, and gave the colonists a new constitution and Philadelphia a charter. From this time to 1720 emigration to Pennsylvania constantly increased. Penn died in 1718, and his heirs succeeded him as proprietaries. The war between France and Great Britain in 1744 led to apprehensions of trouble with the Indians, whom the French were stimulating to hostility against the English colonists. Great efforts were made to retain the friendship of the Indians, but all in vain. The Shawanese were the first to break faith with the colonists. The French, having secured them as allies, constantly increased their aggressions. The boundary between Pennsylvania and Maryland was run in 1766-67 by Charles Mason and Jeremiah Dixon. In 1768, by a treaty with the Six Nations, a large tract of land, called the New Purchase, embracing most of the counties of Northern and Northwestern Pennsylvania, was conveyed to the proprietaries, and at once induced an enlarged immigration. Pennsylvania took an active part in the movement for independence. (See PHILADELPHIA.) The massacre of the Wyoming settlers by British soldiers, Tories, and Indians occurred in July, 1778, and was summarily avenged by the McIntosh and the Sullivan expeditions. In 1778 the royal charter was annulled, and the Penns were allowed £130,000 for their unsettled lands in the State. Pennsylvania furnished more than her full quota of troops for the Revolutionary war. Slavery was abolished in 1780. The "Whisky Insurrection" in the western counties occurred in 1794; it occasioned great excitement, but was put down without bloodshed. A less considerable insurrection was attempted four years later, but was promptly suppressed. In 1799 the State capital was removed to Lancaster, and in 1812 to Harrisburg. After the war of 1812 the State was largely engaged in colossal enterprises of internal improvement—canals and railways—which for some years embarrassed her finances. In 1859 the petroleum discoveries were made. The State was three times invaded by the Confederates—first on Oct. 10, 1862, when Chambersburg was captured and military stores burned; second, by Gen. Lee, when the battle of Gettysburg was fought on her territory; third, in July, 1864, when Chambersburg was burned. The State furnished nearly 400,000 soldiers for the civil war (1861-65).

The constitution of 1776 was framed on the advice of the Continental Congress. A convention, called on the recommendation of a conference of county committees (ignoring the Assembly of the province then in session), drew up a constitution and provided for setting it in operation. It was not submitted to vote of the people. It provided for a single legislative assembly and a plural executive (president and council). It also provided for a council of censors, two from each county, to meet every seven years, with authority to investigate breaches of the constitution and recommend changes in it; and it contained the germ of the modern referendum by requiring all public bills to be printed for the consideration of the people before their final passage, which, except on occasions of public emergency, was to be deferred till a succeeding session. On Sept. 15, 1789, the Assembly provided for a convention to amend the constitution. The convention met Nov. 24, completed its work Feb. 20, 1790, voted that the new constitution be published, adjourned till Aug. 9, and on Sept. 2 adopted it with some modifications. It was not submitted to the popular vote. By this constitution the number of representatives was to be not less than 60 nor more than 100, distributed among the counties in proportion to taxable inhabitants. A senate was created to consist of not more than one-third nor less than one-fourth the number of the lower house. The

executive power was vested in a Governor, to be elected for a term of three years. Judges were to be appointed to serve during good behavior (seven years having been the previous term), and to receive a fixed compensation. This constitution introduced a highly important change of the old English law of libel, by providing that "in prosecutions for the publication of papers investigating the official conduct of officers or men in a public capacity, or where the matter published is proper for public information, the truth thereof may [might] be given in evidence." In 1837 and 1838 another convention was held which reduced the patronage of the Governor, gave the election of all county officers to the people, and limited the term of judges to fifteen, ten, and five years. Amendments to this constitution were proposed by the Legislature and adopted by the people—one in 1850, four in 1857, three in 1864, and one in 1872. In 1872 and 1873 another convention framed the present constitution, which introduced many important changes, and was ratified Dec. 16, 1873. Under this constitution a Governor can not be elected his own successor.

GOVERNORS OF PENNSYLVANIA.

COLONIAL.			
<i>Under the Swedes.</i>			
Peter Minuit	1638	John Evans (gov.)	1704
Peter Hollandaer	1641	Charles Gookin (lieut.-gov.)	1709
John Printz	1643	Sir Wm. Keith (lieut.-gov.)	1717
John Pappogoya	1653	Patrick Gordon (lieut. gov.)	1726
Johan C. Rysingh	1654	Cornel. J. Logan, pres.	1736
		Geo. Thomas (lieut. gov.)	1738
		Cornel. A. Palmer, pres.	1747
		Jas. Hamilton (lieut.-gov.)	1748
		Robt. Hunter Morris (lieut.-gov.)	1754
		William Denny (lieut.-gov.)	1756
		Jas. Hamilton (lieut.-gov.)	1759
		John Penn (gov.)	1763
		Council (J. Hamilton, pres.)	1771
		Richard Penn (gov.)	1771
		John Penn (lieut.-gov.)	1776
<i>Under the Dutch.</i>			
John Paul Jacquet	1655		
<i>Colony divided into city and company</i>	1657-62		
Jacob Alricks (city)	1657		
Alex. d'Hinoyossa (city)	1659		
Goeran Van Dyke (company)	1657		
Wm. Beekman (company)	1658		
<i>Colony united</i>	1662		
Wm. Beekman	1662		
Alexander d'Hinoyossa	1663		
<i>Captured by the English</i>	1664		
<i>Under the English.</i>			
Col. Richard Nicolls (gov.)	1664		
Robert Carr (deputy gov.)	1664		
Col. Francis Lovelace	1667		
<i>Under the Dutch.</i>			
Anthony Colve (gov.)	1673		
Peter Alricks (deputy gov.)	1673		
<i>Under the English.</i>			
Sir Edmund Andros	1674		
<i>The Proprietary Government.</i>			
Wm. Markham (dep. gov.)	1681		
Wm. Penn (proprietary)	1682		
The Council (Thos. Lloyd, president)	1684		
Commissioners appointed by Penn	1688		
John Blackwell (dep. gov.)	1688		
The Council (Thos. Lloyd, president)	1690		
Thos. Lloyd (d. g. of prov.)	1691		
Wm. Markham (deputy governor lower counties)	1691		
<i>Under the Crown.</i>			
Benj. Fletcher, Governor of New York (governor)	1693		
Wm. Markham (lieut.-gov.)	1693		
<i>Proprietary Government.</i>			
Wm. Markham (gov.)	1695		
Wm. Penn (proprietary)	1699		
Andrew Hamilton (gov.)	1701		
Council (E. Shippen, pres.)	1703		
Wm. Penn (gov.)	1706		
John Penn (gov.)	1726		
John Penn (lieut.-gov.)	1726		
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STAGE.

Thomas Mifflin	1790
Thomas McKean	1799
Simon Snyder	1808
William Findlay	1817
Joseph Herster	1820
John Andrew Shulze	1823
George Wolf	1829
Joseph Ritner	1845
David R. Porter	1839
Francis R. Shunk	1845
Wm. F. Johnston	1848
William Bizer	1852
James Pollock	1855
William F. Packer	1858
Andrew G. Curtin	1861
John W. Geary	1867
John F. Hartranft	1873
John F. Hartranft	1876
Henry M. Hoyt	1879
Robert E. Pattison	1883-87
James A. Beaver	1887-91
Robert E. Pattison	1891-95
Daniel H. Hastings	1895-

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torical Society, 1888); *The Pennsylvania Magazine of History and Biography*, 18 vols.; and numerous county and local histories.

GEORGE W. ATHERTON.

Pennsylvania College: an institution at Gettysburg, Pa.; founded in 1832, under the auspices of the Lutheran Church. In 1834 the State of Pennsylvania appropriated \$18,000 to the institution, and, for a number of years, annually \$1,000. By an act of the Legislature in 1850 one-third of the value of the funds of Franklin College of Lancaster, Pa., was transferred to Pennsylvania College, to establish in it a professorship known as the "Franklin professorship." A preparatory department has been from the first connected with the institution. The control is in the hands of a board of thirty-six trustees, six of whom are nominated by the alumni association, but all of whom are elected by the board itself as vacancies occur. The president (1894) is Rev. Harvey W. McKnight, elected in 1884. There are professorships of the German language and literature, of the English language and literature, of the natural sciences, of hygiene and physical culture, and of the English Bible. The institution possesses chemical and philosophical apparatus, a laboratory for practical chemistry, a cabinet of mineralogy, and an astronomical observatory. Its libraries and those of its literary societies contain over 21,000 volumes. Since 1888 a large recitation and library hall has been erected at a cost of \$91,000, also Bena Chapel, and Pennsylvania and Linnæan halls and the chemical laboratory have been remodeled and improved at a cost of about \$40,000. The number of students was 240 in 1893-94.

H. W. MCKNIGHT.

Pennsylvania Dutch (more correctly *Pennsylvania German*): a South-German dialect, due to the fusion of forms existing on the upper Rhine in Rhenish Bavaria, Baden, Darmstadt, Württemberg, German Switzerland, and Alsace, and taking up in the U. S. (chiefly in Pennsylvania) an English element, as English itself took up native words like *hickory*, or French forms like *prairie*, *bayou*, and *ville*. The characteristics of the dialect may be learned from the excellent poems in it by the late H. Harbaugh, D. D. (1870), and in Haldeman's *Pennsylvania Dutch* (1872). It is a mistake to suppose that it is a corrupt dialect of German, or in any way akin to such broken English as Leland in his *Hans Breitmann's Ballads* attributes to European German. Careless speakers of English unconsciously corrupt their language with Germanic idioms, as in the use of "dumb" for *dull* or *stupid*, and "red beet" for *beet*, translating *die rothe Rübe*, because in German a "white" beet (*weisse Rübe*) is a turnip.

Pennsylvania, University of: an institution which originated as a charity school in 1740; was founded as an academy in 1749; incorporated as a college in 1755; erected into a university, the first in the U. S., in 1779. The medical department, the oldest in America, was founded in 1765, and the law department in 1789. In 1872 the institution was removed to its present site in West Philadelphia, Pa., where it has above 52 acres. The twelve departments of the university occupy twenty-three buildings. The college embraces the courses in arts and science; the Towne Scientific School, including the courses in civil, mechanical, and electrical engineering, chemistry, etc.; the School of Architecture; the School of Biology; the School of American History; and the Wharton School of Finance and Economy. These are all four-year courses, with the exception of the two-year courses in history. In the science courses the degree of B. S. is given after four years, and the technical degree after prescribed post-graduate work. The college offers altogether 450 courses. The department of medicine had a three years' course up to the fall of 1893, after which it is four years. Closely connected with it are the University Hospital, with accommodations for over 200 patients; the auxiliary department of medicine, which makes provision for advanced study in medical science; and the recently endowed Wistar Institute of Anatomy and Biology. The Dental School has a three years' course, and is thoroughly equipped, the students using, with the medical students, the largest chemical instruction laboratory building in the world. The veterinary department occupies four buildings erected for its use, two of these being devoted to the Veterinary Hospital. The course of instruction lasts three years. The department of law has a course of three years, with additional post-graduate instruction where desired. The method of instruction is partly by lectures and partly by moot-courts. The department of hygiene, opened in 1892, is situated in a large building, with ample facilities

for the study of practical hygiene and bacteriology, and for special research. The university's courses leading to the post-graduate degrees of M. A., M. S., and Ph. D. are under the supervision of the department of philosophy. Allied with this is the graduate department for women, which makes free provision for a certain number of advanced students. The university museums are very large, and the university libraries number together over 120,000 bound volumes, and more than that number of unbound volumes and pamphlets. In 1894 there were 87 professors, 179 other teachers, and 2,180 students.

WILLIAM PEPPER.

Penny [M. Eng. *peni* < O. Eng. *penig*, *pening*, *pending*. For ending, cf. *shilling* and *farthing*. Etymology obscure]: an English coin, first mentioned in the laws of Ina, King of Wessex, about 695 A. D. It was at first of silver, and at one time weighed 22½ grains troy, but its value and weight slowly declined. The first copper pence were introduced in 1797. At present the British penny is of bronze. It is the twelfth part of a shilling, and is designated by the letter *d*, the initial of the Lat. *denarius*. The name is sometimes also applied to the U. S. cent.

Penn Yan: village; capital of Yates co., N. Y. (for location, see map of New York, ref. 5-E); at the foot of Keuka Lake; on the Fall Brook and the North. Cent. railways; 43 miles N. by W. of Elmira, 53 miles S. E. of Rochester. It is the distributing center of the largest grape-growing region E. of California, being surrounded by 16,000 acres of vineyard. It has daily steamboat connection with Hammondsport, at the head of the lake, and derives good power for manufacturing from the lake. There are 2 national banks with combined capital of \$100,000, a State bank with capital of \$50,000, an academy, and a monthly and 3 weekly newspapers. Pop. (1880) 3,475; (1890) 4,254.

EDITOR OF "CHRONICLE."

Pennyroyal [(by attraction to *penny*) < O. Eng. *puhall* *royal*, transl. of Lat. *pulegium regium*; *pulegium*, fleabane, pennyroyal (deriv. of *pulex*, flea), whence Eng. *puhall* + *regium*, royal]: a fragrant labiate herb of the Old World (*Mentha pulegium*) growing wild or cultivated in gardens, and used in Europe in domestic medicine as a stimulant and carminative. It is a perennial herb, very common in Southern Europe, and still hardy in the northern part of Germany. Its odor is quite distinct from that of other mints, having in its sweetness something sour which at first is found very refreshing, but soon becomes nauseous. In the U. S. the name is given to *Hedeoma pulegioides* (low pennyroyal) and *Mentha canadensis* (high pennyroyal), both having very nearly the odor of the English pennyroyal. They are found all over the U. S., from Mexico to Canada, mostly in barren and arid places. They are valuable as deobstruents, carminatives, and diaphoretics.

Pennyweight: See WEIGHTS AND MEASURES.

Penobscot Bay: an inlet of the Atlantic Ocean penetrating the coast of Maine for 30 miles, having Waldo and Knox Counties on the W. and Hancock County on the E. Its deep waters abound in islands and good harbors; principal tributary, Penobscot river.

Penobscot Indians: See ALGONQUIAN INDIANS.

Penobscot River: the longest and largest river of Maine, and the most important navigable stream in the New England States. It rises in Somerset County, near the Canada line, flows E. into Chesuncook Lake, thence S. E. to its union with the Mattawamkeag, having 12 miles above united in the town of Medway with the Sebocis or east branch of the Penobscot. Afterward its course is S. by W. to Penobscot Bay; its total length is 300 miles. It is navigable for large ships to Bangor, 60 miles, where the tide rises 17 feet. Above this point small steamers run for many miles. Its upper waters afford valuable motive-power, and great numbers of logs are floated from the forests of Northern Maine to Bangor, and then sawed for lumber. The valley of the Penobscot has an area of 8,200 sq. miles. The mean outflow of water is given as 146,250 cubic feet per minute, but this enormous motive-power is only in small part utilized.

Penology: See PRISON DISCIPLINE.

Penrith: town; in the county of Cumberland, England; 18 miles S. S. E. of Carlisle (see map of England, ref. 4-F). It is well built, and has a ruined castle in which Richard III. is said to have lived before he came to the throne. There are tanneries, breweries, and sawmills. Pop. (1891) 8,981.

Pensacola: city, port of entry, and capital of Escambia co., Fla. (for location, see map of Florida, ref. 2 B); on Pensacola Bay, and the Louisv. and Nashv. and the Pensacola and Perduco railways; 6 miles N. of the Gulf of Mexico, 48 miles E. of Mobile. It has an excellent landlocked harbor with from 23 to 26 feet of water on the bar; was a place of much importance during the Spanish and English government of Florida; and is the site of a U. S. navy-yard, of Forts McRae and Pickens, and of the ruins of the old Spanish fortresses of San Miguel and San Bernardo. The city has gas, electric-light, water and street-railway plants, and contains 11 public-school buildings, public-school property valued at over \$36,700, U. S. Government building (cost \$250,000), opera-house (cost \$75,000), court-house (cost \$45,000), State armory, several public parks, 2 national banks with combined capital of \$200,000, and a daily and a weekly newspaper. It has a large foreign and domestic trade in lumber, timber, shingles, fresh fish, and coal. The climate is generally healthful, the sanitary and quarantine regulations of the port being of a character to preclude the possibility of further introductions of yellow fever, which in nearly every instance was brought by vessels from infected ports. In 1893 the city had an assessed valuation of \$2,503,400, and a net debt of \$279,754. Pop. (1880) 6,845; (1890) 11,750; (1895) 14,084. Editor of "News."

Pensacola Bay: an inlet of the Gulf of Mexico; at the western extremity of Florida, extending inland N. E. about 35 miles, affording a deep, capacious, and commodious harbor. It is divided into Escambia Bay on the W. and the Bay of Santa Maria de Galvez on the E., and receives Escambia, Black Water, and Yellow Water rivers. The entrance is a mile wide between Santa Rosa island, on the E. defended by Fort Pickens, and the entrance point of the mainland on the W., on which stands Fort McRae. Less than 2 miles N. of the latter stands the old Spanish fort of San Carlos de Barrancas, and in its immediate vicinity a naval hospital, extensive barracks, and a lighthouse, while a short distance N. E. is the navy-yard, which was surrendered to the Florida militia Jan. 12, 1861, not long before the outbreak of the civil war, but recovered by the Federal forces, after sharp engagements, early in 1862.

Pensions [from Lat. *pen'sio*, payment, deriv. of *pen'dere*, *pen'sum*, weigh, weigh out, pay]; allowances of money, generally in fixed amounts and annual payments, made by the government to certain individuals or to their families and representatives, in consideration of some public services performed or supposed to have been performed by them. In Great Britain, besides large sums devoted to pensioning army and navy men, pensions are conferred upon the judges of the higher courts and upon many other civil officers who have performed their duties for a specified number of years and then resigned their active functions. They are also frequently granted to distinguished and meritorious authors, artists, scientific men, inventors, and the like, or to their widows or families, for the purpose of rewarding personal merit and of encouraging literature, art, and science. The policy of the U. S. Government has confined the bestowment of pensions to the officers and privates who have served in the army or navy during the wars in which the republic has been engaged, or who have been wounded or otherwise disabled while in active service, and to their widows, children, and other dependent relatives. The provisions of the existing laws relating to pensions in the U. S. are contained in the Revised Statutes of the U. S. (§§ 4692-4791, and later).

Pentacrinus [Mod. Lat., from Gr. *πέντε*, five + *κρίνον*, lily]: a genus of Crinoids (see CRINOIDEA) containing nine living and many fossil species, most abundant in the Jurassic. The living species are inhabitants of the deeper portions of the Atlantic and Pacific Oceans.

Pentam'eter [from Gr. *πεντάμετρος*, of five measures; *πέντε*, five + *μέτρον*, measure]: properly, a verse of five feet, but the name is usually given to the synopated dactylic hexameter of Greek and Latin elegiac poetry. (See ELEGIAC DISTICH.) It consists of two cola (like the masculine first colon of a hexameter) with invariable caesura between, the entire feet of the second colon always being pure dactyls:

αἶψα ἀνδρῶν γαῖαν ἐπιστρέφει.

Panditur ad nullas ianua nigra preces.

Never is death's dark door opened at human appeal.

The third foot is often to be read with a pause instead of prolongation of the syllable.

The name originated from the absurd assumption that the verse was — — — — —, though the correct reading is explicitly taught by ancient authors.

MILTON W. J. WELLS.

Pentateuch [from Lat. *pentateuchus* — Gr. *πεντάτευχος*; *πέντε*, five + *τεύχος*, implement, book, deriv. of *τεύχω*, prepare]; the collective name of the first five books of the Old Testament—Genesis, Exodus, Leviticus, Numbers, and Deuteronomy. It originated from the Greek translators and Fathers; the Jews themselves called this division of their sacred book *Torah*, the Law. These and the book of Joshua form the **HEXATEUCH** (*q. v.* for authenticity, etc.). See also the article **BIBLE**.

Pentathion'ic Acid: an acid of the composition $H_2S_4O_6$, prepared by the action of hydrogen sulphide, H_2S , on a solution of sulphur dioxide, SO_2 , in water. It is unstable, and very little is known about it.

Pentecost [from Lat. *pentecoste* — Gr. *πεντηκοστή*, the fiftieth (sc. *ἡμέρα*, day), deriv. of *πεντήκοντα*, fifty]; one of the three principal festivals of the Jews, celebrated on the fiftieth day after the 15th Nisan, the second day of the Passover (Lev. xxiii. 15, 16), whence the name. It was originally called the "Feast of Weeks" (took place at the beginning of harvest-time, hence also its other name, "Feast of Harvest"), was characterized by the offering, as "first fruits," of two loaves of leavened bread made from new grain, and was a period of liberality to the poor. In modern times the Jewish festival of the Pentecost lasts two days, and the anniversary of the giving of the Law on Sinai has been combined with the earlier festival. In the Christian churches the word Pentecost has a different meaning, derived from the occurrences related in Acts ii.—viz., the descent of the Holy Spirit upon the infant Church ten days after the Ascension, the gift of tongues, and the conversion of 3,000 persons. In the English Church, Pentecost is known as Whitsunday or Whitsuntide, from the white garments formerly worn by candidates for baptism.

Revised by S. M. JACKSON.

Pentecost, GEORGE FREDERICK, D.D.: clergyman and author; b. at Albion, Ill., Sept. 23, 1842; learned the trade of a printer, then studied law. He became a member of Georgetown College, Kentucky, which he left in 1862 to serve in the Union army. He was the pastor successively of five Baptist churches, but from 1881 to 1890 he was pastor of a Congregational church in Brooklyn, N. Y. For many years he has been engaged in evangelistic work in the U. S., in India, and in Great Britain. He has written *Bible Studies for 1889* (1888); *The Gospel of Luke* (1889); and several religious books, besides tracts. In 1885 he became the editor of *Words and Weapons for Christian Workers*.

G. P. FISHER.

Pentland Firth: a channel connecting the Atlantic with the German Ocean, and separating the Orkney islands from Scotland; is 17 miles long, from 6 to 8 miles broad, and annually passed through by about 4,000 vessels, though it is very difficult to navigate.

Pennu'bra: See ECLIPSE.

Pen'za: government of European Russia; lying around the rivers Moksha and Soora (see map of Russia, ref. 8-F). Area, 14,997 sq. miles. The ground is mostly level and somewhat elevated, and the soil fertile. Wheat, flax, hemp, tobacco, hops, and beetroots are raised; forests of oak-trees cover nearly one-third of the country. Besides agriculture, the principal branch of industry, manufactures of linen stuffs, spirits, glass, and beetroot-sugar are carried on. Pop. (1890) 1,596,500. The capital, Penza, on the Soora, has a cathedral, a large park, and manufactures of paper, soap, spirits, beetroot-sugar, etc. Pop. (1890) 47,701.

Penzance': town; in the county of Cornwall, England; at the head of Mount's Bay; 80 miles S. by W. of Plymouth and the terminus of the Great Western Railway (see map of England, ref. 15-B). It has an esplanade commanding picturesque land and sea views, a harbor, forming a tidal basin of 21 acres, with docks and two piers. The chief buildings, principally constructed of granite, include the public rooms in the Italian Renaissance style and the market-house in the Grecian style. The churches of St. Mary and St. Paul are built of cut granite in the Perpendicular and thirteenth century styles, respectively. The most important industries are the mackerel and pilchard fisheries and market gardening. The mild climate and the beauty of the surroundings attract a great number of visitors. Pop. (1891) 12,448.

Pe'ony [from O. Fr. *pione* > Fr. *pivoine* < Lat. *pæonia* = Gr. *παῖωνία*, deriv. of *Παῖων*, *Παῖον*, the god of healing. See **PÆAN**]: any herb or shrub of the genus *Pæonia*, family *Ranunculaceæ*. The U. S. has but one native species, *P. brownii*, of the Pacific States and British America. It has small purple flowers. The various Old World species are cultivated as ornamental plants. The flowers are generally showy. Of the many artificial varieties some are fragrant. All have a poisonous principle, and some species were once employed in medicine, but none are much used at present. The seeds and roots of some species are used as food by wild tribes in Asia and America. The finest varieties in garden-culture belong to *P. officinalis*, *albifolia*, *tenuiflora*, *paradoxa*, etc. The tree-peony of Japan (*P. moutan*) affords some very fine varieties. Revised by L. H. BAILEY.

People's Party: a political party in the U. S. whose leading principle is opposition to the control exerted by wealth. The idea prevails, especially in the West and South, that the laws are largely framed and executed in a manner to give undue advantage to those who are unscrupulous in the use of money, and that this is the prime reason for the great inequality in the distribution of property. According to the estimate of special census agent G. K. Holmes, 9 per cent. of the people own 71 per cent. of the national wealth, while Thomas G. Shearman has estimated that less than 50,000 people own half.

Principles and Arguments.—The great increase in the proportion of business done by corporations, with the resulting concentration of capital into the hands of a few managers and the temptation to use it to protect or procure valuable franchises or trade advantages, together with the preservation of monopolies and the expense of securing elections (which appears to be from \$7,000 to \$13,000 for a Congressman, the salary of whose term is only \$10,000), have introduced an era of official venality unparalleled since the days of Walpole. To such an extent do rich men find their way into the Senate that the average income of a Senator is estimated to be above that of a British peer, stated by *London Truth* at \$135,000 per annum. This condition excites attention in Europe and leads to comments like that of Leroy Beaulieu, that money seems to be the legitimate sovereign of democracies.

Of the laws and lack of laws through which the rich are aggrandized, the chief attention of the Populists has been given to those creating or permitting (1) unequal taxation; (2) trusts and monopolies; (3) the single gold standard, excluding silver.

The burden of local taxation caused by the escape or unjust exemption of notes, stocks, and bonds—the peculiar property of the wealthy—is rapidly increasing. Though personal property increases much faster than real, its assessment relatively declines. This is roughly seen in the census data, which show an increase from 1870 to 1890 in the real estate taxed from 9,914 millions of dollars to 18,933, while the increase for the same time in personalty was from 4,264 millions to 5,718. The comptroller of the State of New York, in his report for 1890, gave his official opinion that in that State more than 2,500 millions of personal property unjustly escaped taxation. In Massachusetts it is the opinion of men versed in the subject that the people are defrauded of more than \$15,000,000 a year in taxes, a sum which at legal interest compounded for a generation would equal the whole valuation by the assessors. The taxes shirked by the wealthy fall over largely on the farmers, whose property is visible and can not escape, and, through rents, on to the working classes. The Populist calls for equal taxation of property, sometimes for doomage laws, and always for an income-tax.

As to monopolies, the substance of the Populist doctrine is that as the Government recognizes its duty to protect the citizen against the man who by superior physical strength wrongfully seizes his pocketbook, it is equally bound to protect him against the man who by superior financial strength or special privilege does the same. Therefore it calls for adequate control of such, and, where necessary for this purpose, for Government ownership and operation of monopolistic properties. As this is the first step in the plan of Edward Bellamy, the Nationalists are generally Populists.

The leading question, however, has been that of honest money, whose proper function is to buy always the same average amount of commodities. When A buys of B 1,000 bush. of wheat for \$1,000, payable in five years with interest, the money should give B, when the debt is paid, not the same amount of wheat, for that may have fallen or

risen, but the same average amount of all exchangeable commodities which it would buy when the debt was made. It need not give the same amount of labor, for that may have risen or fallen, and B has no more right to claim that than he has to claim the same wheat, though given by him in time of plenty and paid in time of famine. Neither can he justly claim more commodities if improved modes of production may have cheapened them. He gave to A a certain amount of commodities or capital for a rent called interest, and he has no better claim to be made whole for such a depreciation than he would have had he rented a house, to be made whole for a reduction in its value caused by the introduction during the tenancy of some improved mode of building. He would have suffered that loss had he kept his house or capital himself. All economists agree that there has been since 1873 a great increase in the purchasing power of gold. If the foregoing reasoning is correct, debtors have thereby been defrauded. Most economists agree that this is due to the demonetization of silver in 1873, and the smallness of the annual increment of gold since going into the money volume compared with the increase of demand; but the cause is immaterial. The extent of this appreciation of gold since 1873 is shown by various price-tables which substantially agree. Those of Augustus Sauerbeck show a decline in prices of 38.3 per cent. up to Nov. 1, 1892, and the financial depression of 1893 probably increased this to 44 or 45, which represents an increase in the purchasing power of money of about 80 per cent.

A conception of the hardship to debtors may be had by a rough estimate. The debts of the world are supposed to reach 150 billions of dollars. Suppose the volume since 1873 to have been 100 billions, and the average increase in the purchasing power of money has been 30 per cent., the unjust exaction from debtors will reach 30 billions in commodities, while the whole assessed value of the property, real and personal, of the U. S. in 1890 was only 24 billions. Declining prices also involve business stagnation. The Populists generally, restless at the great increase in the burden of their debts, propose fresh issues of paper and the free coinage of silver. Those in Massachusetts have proposed multiple standard money, involving the demonetization of gold and silver, and the substitution of a volume of irredeemable legal-tender treasury notes, issued only by the Government, and receivable for all its dues, the volume to be expanded or contracted according as it shall be found that the dollar will buy more or less in a given market than a predetermined average amount of a large number of commodities (say 100) selected as best representing all commodities. The purchasing power of the dollar would thus always be kept uniform.

The Farmers' Alliance.—The farmers, pinched by such conditions as rendered it very hard to pay their debts, bled by railroads and middlemen who sold them goods and made advances on their crops, began to organize societies for mutual advantage, education, and defense. The chief of these has been the Farmers' Alliance. Its effective beginning was in a small body organized at Poolville, Tex., July 28, 1879. The order, having extended into a few counties, formed, and obtained a charter for, a State alliance in Texas, Oct. 6, 1880. By 1882 120 sub-alliances had been organized. This order was consolidated with another of like purpose, the Farmers' Union of Louisiana. A national organization, the National Farmers' Alliance and Co-operative Union of America, was established at Waco, Tex., in Jan., 1887. The Agricultural Wheel, another like order, was also joined, subject to ratification of the subordinate bodies, and a constitution was adopted at a meeting of both orders at Meridian, Miss., Dec. 5, 1888. The Agricultural Wheel originated Feb. 15, 1882, at a meeting held in a log cabin near Des Arc, Ark. It was chartered in Aug., 1882, organized a State Wheel Apr. 7, 1883, and a National Wheel in 1886. In 1888 it reached 1,947 subordinate bodies, and had 75,000 members in Arkansas alone. The name given the consolidated order at Meridian was The Farmers' and Laborers' Union of America. The union was after ratification proclaimed as of Oct. 1, 1889. The order contained fully 1,000,000 members, and extended into eighteen States and Territories. The next national meeting was held at St. Louis, Dec. 3, 1889. The constitution was amended, and the name National Farmers' Alliance and Industrial Union adopted. These orders had been largely educational and social, and did not admit colored persons. They had established co-operative stores and united in various ways to promote agricultural interests. They were strictly non-partisan,

but were free to formulate political demands, and active within the old party organizations. Great interest had begun to be felt in all the kindred organizations representing the industrial masses to agree upon common political principles and unite to secure just legislation. Accordingly, the National Farmers' Alliance of the Northwest and the National Colored Farmers' Alliance met also at St. Louis at the same time. The Knights of Labor sent also their president, with other officers. Demands were formulated with the express concurrence of the latter, which were adopted, with those of later conventions, with some modifications by the People's Party in their national convention at Omaha in 1892. The next annual meeting of the National Farmers' Alliance and Industrial Union was held at Ocala, Fla., Dec. 2, 1890. Additional demands were made, and it was voted "that a free ballot and a fair count will be insisted upon and had for colored and white alike by every true Alliance man in America."

The Formation of the People's Party.—By this time, failure to secure favorable results through the old parties being apparent, a strong pressure existed for separate political action. The Alliance and its sympathizers had made in 1890 energetic contests in many sections in the South, mainly through the primaries, but in the Northwest at the polls. The results were greatest in Georgia and Kansas. In the latter State a Republican plurality of 80,000 was cut down to 8,000, the Legislature was carried (securing a U. S. Senator), and five Congressmen out of seven elected. The chairman of the executive committee at Ocala, stating that a third party was opposed in the South but favored in the West and Northwest, suggested a meeting of "delegates from all the organizations of producers" to decide the question. A committee was chosen to carry this into effect, and the St. Louis conference of Feb. 22, 1892, was the result. Another conference, to provide for a national ticket in 1892, if the St. Louis conference should fail to do so, was arranged for by individual delegates at Ocala, and held at Cincinnati on May 19, 1891. At St. Louis the third-party men gained control. The opponents were mainly from the South, and some of the leaders bolted afterward. A vote was passed requesting Alliance Congressmen to stay out of old-party caucuses. An address was adopted denouncing the old parties and declaring that a party representing the principles then agreed was necessary. Action which might be held to contravene the organic law of the order was taken by the delegates as individuals remaining in their seats after adjournment.

The national convention of the People's Party provided for by these conferences was held at Omaha, July 4, 1892, with 1,347 regularly elected delegates. A platform was adopted, of which the demands may be thus epitomized:

A national legal-tender currency, safe, sound, and flexible, issued by the Government only without the use of banks, direct distribution to the people at a tax not to exceed 2 per cent. per annum, to be provided as set forth in the Alliance sub-treasury plan or a better system, and by payments in discharge of obligations for public improvements. Free coinage of silver and gold at the ratio of 16 to 1. Increase of the circulating medium to \$50 per capita. A graduated income-tax. Limitation of State and national revenues to the necessary expenses of government economically and honestly administered. Government ownership and operation of railroads, telegraphs, and telephones. That land and natural sources of wealth should not be monopolized for speculation, and alien ownership of land should be prohibited. That land owned by railroads and corporations in excess of needs and land of aliens should be reclaimed by the Government and held for settlers.

Resolutions were adopted for a free ballot and a fair count, to be secured by the unperverted Australian secret-ballot system. For the application of the revenue of the graduated income tax to relieve the taxes on domestic industries; for fair and liberal pensions; for further restriction of undesirable immigration; for enforcement of the eight-hour law on Government work, with penalties; against the Pinkertons; for the initiative and referendum; for limiting the offices of President and Vice-President to one term; and against subsidies and private corporations.

On this platform James B. Weaver, of Iowa, was nominated for President, and James G. Field, of Virginia, for Vice-President. The vote for Weaver reached 1,041,028. He carried the States of Colorado, Idaho, Kansas, Nevada, and North Dakota, receiving twenty-two electoral votes. Five U. S. Senators and eleven Representatives were elected.

At the meeting at Memphis, Nov. 9, 1892, a new subordinate organization was formed in aid of the People's Party. It was called the Industrial Legion and was indorsed by the national executive committee. In 1894 1,000 subordinate legions were in existence.

HENRY WINN.

Peoria: city (settled in 1779); capital of Peoria co., Ill. (for location, see map of Illinois, ref. 4-D); on the Illinois river, and eleven main lines of railway; 45 miles W. N. W. of Bloomington, 160 miles S. W. of Chicago. It is at the foot of an expansion of the river known as Peoria Lake, has a water frontage of about 4 miles, and covers an elevated plateau extending back three-quarters of a mile to a bluff rising 120 feet above tide-water. On the bluff are many fine residences, and from it may be had many attractive views of the river valley and the adjacent country. An elaborate system of parks and driveways has been established. There are 35 miles of paved streets. The city is in a corn and coal region, is noted for its manufactures of spirits, and is the eighth grain-market in the U. S. It has an extensive commerce by rail and water with Chicago, St. Louis, and other large centers. There are 16 public-school buildings, public-school property valued at over \$500,000, court-house (cost \$300,000), U. S. Government building (cost \$250,000), cathedral (cost \$225,000), high-school building (cost \$75,000), new system of water-works, 3 libraries (High School, Law, and Public) containing over 55,000 volumes, 6 national banks with combined capital of \$1,250,000, 4 State banks with capital of \$700,000, 5 savings-banks, 2 private banks, 6 electric street-railways, gas and electric light plants, and a monthly, 6 daily, and 11 weekly periodicals. The census returns of 1890 showed that 554 manufacturing establishments (representing 90 industries) reported. These combined had a capital of \$15,072,567, employed 7,696 persons, paid \$4,327,637 for wages and \$9,979,907 for materials, and had products valued at \$55,504,523. The principal industries reported were, in the order of capital investment, the manufacture of agricultural implements, 7 establishments and \$967,366 capital; malt liquors, 4 establishments and \$874,496 capital; cooperage, 8 establishments and \$388,200 capital; foundry and machine-shop products, 14 establishments and \$372,072 capital; printing and publishing, 19 establishments and \$359,520 capital; planing-mill products, 5 establishments and \$343,132 capital; and flour and grist mill products, 8 establishments and \$280,100 capital. There are 14 distilleries, 5 grain elevators with a total capacity of 2,400,000 bush., 2 large glucose-factories, using 30,000 bush. of corn per day, an extensive chemical laboratory, flour-mills, straw-board mill, rolling mill, white lead works, stock-yards, and several meat-packing houses. The city expenditures during 1893 were \$338,785; bank clearings, \$82,836,982; grain receipts, 33,670,870 bush.; and internal revenue collection, \$13,389,736. In 1894 the city had an assessed valuation of \$8,869,644, and a net debt of \$614,500. Pop. (1880) 29,259; (1890) 41,024. EDITOR OF "JOURNAL."

Peoria Indians: See ALGONQUIAN INDIANS.

Pepe, GUGLIELMO: revolutionist; b. at Squillace, Italy, in 1783; served in the army of the Parthenopean republic, fought on the side of the French in Spain, and afterward under Murat. By the year 1815 he had risen to the rank of lieutenant-general. Sympathizing with the aspirations of the liberal party in Naples he joined the Carbonari, and in 1820 placed himself at the head of a military revolt. This was at first successful; Pepe entered Naples in triumph, and the king was forced to accept the constitution, but Austrian intervention, under the sanction of the Holy Alliance, soon restored the Bourbon tyranny. Pepe was defeated at Rieti Mar. 7, 1821, and fled to London, later to Paris. Having returned in 1848, he commanded the Neapolitan contingent against the Austrians, and distinguished himself by his brilliant defense of Venice. He afterward lived in Turin, where he died Aug. 9, 1855. His principal works are *Relation des Evénements Politiques et Militaires qui ont eu lieu à Naples en 1820 et 1821* (Paris, 1822; Italian and French); *Histoire des Révolutions et Guerres d'Italie en 1847-49* (Paris, 1850).

Pepin, Lake: an expansion of the Mississippi river; 27 miles long and from 2 to 3 miles wide, having Pierce and Pepin cos., Wis., on the N. E., and Goodhue and Wabashaw cos., Minn., on the S. W. It is surrounded by rocky ramparts of picturesque and inspiring appearance. The lake is not very deep.

Pepin (or Pippin) le Bref [Fr., Pepin the Short]: the first Carolingian king of the Franks; b. in 714; son of

Charles Martel and father of Charlemagne; became in 741 major-domus of Neustria and Burgundy under Childeric III., one of the *rois fainéants*, and in 747 succeeded his brother Carloman as major-domus of Austrasia and the Rhine country, including Thuringia and Suabia. In 749 he defeated the Bavarians, and in 752 was crowned King of the Franks by St. Boniface by authority of Pope Zachary; conquered Septimania from the Saracens 752-760; was again crowned by Pope Stephen III. 754; broke the power of the Lombards in Italy 754-756, and gave the exarchate of Ravenna and the Pentapolis to the holy see, the origin of the temporal power of the popes; overcame the Saxons 757; took Narbonne from the Saracens 759; waged a stubborn war with Guaifer, Duke of Aquitania, 760-768, and in the latter year procured the assassination of his valorous enemy. D. Sept. 18 or 24, 768. See FRANKS, THE.

Pepin of Héristal: founder of the Carolingian line of Frankish kings; a grandson of Pepin von Landen, mayor of the palace in Austrasia; became Duke of the Austrasian Franks 680, and in 687, by the battle of Testry, conquered Burgundy and Neustria, and afterward subdued the Frisians and ravaged Suabia. D. Dec. 16, 714 A.D. He never assumed the royal title, but exercised sovereign power in the name of four successive Merovingian *fainéant* kings. Charles Martel was his natural son.

Pepper [M. Eng. *peper* < O. Eng. *pipor*, from Lat. *piper* from Gr. *πίπερι*, *πέπερι*; cf. Sanskr. *pippala*, a kind of pepper, Pers. *pūpūl*, pepper]; a name applied to the pungent fruits of certain plants and to the condiment prepared therefrom. Black pepper is the product of a climbing shrub belonging to the family *PIPERACEÆ* (*q. v.*), with a smooth, woody stem from 12 to 20 feet long, with leathery, ovate, cordate leaves, and, opposite to each leaf, a solitary spike with hermaphrodite flowers, and fruits of the size of a pea and bright red when ripe. The plant is a native of the East Indies, but now extensively cultivated in most tropical countries. It was known to the Romans, and highly appreciated during the Middle Ages, when a pound of pepper was considered a royal present. It is now one of the most common spices. The white pepper of commerce is the same product with the outer covering removed. Red pepper is the product of a species of *Capsicum*, a genus of the Nightshade family especially *C. annuum* and *C. frutescens*, natives of South America, but now widely dispersed in warm countries. From these the Chili and Cayenne peppers are made. The commercial product is prepared by grinding the dried ripe fruits, adding flour to the powder, and baking the whole into cakes. These cakes are then ground into commercial pepper. In temperate climates many varieties of red peppers are grown for home use and as an ingredient of mixed pickles. These kitchen-garden peppers, while immensely variable, are no doubt all offspring of *Capsicum annuum*. Over thirty varieties are now in cultivation in the U. S. The most pungent of these are the so-called Cayenne and Chili varieties, which bear very long and slender finger-like fruits. The mild varieties, or so-called "sweet peppers," are fruits of great size and are somewhat hollow and furrowed. The Bull Nose, Sweet Mountain, and Grossum are common sorts of this type. Red peppers need a warm, quick soil and a forward exposure. As they continue to bear until cut off by frost, the largest product is obtained when the plants are started under glass. Jamaica pepper is the product of a species of *Eugenia* of the family *Myrtaceæ*, and various other species of *Piper*, as *P. longum*, *P. officinarum*, *P. methysticum*, and *P. betle*, yield pepper or pepper-like products. Both pepper and capsicum are useful gastric stimulants and carminatives. Cubebs, used in medicine, are the product of *P. cubeba* (*Cubeba officinalis*). L. H. BAILEY.

Pepper, WILLIAM, M. D., LL. D.: eleventh provost of the University of Pennsylvania; specialist in medicine; b. in Philadelphia, Aug. 21, 1843; son of Dr. William Pepper (Professor of Theory and Practice of Medicine, University of Pennsylvania, 1860-64); graduated at the University of Pennsylvania 1862; from the medical department 1864; lecturer on morbid anatomy 1868-70, on clinical medicine 1870-76; Professor of Clinical Medicine 1876-87; Professor of Theory and Practice of Medicine, succeeding Dr. Stillé, 1887; unanimously elected provost of the university 1881; resigned in 1894. During his administration the material equipment of the institution increased in value not less than \$2,500,000, and the Wharton School of Finance and Economics, the department of veterinary medicine, the School of Philosophy, the School of Biology, the School of American

History, the department of archaeology and palæontology, and the department of hygiene were added. He attended to his professional practice while organizing and moulding the university. He was medical director of the Centennial Exposition 1876, and for his services received from the King of Sweden the decoration of Knight Commander of the Order of St. Olaf. He was elected president of the Association of American Physicians 1891, and of the first Pan-American Medical Congress in Washington (1893). He founded *The Medical Times*, and was its editor 1870-71. His principal literary work has been the editing of the *System of Medicine*, by American authors (1885-86). Among his contributions to journals or the transactions of societies are *Trephining in Cerebral Disease* (1871); *Local Treatment of Pulmonary Cavities* (1874); *Catarrhal Irritation* (1881); *Report on the Mineral Springs of America* (1881); *Epilepsy* (1883); *Phthisis in Pennsylvania* (1886). Other publications of less technical character are *Sanitary Relations of Hospitals* (1875); *Higher Medical Education: The True Interest of the Public and the Profession* (1877); *Report of the Medical Department of the Centennial Exposition* (1877). He is associate editor in charge of the department of medicine, surgery, and collateral sciences, *Johnson's Universal Cyclopædia*. C. H. THURBER.

Pepperell, Sir WILLIAM: b. at Kittery Point, Me., June 27, 1696, of Welsh descent; the son of a fisherman; became a merchant and a distinguished Indian fighter; was a member of the Massachusetts council 1727-59; became chief justice of the common pleas court 1730; captured Louisbourg 1745; was made a baronet 1746; a colonel of the British army 1749; major-general 1755; lieutenant-general 1759; was acting Governor of Massachusetts 1756-58. D. at Kittery, Me., July 6, 1759.—WILLIAM PEPPERELL SPARHAWK, his grandson, took his name, title, and his great estates in 1774, but lost everything in consequence of his Tory principles in 1778. D. in London, Dec. 17, 1816.

Pepper Family: the *PIPERACEÆ* (*q. v.*).

Pepperidge: See BLACK-GUM.

Peppermint: a well-known labiate herb, the *Mentha piperita*, a native of the Old World, but completely naturalized in the New. This plant and its essential oil are extensively used in confectionery, and in medicine as a carminative and to conceal the flavor of nauseous drugs. Peppermint is extensively cultivated in Kalamazoo, St. Joseph, and Wayne cos., Mich., and in Wayne co., N. Y.

Pepsin [from Gr. *πέψις*, cooking, digesting, deriv. of *πέσσειν*, cook]; an active ferment of the gastric juice, secreted by the cells lining the "peptic" glands, and may be precipitated by alcohol or lead acetate. It has never yet been perfectly isolated, but is known to be one of the albuminoids or nitrogenous organic substances. Pepsin possesses the power of converting proteids into peptones in the presence of an acid and heat. It does not digest starches. Substances called pepsin, usually containing some of the active principle, are often prescribed in dyspepsia for the relief of the irritated stomach. Recently so pure a pepsin has been isolated that it will digest 25,000 times its own weight of albumen. Pepsin is usually derived from the stomach of the pig. Revised by H. A. HARE.

Peptonized Food: food prepared, through the action of pancreatin upon proteid substances, for the purpose of supplanting natural digestion in persons whose digestive apparatus is too feeble to carry out its function properly. This process of peptonization (see FERMENTATION) has become an exceedingly important one in dietetics, and is constantly resorted to. The method of peptonizing milk is as follows: From 5 to 20 grains of pancreatin and 5 grains of bicarbonate of sodium are added to a pint of milk at a temperature of 100°, and the process of peptonization is permitted to go on for varying lengths of time, according to the degree of digestion which is desired; 5, 10, or 20 minutes is the period generally allowed. After this time, if the digestive process is not stopped, the formation of a large amount of peptone gives such a bitter taste to the milk that most patients refuse to take it. Most of the pancreatin used for peptonizing foods is put up by manufacturing chemists in small glass tubes containing the proper quantities and ingredients for one process, or in compressed tablets containing the same quantity.

Peptonized beef is made in the same way by taking a quarter of a pound of finely minced lean beef, adding to it a pint of warm water, mixing it in a saucepan, and then

keeping the mixture at the temperature of the body, or a little above, for a few minutes. In the case of both the milk and the beef the process of peptonizing may be stopped in one or two ways, either by bringing the liquid to the boiling-point, which destroys the ferment, or by placing it upon ice, where it will rapidly cool. If it is desirable to stop the process absolutely, it is safer to bring the liquid to the boiling-point than to cool it.

H. A. HARE.

Pepys, *pep'is*, or *peps*, **SAMUEL**: diarist; b. Feb. 23, 1633; the son of a London tailor; was educated at Huntington, and at Magdalene College, Cambridge; became a Roundhead, but turned Royalist under Monk; held various positions in the navy and was secretary to the admiralty under James II. He was imprisoned 1679-80 for alleged complicity in the popish plot; president of the Royal Society 1684-86, and was in 1690 imprisoned for a time as a Jacobite. D. in London, May 26, 1703. Pepys's *Diary*, kept in shorthand (1660-69), has been often imperfectly reprinted since 1825, when Lord Braybrooke's incomplete edition appeared. Bohn's edition, by H. B. Wheatley (8 vols.), gives the complete annotated text as rendered from the MS. by Rev. Mynors Bright, with the exception of some details of his and wife's ailments, and some coarse expressions and stories, all such omissions being indicated by dots. This work is instructive and entertaining, giving us a valuable insight into the everyday life of the times of the later Stuarts. His *Memoirs of the Royal Navy* (1690), *Portugal History* (1677), and other writings, are of some value. He was an industrious collector of ballads, prints, maps, and music, a dabbler in the various sciences and the fine arts, and founder of the Pepysian Library at Magdalene College, Cambridge. See H. B. Wheatley, *Samuel Pepys and the World he lived in* (London, 1880).

Revised by H. A. BEERS.

Pequod or **Pequot Indians**: See ALGONQUIAN INDIANS.

Pe'ra [from Gr. *πέραν*, beyond]: a suburb of Constantinople. The term has been applied since the sixth century to the formerly waste plateau N. of the Golden Horn and beyond Galata. This region began to be inhabited after the Ottoman Conquest (1453), and has become the diplomatic quarter of the metropolis and the chief residence of the foreign Christians. In the great fire of 1870 more than 1,000 persons lost their lives, and over 6,000 houses were consumed, but the suburb has been entirely rebuilt.

E. A. G.

Pera'a [= Lat. = Gr. *περαια* use, γῆ, land, or χώρα, region, liter., the farther country, the country beyond, fem. of *περαιός*, lying farther, beyond, deriv. of *πέραν*, beyond]: any one of several districts lying beyond a river, strait, or sea, but used especially of that part of Trans-Jordanic Palestine which extended from Pella on the N. to Macharus on the S., and from Philadelphia on the E. to the Jordan on the W. These were its boundaries as given by Josephus in his *De Bello Judaico*, iii., 3, 3. It is there described as generally wild and rugged, though well watered by streams and fountains, and in some parts of it very fertile. The name has also been applied to the whole of Palestine beyond the Jordan. Pera'a constituted one of the four provinces into which Herod, and later the Romans, divided Palestine.

Per Capita: See DESCENT.

Perception [from Lat. *perceptio*, deriv. of *percipere*, *perceptum*, seize, perceive, liter., take or get completely; *per-*, through, thoroughly + *ca pere*, take]: the act of obtaining knowledge of external objects through or by means of the organs of sense, or of internal states and conditions by means of consciousness or intuition. It also signifies the result of such act. Application has been made of this term to signify cognition or thinking in general, including all the theoretical powers—sensation, representation, inference, and intuition. In this sense perception and volition would include all the powers of the mind. It is limited by many writers to external perception by means of the senses, and the higher activities of reason and reflection are regarded as modified sensation. The presence of inference or judgment in each act of sense-perception has been pointed out by Reid, Kant, Fichte, Hegel, Plato, and others. Erasmus Darwin made volition an essential element of higher perception—the association of ideas. In so far as attention underlies perception, the modifying influence of the will is obvious.

Historical.—The doctrine of the intervention of images arising from effluxes from sense-objects has played a great rôle in the history of philosophy. Empedocles (500 B. C.) first advanced this theory, explaining sense-perception through

effluxes and pores, interpenetration and mixture of elements arising through the same; effluxes of fire and water to and from the eyes constituting sight; of air into the ears, producing sound; smell and taste being similarly caused. Cognition of the elements of things was held to be by means of corresponding elements in ourselves. Anaxagoras (500 B. C.) noted the principle of contrast in perception, and held that like is not known by like, but by unlike, thus repudiating the principle of identity as set up by Empedocles, and explaining perception through difference. The atomists Leucippus and Democritus (460 B. C.) taught the doctrine of effluxes modified to suit their doctrine of atoms. Atoms impinge on our senses and produce images. These thinkers also distinguished between obscure perception (*σκόρτια*)—i. e. through the organs of sense—and clear perception (*γνῶσις*), through investigation. The doctrine of effluxes appears again with Epicurus (341-270 B. C.); sense-perceptions are mental images coming from the surfaces of things by efflux. Plato (427-347) pointed out the existence of inference in all sense-perception, and showed it to be necessary to reconcile the contradictory predicates which inhere in sense-objects by reason of their relativity. He found a higher form of perception in the cognition of ideas, which constitute the true in and for itself; sense-perception deals with the changing and variable. Aristotle (384-322 B. C.) held that sense-perception (*αἰσθησις*) is the result of qualities which exist potentially in the objects perceived, and actually in the perceiving subject. The seeing of colors, for example, depends on the activity of the medium of vision (air or water). In the active reason (*νοῦς ποιητικός*), which is the highest phase of the soul, will and perception are one; it is creative and cognitive in one. The Peripatetic Strato (288 B. C.) made this higher perception to be only a modification of the lower, and in this direction the Stoics tended, their prevalent doctrine being that sense-perception is the origin and criterion of all perception. St. Augustine, Thomas Aquinas, and Meister Eckhart held the doctrine of effluxes and images which were taken up into the soul through the senses; but with Aristotle, they distinguished from this the higher perception through the active reason, which gives us knowledge of divine truth. Descartes (1596-1650) laid great stress on the distinction between clear and obscure perceptions, making the former cognizant of eternal truths existing only in the mind, and the latter cognizant of external things and their affections. He separated soul from body so sharply that he was forced to explain their connection (in volition and sense-perception) by divine interference. Geulincx tried to explain the same by the doctrine of occasionalism, holding that through God's power our psychical activity is transmuted into corporeal, and the latter into the former. Malebranche unfolded this into the mystical doctrine that we perceive all things by participation in God's perception. Spinoza, however, abandoned the Cartesian dualism altogether for the doctrine of the unity of substance, which makes perception explicable. Leibnitz denied the theory of effluxes as a mere mechanical explanation, and set forth the more spiritual one of monads as perceiving-substances which reflect or represent within themselves, each, the entire universe. Obscure or insensible perceptions are those which are unaccompanied with consciousness or memory. The myriad of perceptions to which we do not direct our attention are of this order. The whole universe is latent, as it were, in each monad, existing in this form of insensible perception, which needs only to be aroused to consciousness to become actual knowledge. Thus even the lowest state of the monad—that simply of heavy matter—contains in its weight an obscure representation of the universe of matter, for the weight of each body depends upon the mass of all other bodies in space. Thus the entire history of each being and of all beings is contained in a dormant state in each being; and it is the activity of the soul which brings them to consciousness in the various grades of perception. The aggregate of these obscure or insensible perceptions makes up the instinct of animals, and the disposition, impulses, and emotions of man. Herbart (1776-1841) and Beneke (1798-1854) have pursued this thought of Leibnitz, and have made many valuable discoveries in psychology. The mutual arrest of opposing ideas in consciousness, and the power which one idea has of intensifying or obscuring and rendering latent another, as well as of combining, when latent, with other latent ideas and reappearing in consciousness in a new guise—the investigation of these phases of perception forms one of the most interesting chapters in modern psychology. Kant (1732-

1804) made time and space the *a priori* forms of sense-perception, and denied the objective validity of higher perception, limiting it to subjective forms. Reid (1710-96) taught that mind is active in sense-perception, every act being an act of judgment or inference. Common sense or higher perception cognizes necessary truths of inherence, causation, and design—truths which Kant had pronounced merely subjective. Sir William Hamilton agrees on the one hand with Reid in repudiating the intervention of images and material effluxes, but holds with Kant that we do not cognize things in themselves, thus rejecting Reid's common-sense theory.

WILLIAM T. HARRIS.

Current Theories of Perception.—Leaving the general problems of the theory of knowledge to metaphysics, current psychological theories have to do only with the process of perception, considered as an operation of mind in attaining knowledge of the external world. That is, we have to answer the simple question, "How do we arrive at the knowledge of individual objects localized in space and time?" In view of the terms of this question and of the analysis which follows, we may define perception in a general way as *the process of the construction of our representation of the external world.*

A little reflection leads to the conclusion that our perception of the external world is a matter of mental construction. All advance into the region of mind must be through mental states. The characteristic of mind is consciousness, and nothing can enter the domain of mind except through the mediation of consciousness. This is seen in the fact that our images play in consciousness in such a way as sometimes to deceive us in regard to the external world. (See ILLUSION.) Many pathological facts show this. When the eye is deranged the mind is deceived in regard to colors and distances. When we have a cold our taste is impaired. When the hand is amputated, irritation of the nerve ends is still localized in the hand. This amounts to saying that the mental picture, which in every case is necessary to the perception of the object, is impaired or dissipated. The nervous system also intervenes between the mind and the world, and the proper activity of mind in representation depends upon the normal functioning of this system. This fact, that the mind deals with its images primarily and with external realities only through these images, is best seen when we consider that all mental states are modifications of consciousness itself, and that the perception of the external world, however real that world be, with its conditions of space and time, is possible only by some process of mind whereby these conditions can be mentally reconstructed and the data of experience cast in the forms of this reconstruction.

The construction of the representation of the external world is generally analyzed into three stages, which we may call *Discrimination*, *Localization*, and *Sense-intuition*.

Discrimination.—The beginning of all life experience is probably a state of general undifferentiated feeling. There are, at this beginning of sensation, no distinct forms for the different senses, no notion of externality, no perception either of one's own body or of things. It is easy to imagine one's self in that condition. All physical feeling is then vague, like the internal sensations which we can not localize or trace to their causes. It is probable that the muscular sense, with touch, constitutes almost the whole of this experience. The earliest transition from this state of general sensation is also probably due to touch and the muscular sense, through differences of intensity in feelings of resistance, and through the sense of locality in the body. The special organs of the other senses are more complex and must be adapted to their function of reporting impressions from without. Yet no step toward a real differentiation of sensations can take place till a reaction of consciousness is possible in the shape of *attention*. Definite sensations as such are not distinguished without attention. At first this attention is called "primary" or reflex; but by it the unordered and chaotic mass of sensation, which is thrown upon the helpless individual, is divided and distinguished. As this differentiation proceeds, each sense becomes a distinct source of experience, somewhat in the following order of development: muscular sense, touch, temperature, light, sound, taste, smell, color. The mere fact of differentiation, however, can give us no sense of difference between our own body and a foreign body. This distinction can arise only after we begin to localize our states; and even then all these states are located first in the bodily organs.

Localization.—By this is meant the mental reference of

sensations to a locality in space. "Things," as we perceive them, are always in space. Whence does the perception of space arise, and to what factor in the perceiving process is it due? This is the question of the origin of the idea of space, one of the problems most discussed in general philosophy, and one to which contemporary psychology is fully alive.

In the perception of space relations by the muscular sense, touch, and sight, the senses through which it is accomplished, two classes of data seem to be involved. These data are of a physical kind, and serve as basis for a mental reaction. They are *muscular movements* and *local signs*.

Muscular Movement.—In the discussions of muscular sense, sensations of "effort" are usually distinguished from sensations of "resistance." Both of these seem necessary to the finished feeling of movement, though feelings of resistance play a predominating rôle. We learn from pathological cases that if the feeling of resistance be destroyed, a limb may be moved voluntarily, but there may be no knowledge of the actual movement, and, consequently, no indication of space position; but, on the other hand, the movement of a limb mechanically is felt as movement when there is no voluntary motor discharge. Hence, whether we hold that space is a succession of resistances, or that space is an original element in the muscular experience, we still find the element of muscular resistance in our first sensations of locality. The same influence of movement is found in the appreciation of space relations by the eye.

The muscular movements of the eye are of extreme delicacy and variety. There is for every point of the retina a fixed amount and direction of movement necessary to bring the center of clearest vision to that point; and when such a point, right, left, above, below, is excited there is at once a tendency to revolve the ball of the eye in such a way as to bring the line of vision through this point. This represents a given degree of central nervous discharge to bring about the muscular strain. Since movement of the eyes precedes vision, there are no means whereby such movement can be ruled out; and further, the influence it exerts in localization is seen in the fact that if one of the muscles of the eye be destroyed, so that no movement follows its stimulation, objects are localized as if this movement had taken place.

Local Signs.—The second kind of data required by modern theories is the local sign, by which is meant some character in each position on the skin and retina by which its peculiar location is reported. The doctrine was first propounded by Lotze.

Perception of Foreign Body.—The distinction between our own and a foreign body arises very early in child life, and is not subsequent to the completed idea of our own body. As we have seen, the perception of our own body as extended involves both distance or movement, and resistance. In the primary feeling of resistance we have the beginning of the perception of foreign body. The amount of movement or distance, measured in muscular sensation, indicates roughly, at first, but with great precision later, the localities of objects around us in reference to our own body. This is greatly aided by active touch and by sight. We feel round a body and give it the third dimension, which we have already found to be an attribute of our own body. The distinction between our own members and other objects is further assisted by the phenomenon of double touch; that is, the two sensations of touching and being touched, when we come in contact with our own skin. In paralysis our own limbs are to us as foreign bodies, inasmuch as the sensation of active touch is present alone. Another important series of double sensations arises when the child sees and also feels his own movements.

Sense-intuition.—The final factor in perception is the gathering up of all the data of sense, time, and place in the finished objects of the external world. This is sense-intuition. It is largely due to association, as is shown again by pathological cases. Injuries to the brain, either accidental (in man) or intended (in animals), may leave the creature with all his senses intact, but with no power to distinguish things, their uses, their nature, their relationships. This faculty probably demands the association in the brain of many centers bound together by the so-called "association fibers." On the side of consciousness it demands healthy and concentrated attention. See ASSOCIATION OF IDEAS, SUGGESTION, SENSATION, PSYCHOLOGY, ILLUSION, and INSANITY.

LITERATURE.—See the *Psychologies* of James, Höffding, Sully, Ladd, Baldwin; Hume, *Treatise on Human Nature*; Berkeley, *Principles of Knowledge*; Mill, *Examination of Hamilton*; Pikler, *Belief in Objective Existence*; articles

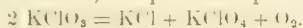
by Stout, Robertson, Baldwin, on *External Reality in Mind* (1890-91); Royce, *The External World and the Social Consciousness* (*Philos. Review*, Sept., 1894). J. M. BALDWIN.

Per'ceval, SPENCER; statesman; b. in London, England, Nov. 1, 1762; was the second son of John, Earl of Egmont; educated at Harrow and Cambridge; studied law at Lincoln's Inn; was called to the bar 1786; entered Parliament for Northampton 1796; became intimate with Pitt, through whose influence he was made solicitor-general in the Addington ministry 1801; was promoted to attorney-general 1802; conducted the prosecution in the celebrated Peltier case; was an active partisan of war with France and an opponent of Catholic emancipation; resigned office on the death of Pitt; became chancellor of the exchequer in the Portland cabinet Apr., 1807; succeeded the Duke of Portland as premier Oct., 1809; and was assassinated by John Bellingham in the lobby of the House of Commons May 11, 1812.

Perch [viâ O. Fr. from Lat. *perca*—Gr. *πέριον*, *perich*; cf. *περκυός*, dark-colored; Sanskr. *pr'çni*, spotted. The Teutonic cognate appears in Germ. *forelle*): a name originally applied to the species of *Perca* or yellow perches (*Perca fluviatilis* of Europe (see FISHES for illustration), and the related American *Perca flavescens*). In the U. S., especially southward and westward, where the yellow perch is not found, the name is applied loosely to various spiny-rayed fishes. See PERCIDE. Revised by D. S. JORDAN.

Perchlor'ates: See PERCHLORIC ACID.

Perchloric Acid: a compound of chlorine, hydrogen, and oxygen. When potassium chlorate is heated for the purpose of making oxygen it first undergoes a change represented in the following equation, the products being oxygen, potassium chloride, and potassium perchlorate:



By treating potassium chlorate with sulphuric acid and heating, perchloric acid distills over in solution in water. When pure it is a colorless, fuming liquid of the composition HClO_4 . It acts very energetically upon combustible substances, causing explosions in consequence of the ease with which it gives up its oxygen. *Perchlorates* are salts formed by the action of perchloric acid on bases. The potassium perchlorate formed when potassium chlorate is heated, as stated above, is a good example. IRA REMSEN.

Per'cidæ [Mod. Lat., named from *per'ca*, the typical genus, from Lat. *per'ca*, See PERCH]: a family of fishes typified by the common yellow perches of Europe and the U. S. The body is elongated; covered with ctenoid scales, and the head conic and more or less compressed; the mouth variable in size; teeth villiform, on the jaws as well as palate; branchial apertures ample; branchiostegal rays seven; dorsals two, the anterior with many spinous rays, the posterior with soft ones; anal small, far behind; ventrals thoracic, each with one spine and five rays. The skeleton has numerous vertebrae (in the perch 21 + 20 = 21); the stomach is caecal, and pyloric caeca are developed. The family, as now limited, embraces only fresh-water fishes distinguished by the increased number of vertebrae and other associated characters. To it are to be referred, besides the large and familiar species of the group, numerous small fishes distributed among the fresh waters of the U. S., commonly known as Darters, and composing the genus *Etheostoma*. These small fishes, some seventy species in all, are confined to the eastern waters of the U. S., and are remarkable for their brilliancy of coloration, some of them surpassing in this respect all other fresh-water fishes whatsoever. These are concentrated perches fitted to a life on the rocky bottoms of swift streams. All the *Percidæ* are confined to the north temperate zone. The best-known genera are *Perca*, including the common yellow perches; *Lucioperca*, including the pike-perches; *Acerina*, represented by the ruffles of Europe; *Aspro*, confined to the Old World; *Etheostoma*, confined to the New World. Revised by D. S. JORDAN.

Percep'sidæ [Mod. Lat., named from *Percop'sis*, the typical genus; *Perca*, perch + Gr. *σαῖς*, appended]: a family of fishes represented by two genera, *Percopsis* and *Columbia*, confined to North America. The form is perch-like, with the mouth and the rough scales of the perch associated with the fins of a trout. The body is covered by moderate scales with comb-like margins; lateral line well defined and nearly straight, but somewhat concurrent with the back; head conical, compressed; opercular apparatus with all the bones present and unarmed; mouth small, but with a lateral cleft;

upper jaw with its margin formed by the intermaxillary bones alone; teeth villiform on the jaws, but none on the palate; branchial apertures ample; branchiostegal rays six; one true dorsal fin, with mostly branched rays; an adipose fin also developed as in the Salmonids; the anal small; ventrals thoracic. The family was considered by Prof. Agassiz, who first described its type, as one of the most remarkable of living fishes, and was referred by him either to the vicinity of the *Percidæ*, or considered as perhaps the type of a peculiar order; it is now, however, generally admitted to be most closely related to certain South American forms (*Haplochitonidæ*, etc.), and more distantly to the *Salmonidæ*. Two species are known, the sand-roller (*Percopsis guttatus*), from the Great Lakes and the Western rivers, and *Columbia transmontana*, from the Columbia river.

Revised by D. S. JORDAN.

Percussion [from Lat. *percussio*, deriv. of *percutere*, strike through or thoroughly; *per*, through, thoroughly + *cutere*, shake, strike]: in medicine, a peculiar branch of auscultation, by which the presence or absence of air and fluid in certain internal organs is ascertained by the aid of artificial sounds. These sounds are produced either directly by tapping with the fingers or a small hammer tipped with India-rubber on the surface of the body just above the place to be investigated, or mediately by the aid of a pleximeter, and struck either with the fingers or with a hammer. See AUSCULTATION.

Percussion-caps: See FULMINATES.

Percy: a noted family of England, descended from William de Percy, who was a companion of William the Conqueror, and derived his name from the village of Percy in Normandy. The barony of Alnwick was acquired by Henry de Percy in the reign of Edward I. His grandson having married into the royal Lancastrian family, Henry Percy, father of the celebrated Hotspur, was created Earl of Northumberland in 1377 by Richard II. The first four earls of this family took prominent parts in the wars of the Roses, and all perished in battle or by assassination. The title became extinct in 1537, but was revived in 1557 in favor of Thomas Percy, who was beheaded at York 1572 for conspiring against Elizabeth. His brother Henry, eighth earl, was charged with conspiring in favor of Mary, Queen of Scots, and was murdered in the Tower of London June 21, 1585; Henry, the ninth earl, was imprisoned many years in the Tower for alleged participation in the Gunpowder Plot of 1605. The title having again become extinct in 1670, it was revived in 1749 in favor of Seymour, Duke of Somerset, a grandson of the last earl. His son-in-law, Sir Hugh Smithson, took the name of Percy, succeeded by permission of Parliament to the earldom in 1750, and was made first Duke of Northumberland 1766. His son, Hugh (known as Earl Percy), was engaged in the battle of Lexington, succeeded to the dukedom June 6, 1786, and died July 10, 1817. The career of his son, Algernon Percy, fourth duke, has been given under the title NORTHUMBERLAND, DUKE OF.—The present representative of the family is ALGERNON GEORGE PERCY, LL. D., sixth duke, b. May 2, 1810, who succeeded to the title Aug. 22, 1867, and became Lord of the Admiralty 1858. Northumberland House, Charing Cross, the London residence of the Percies for many generations, was sold to the board of public works in 1873 for £500,000, to be pulled down for the opening of a new street, and the duke employed a considerable part of that sum in the improvement of Trafalgar Square.

Percy, HENRY (surnamed HOTSPUR): son of the first Earl of Northumberland; b. in England May 20, 1364; became famous in the wars of France and of the Scottish border; defeated and killed Douglas at Otterburn (Chevy Chase) 1388; joined Henry of Lancaster 1399, aiding him to obtain the English throne; was rewarded with the wardenship of the East Marches and the gift of the Isle of Man; was distinguished at the battle of Homildon Hill 1402; took up arms with his father to place Mortimer, Earl of March, on the throne, and was killed at the battle of Shrewsbury, July 21, 1403. He is immortalized in Shakspeare's *Henry IV.*

Percy, THOMAS: clergyman and author; b. at Bridgenorth, Shropshire, England, Apr. 13, 1728; was educated at Christ Church, Oxford, where he took his master's degree 1753; became vicar of Easton Maudit and rector of Wilby 1756; and Bishop of Dromore, Ireland, 1782. D. at Dromore, Sept. 30, 1811. His best-known work, *The Reliques of Ancient English Poetry* (1765), had a wide influence in develop-

ing a taste for ballad literature and antiquities. It has been repeatedly published, e. g. edited by H. B. Wheatley (3 vols., London, 1891); by R. A. Willmott (1893); and the folio MS. reprinted by J. W. Hales and F. J. Furnivall (3 vols., 1868), with *Life* by J. Pickford. He translated Mallet's *Northern Antiquities* (1770, now in Bohn's Library), and collected a mass of ancient tales and poetry which were not printed until 1868. Among his other works is a *Key to the New Testament*.
Revised by H. A. BEERS.

Perdic'cas (in Gr. Περδίκκας): the name of several kings of Macedonia—(1) the founder of the dynasty, an Argive, who became king about 700 B. C.; (2) Perdiccas II. reigned from 454–413 B. C.; (3) Perdiccas III. reigned from 365–360 B. C.; (4) a prince of the royal blood and general of Alexander the Great. When on his death-bed Alexander gave him his ring, the symbol of the royal power; he held the empire together for a short time by his superior energy and talents, but when it became evident that he himself aspired to the crown, a coalition was formed against him by Antipater, Crateros, and Ptolemy, and on his expedition against Ptolemy he was assassinated in 321 B. C., near Memphis, by his own soldiers.
Revised by J. R. S. STERRETT.

Pereda, pā-rā-dā. JOSÉ MARÍA, de: novelist; b. at Santander, Spain, in 1833. His first repute as a writer came from his remarkable knowledge of all the peculiarities of the life of his native region—*La Montaña*, as it is commonly called in Spain. With almost photographic accuracy, but with great literary skill, he reproduced this life in the sketches which about 1859 began to appear in the journal called *La Abeja Montañesa*, of Santander. In 1864 he collected these sketches in his first book, entitled *Escenas montañosas*. For some years he continued to produce only such brief pictures of the land and people he was familiar with—*Tipos y paisajes* (1871); *Bocetos al temple* (1876); *Tipos trashumantes* (1877). In 1877 began a new period in his literary career, with the story *El Buey Suelto*, of ampler dimensions, though still a picture of manners rather than a novel. In 1878 came the study of political intrigue, *Don Gonzalo González de la Gonzalera*, though this also had had a predecessor in the story *Los hombres de pró*, written in 1872, but published in the volume *Bocetos al temple*. In 1879 appeared *De tal palo, tal astilla*, in which at last there is something of both the amplitude and the repose of a complete work of art. This was followed in 1881 by another volume of sketches, *Esbozos y rasguños*, and by the novel *El sabor de la tierra*. Since these Pereda has published the stories *Pedro Sánchez* (1883); *Sotileza* (a study of Galician fisher-life, 1884); *La Montálvez* (1887); *La Puchera* (1888); *Nubes de estío* (1891); and *Al primer vuelo*: *Idilio vulgar* (1891). Pereda is one of the greatest masters in Spain of the novel of description or manners. Not a "naturalist," or realist, by theory, he yet is primarily an observer of fact, not an imaginative creator. So rich and powerful is his style, however, that his work rises into the domain of art. The *Obras completas de D. José M. de Pereda* began to appear in Madrid in 1889, and up to 1891 fifteen volumes had been issued.
A. R. MARSH.

Per'egrine Falcon [*peregrine* is from Lat. *peregrīnus* (whence Eng. *pilgrim*), migratory, coming from foreign parts, deriv. of *peregre*, "in the country"; *per* + *ager*, field]: a hawk formerly much used in falconry; the *Falco peregrinus* of ornithologists. It is bold, graceful, swift, docile, strong, and destructive, and was the favorite among the noble falcons, though less powerful than the lanner and the jerrfalcon. The female peregrine is the bird which is, *par excellence*, called falcon; the male is the tercel, and is smaller than his mate. See also FALCON.

Pere'ira, JONATHAN, M. D., F. R. S.: pharmacologist and therapeutist; b. in Shoreditch, London, May 22, 1804; studied at Finsbury for four years; received a medical education; was licensed by the apothecaries 1823; became fellow of the Royal College of Surgeons 1825; apothecary and chemical lecturer to the Aldersgate Street Dispensary 1823; Professor of Materia Medica in the same school 1832; in 1833 Professor of Chemistry in London Hospital; took the doctor's degree at Erlangen 1840; became a fellow of the Royal College of Physicians 1845; physician to the London Hospital 1851; was one of the examiners of London University. D. in London, Jan. 20, 1853. His great work was the *Elements of Materia Medica and Therapeutics* (1839–40), still a standard authority; also published a *Treatise on Diet* (1843), *Lectures on Polarized Light* (1843), and other works.
Revised by S. T. ARMSTRONG.

Pere'ira da Sil'va, JOÃO MANOEL: historian; b. at Rio de Janeiro, Brazil, Aug. 30, 1817. He graduated in law at Paris, and settled at Rio de Janeiro where, after 1844, he was somewhat prominent in politics. His works are voluminous, and deal mainly with modern Brazilian history and biography. They include: *Plutarco Brasileiro* (1847), enlarged and republished as *Varões illustres do Brasil* (1858); *Historia da fundação do Imperio Brasileiro* (7 vols., 1864–68); *Segundo periodo do reinado de D. Pedro I.* (1871); and *Historia do Brasil de 1831 á 1840* (1878). H. H. S.

Perekop: town in the government of Taurida, European Russia; on the isthmus of the same name, which connects the Crimea with the mainland (see map of Russia, ref. 10–D). The town, which was formerly strongly fortified, is still of great strategical and commercial importance, as it is situated at a point where all the roads leading from Southern Russia into the Crimea connect. The preliminary works for a ship-canal through the isthmus were completed in 1889. Pop. about 5,000.

Pe'rez (Sp. pron. pā'reth), ANTONIO: b. at Monreal de Ariza, Aragon, Spain, in 1541; natural son of Gonzalo Perez, who was long a secretary of Charles V. and Philip II.; educated at the University of Louvain, studying also at Venice and at Madrid; became Secretary of State to Philip II. on the death of his father in 1567; was the chief agent of that treacherous monarch in many of his secret crimes, especially in the assassination of Juan de Escovedo 1578; was tried for that crime, imprisoned, and exiled from the court; was again arrested for the same crime in 1590, when, being put to the torture, he confessed the act, but accused the king of complicity; escaped to Aragon in April, where he placed himself under the protection of the *fueros* or privileges of that kingdom; was twice seized by royal command and handed over to the Inquisition, but on both occasions released by the people, thus giving rise to a rebellion which ended in the suppression of the *fueros* of Aragon. Perez escaped to France Nov., 1591; resided in England as secret agent of Henry IV. 1593–95; published in London his *Relaciones*, giving his own account of his romantic adventures (1594), and was the author of *Cartas Familiares* and several other works, elegantly written. D. in Paris, Nov. 3, 1611. See Mignet's *Antoine Perez et Philippe II.* (1845).

Pérez de Hita, GINÉS: Spanish romancer and historian, the dates of whose birth and death are alike unknown. The one assured fact of his biography is that he took part as a soldier in the cruel campaign against the revolted Spanish Moors (1568–71). He was probably a citizen of Murcia, though there are reasons for thinking that his birthplace was the town of Mula, some 20 miles W. of Murcia. The fame of Pérez de Hita comes from the work, in two parts, commonly known as the *Guerras civiles de Granada*. The first of these, purporting to be a history, was published in Saragossa in 1595. (An edition of Alcalá (1588) is mentioned in some bibliographies, but seems uncertain.) The work is not a history, but an historical romance based upon popular tradition, and as a work of fiction is very notable. The second part, published in Barcelona in 1619 (written, however, and perhaps published, in 1604), deals with events seventy years later than those of the first part—in fact, the events of that very campaign against the Moors in which Pérez de Hita had himself taken part. Here there is much of historical fact, but here also the author has added romantic embellishments. Numerous editions of the work as a whole have appeared even down to the present day. Calderón took the story of Tuzani (*Guerras de Granada*, 2a parte, cap. xxiii, xxiii, xxiv.) for the theme of one of the finest of his plays, *Amor después de la Muerte*. In France Mme. de Scudéry founded upon the work of Pérez de Hita her romance, *L'Almahide*, which in its turn gave rise to a long series of romances and plays. Later we have also in France the *Gonsalve de Cordoue* of Florian, and *L'Abencerrage* of Chateaubriand, both based on the same material. Finally, we have in the U. S. the famous *Conquest of Granada* of Washington Irving, which reproduces both in its affectation of historical accuracy and its romantic coloring its original. The best edition of the *Guerras de Granada* is in volume iii. of Rivadeneyra's *Biblioteca de Autores Españoles* (Madrid, 1876).
A. R. MARSH.

Pérez de Montalván, JUAN: See MONTALVÁN, JUAN PÉREZ, de.

Pérez Galdós, BENITO: Spanish novelist; b. at Las Palmas, Canary islands, May 10, 1845. In 1863 he went to

Madrid to study law, but with little affection for the profession. He already inclined toward letters, and soon tried his hand at writing pieces for the stage, none of which had sufficient merit to be actually produced. In 1867 he had the happy inspiration to write a novel, *La Fontana de Oro*, on which he worked for several years, finally publishing it in 1871. The success of this encouraged him to write a second story, *El Audaz*, published in 1872. Both these tales were essentially historical romances, dealing with events in Spanish history of the years 1820-23 and 1804 respectively. Through them Pérez Galdós entered upon his two long series of historical novels, called by him *Episodios Nacionales*, dealing either with the period of struggle against Napoleon, or with the agitation of the contest of Spanish liberalism against the tyranny of Ferdinand VII. The first of these works was *Trafalgar*, written in 1873, and it has been succeeded by the following volumes of the first series: *La Corte de Carlos IV.*; *El 19 de Marzo y el 2 de Mayo*; *Barbón*; *Napoleón en Chamartín*; *Zaragoza*; *Girona*; *Cádiz*; *Juan Martín el Empecinado*; *La batalla de los Arapiles*. To the second series belong *El Equipaje del Rey José*; *Memorias de un Carabiniere de 1813*; *La segunda casaca*; *El Grande Oriente*; *7 de Julio*; *Los cien mil hijos de San Luis*; *El Terror de 1817*; *Un voluntario realista*; *Los Apostólicos*; *Un faccioso más y algunos frailes menos*. In these works Pérez Galdós shows clearly the influences of Erckmann-Chatrian, but at the same time he tells his story always with a force and purity of style peculiar to himself, and notable enough to give him a foremost place among living novelists. More original in matter and more interesting to others than Spaniards are the novels called by their author *Novelas españolas contemporáneas*. Among these are *Dña Perfecta*; *Gloria*; *Marciana*; *La familia de León Roch*; *La Desheredada*; *El Amigo Manso*; *El Doctor Centeno*; *Tormento*; *La de Bringas*; *Lo Prohibido*; *Fortunata y Jacinta*; *Miau*; *La Incógnita*. In all these works are to be found both truth to social fact and imaginative rendering of that fact in a very unusual degree. This results perhaps from the circumstance that while Pérez Galdós has felt deeply the so-called realistic tendencies of recent literature, he has not blindly accepted the theories of the French school of realists. His chief admiration is the English, not the French, novel; and certainly both his style and his matter show a happy combination of manliness and uprightness of feeling with desire to state the truth as it is. Of late years Pérez Galdós has lived chiefly in Madrid, varying his literary labors with those of a deputy, representing Puerto Rico. He has also been long the editor of the best Spanish periodical, the *Revista de España*. In politics he is an ardent upholder of the liberal-monarchical—i. e. constitutional—party. There are numerous editions of all Pérez Galdós's novels. See Leopoldo Alas (Clarín), *Benito Pérez Galdós, estudio crítico-biográfico* (Madrid, 1889).

A. R. MARSH.

Perfectionism: the doctrine held by many, both Roman Catholics and Protestants, that it is possible to lead a sinless life. The former maintain that the law of God may be and frequently is perfectly obeyed, yet that no man is entirely free from venial sins—i. e. those which do not send the soul to perdition. They claim that as a matter of fact many do lead perfect lives, and even accumulate a fund of supererogatory merit. The commonest teaching on the subject among Protestants proceeds from the Methodists, who assert that it is possible to live in complete conformity to God's law; yet not so that one is entirely free from errors and infirmities. There is, however, no inward disposition to sin, and no outward commission of it, so there is what is called "Christian perfection." President Asa Mahan, of Oberlin University, Ohio, and Prof. Charles G. Finney, both Congregationalists, taught that one could attain that state of devotedness to God which is required by the moral law. So among the Society of Friends it has been held that the justified may be free from actual sin; but the Lutheran and Reformed creeds agree in maintaining that "sanctification is never perfected in this life; that sin is not in any case entirely subdued; so that the most advanced believer has need so long as he continues in the flesh daily to pray for the forgiveness of sins" (C. Hodge). Those who accept these creeds agree also that perfection with those who claim it is a relative term; that it is based upon a comparatively shallow conception of the holiness of God and the deceitfulness of sin. They assert that the godly who lay no claim to perfection do live as holily as those who do,

but both are faulty, and that the claim to be perfect is one which no one can make without great risk of spiritual pride.

SAMUEL MACAULEY JACKSON.

Pergamus, or Pergamum: an ancient city of Mysia, Asia Minor; was founded by Greek colonists on the northern bank of the river Caicus, 120 stadia (less than 15 miles) from the sea. In the confusion which reigned after the death of Alexander the Great, the city became important as the stronghold of Lysimachus. His governor, Philetærus, made himself independent, and Attalus I. (241-197 B. C.) succeeded in establishing a kingdom, of which Pergamus became the capital. The Romans favored this new state as a useful ally against Macedonia and Syria, and at different times Phrygia, Lydia, Pisidia, Lycæonia, and Pamphylia were added to it. Meanwhile the capital became one of the greatest and most magnificent cities of Asia Minor, celebrated for its architectural monuments, its splendid library, its grammar school, its invention of parchment, etc. On his death (133 B. C.) King Attalus III. bequeathed his possessions to the Romans, and they made Pergamus the focus of all the great military and commercial routes of Asia Minor. Under the Byzantine rule it rapidly declined, but the splendid and extensive ruins around the modern BERGAMA (q. v.) testify to its former importance.

Periander: See CORINTH.

Perianth: See FLOWER.

Pericarditis: See HEART DISEASE.

Pericardium [Mod. Lat., from Gr. *περικάρδιον*; *περί*, around + *καρδία*, heart]: the fibro-serous sac which surrounds the heart. Its outer fibrous part is very dense and strong; its inner or serous lining membrane is continuous with that which covers the heart. It secretes a thin lubricating serous fluid which facilitates the motions of the heart. See HEART.

Pericles [= Lat. = Gr. *Περικλῆς*, *Περικλῆς*, liter., famed about *περί*, around + *κλῆος*, fame]: statesman; b. at Athens about 495 B. C., descended on the father's side from the Pisistratidæ, on the mother's from the Alcæmonidæ; received the instruction of Zeno and Anaxagoras; served with distinction in the army, and entered, about 469 B. C., on his political career as a member of the democratic party. He proposed laws according to which the funds of the public treasury were employed for the benefit of the poorer classes. It became the law that citizens should be paid when serving in the army, on a jury, or when performing any other public duty, even when attending the religious festivals; and thereby it became possible for the poorer classes to take part more actively in public life. By these laws Pericles gained the attention and favor of his party, and soon he attained the absolute leadership of it by his eminent talents, his irresistible eloquence, his adroitness in party manœuvring, and his wise plans. A great victory was achieved over the aristocratic party in 461 B. C.; its position was undermined and its leader was crushed. The Areopagus, which was the principal political organ of the Athenian oligarchy, lost almost entirely its influence as a party organ by the introduction of a new jury system; and after his unsuccessful campaign against Mt. Ithome, Cimon was impeached, and shortly after banished by ostracism. Pericles was now in reality the ruler of the state. Cimon was recalled in 454 B. C., but on the proposition of Pericles, and it was said that there existed an agreement between them, according to which Cimon should command the army on its foreign expeditions and Pericles govern at home. After the death of Cimon, in 449 B. C., the aristocratic party was reorganized by one Thucydides, and once more arrayed against Pericles. In 444 B. C. Pericles was accused of squandering the public money or employing it for inappropriate purposes, but the attempt to overthrow him failed. Thucydides was banished by ostracism, and henceforth there existed in Athens no really effective opposition to Pericles. He was arraigned once more for embezzling some of the gold destined for the statue of Athene in the Parthenon; his friends were repeatedly attacked; Phidias died in prison, Anaxagoras was banished, and Aspasia was saved only by great exertions; but these and other similar events were nothing more than the outbursts of a desperate envy and maliciousness. There is no instance in which any important measure of Pericles was frustrated by an internal opposition. It was the great aim of his policy to make Athens the brilliant and magnificent political center of a united Greece. He opposed his countrymen's extravagant plans of conquest in Egypt, Car-

thage, or Sicily, and concentrated his whole energy on the affairs of Greece herself. Athens stood at the head of a confederacy of several Greek states for defense against a possible Persian invasion. This confederacy held its meetings and kept its treasury at Delos. By Pericles's dexterous negotiations both the meetings and the treasury were transferred to Athens; furthermore, the contributions of the allies were commuted from actual service to a sum of money, for which Athens alone undertook to furnish the whole military armament. Thus the supremacy of Athens was established, and it was further developed by the successful settlement of new colonies, by supporting the democratic parties in the Greek states, etc. Of great influence too in this respect were the magnificence of the city and the splendor of the life led in it. It was the time of Pheidias, Socrates, Sophocles. The Parthenon, the first Odeon, and the Propylæa were built. Commerce flourished, and many branches of industry were carried to perfection; but Athens had an unrelenting rival in the Spartan aristocracy. The Peloponnesian war drew nearer and nearer, and, although Pericles warded it off for several years by bribery, at last it became inevitable. In the same year that it broke out the city was fearfully devastated by the plague. Next year Pericles died (429 B. C.), and with his death began the decline of Athens.

Revised by J. R. S. STERRETT.

Pericles, Age of: See ARCHITECTURE.

Peridot: See CHRYSOLITE.

Peridotite [from *peridot*, French name for chrysolite or olivine]: an important group of very basic, ferro-magnesian, igneous rocks, free from feldspar, and having as their essential constituent the mineral olivine. Peridotites are subdivided according to the minerals which they contain beside olivine as follows: *picrite* (+ augite), *harzburgite* (+ enstatite), *buchnerite* (+ augite + enstatite), *wehrlite* (+ diallage), *therzolite* (+ diallage + enstatite), *cortlandite* (+ enstatite + hornblende), *scyelite* (+ biotite), *dunite* (+ chromite).

The peridotites are holocrystalline rocks usually with an evenly granular structure. They are generally considered to be of igneous origin, and have been definitely proved to be so in some cases. Their component minerals so readily change to serpentine that rocks of this class may be regarded as having given rise to many of the masses of serpentine so common in the older geological formations of the globe. Some of the types of peridotite find their equivalents among the meteoric stones.

Another group of ferro-magnesian rocks closely allied to the peridotites is called by the collective name *pyroxenite*. These rocks contain too little alumina to allow of the formation of feldspar, and also too much silica to permit the crystallization of olivine. They are composed essentially of pyroxene in different varieties, and may be subdivided, like the peridotites, into bronzitite, diallagite, websterite (bronzite + diallage), etc.

G. H. WILLIAMS.

Perier, pe-ri-ä', CASIMIR: politician; b. at Grenoble, department of Isère, France, Oct. 21, 1777; was educated at Lyons; served for a short time in the army; engaged then in the large and prosperous banking business established at Paris by his father and elder brother; was elected a member of the Chamber of Deputies in 1817, and became one of the leaders of the opposition under Charles X. After the Revolution of July, 1830, he was prime minister to Louis Philippe, from Mar. 13, 1831, to his death, May 16, 1832, and as such he occupied a distinctly defined standpoint, the so-called *juste-milieu*, which he vindicated with great vigor, and also with partial success. Attempts at insurrection were speedily put down, and his resistance to the differently colored tendencies of anarchy, ultramontane and radical, which showed themselves in France after 1830, was very effective. Guizot, who in several respects was his political disciple and heir, has given a very vivid and impressive picture of him in his *Mémoires*. His speeches, etc., were published, with a biographical notice by Charles de Rémusat, as *Opinions et discours* (4 vols., Paris, 1834).

Revised by A. G. CANFIELD.

Periers, pe-ri-ä', JEAN BONAVENTURE, des: author; b. in Burgundy, France, at the end of the fifteenth century; though poor, had a liberal education, and found a protector in Marguerite of Navarre. From 1531 to 1537 he was engaged upon the translation of the *Lysis* of Plato, in aiding Étienne Dolet on his *Commentarii Lingua Latina*, and other scholarly labors. In 1537 he published the *Cymbalum mundi*, a

veiled attack on religion, which was burned by the *parlement*, lost him the patronage of Marguerite, and drew to him such universal suspicion that he committed suicide about 1544. His best-known work is his *Nouvelles récréations et joyeux devis*, a collection of short stories reviving somewhat the matter and the spirit of the old *fableaux*. His works have been edited by Lacour (2 vols., Paris, 1866); the *Cymbalum mundi*, with a valuable commentary, by F. Frank (Paris, 1874).

A. G. CANFIELD.

Per'igee [Gr. *περί*, around, near + *γῆ*, earth]: in astronomy, that point of the moon's orbit which is nearest to the earth. Anciently, when the sun and planets were supposed to circulate around the earth, the term was also applied to them.

Périgueux, pä-rée'gö' (anc. *Vesunna*): town; in the department of Dordogne, France; on the right bank of the Isle, a tributary of the Dordogne, 95 miles by rail N. E. of Bordeaux (see map of France, ref. 7-D). The old part of the city, containing the magnificent cathedral and many interesting Roman remains, consists of narrow and gloomy streets, but it is encircled by new and elegant boulevards occupying the site of the old walls and ramparts. A large trade in liqueurs, truffles, partridges, and wine, and some manufactures of paper and woollens are carried on. Pop. (1891) 31,439.

Peri'elion [Gr. *περί*, around, near + *ἥλιος*, sun]: in astronomy, that point in the orbit of a planet or comet which is nearest to the sun. Its position or longitude is one of the elements by which the orbit is determined.

Perim, pä-reem': a small island belonging to Great Britain, in the Strait of Bab-el-Mandeb, at the entrance of the Red Sea, 19 miles from the African coast and 1½ mile from the Arabian. Area, 7 sq. miles. It rises about 230 feet from the sea, is rocky, nearly destitute of vegetation, and without water, but it has a good harbor on its southern coast, and its fortifications command the strait on both sides. The passage generally used by vessels going to or from the Red Sea is the narrow one between the island and the Arabian coast. Perim was first occupied by the British in 1799, while Napoleon was in Egypt. It was given up in 1801, but again occupied and fortified in 1857, on account of the cutting of the Suez Canal. In 1883 it was made a coaling station. The island is under the jurisdiction of the governor of Bombay Presidency. Pop. about 400.

Periodical: any publication appearing at stated intervals. In current usage the word is applied only to publications composed of miscellaneous articles, appearing less often than once a week and more frequently than once a year, thus excluding the daily and weekly newspapers on the one hand, and annual publications, such as almanacs, directories, etc., on the other. Using the word in this restricted sense, periodicals may be roughly divided into three main groups: (1) Magazines and reviews devoted to general literature and science; (2) what may be termed class periodicals, devoted to particular branches of science, art, or industry; (3) publications of academies and societies, though in this group it is often difficult to determine what is and what is not entitled to be called a periodical. As regards form, by far the greater number of periodicals in the English language are monthly publications, and the same may be said of continental European periodicals as a whole, though in France and Italy the fortnightly is a favorite form, and in Germany a large and constantly increasing number of periodicals are issued at irregular intervals.

The earliest representative of the modern periodical is generally considered to be the still flourishing *Journal des Savants*, which began its career in Jan., 1665, as a weekly review of literary events, but, after the thirtieth number, was issued at irregular intervals down to 1723, when it suspended publication, to reappear as a monthly in 1724; after several subsequent interruptions it was finally re-established in 1816 as the organ of the French Academy, and is now edited by a committee of scholars under the auspices of the Minister of Public Instruction. Though the origin of the modern periodical may thus be traced back to the seventeenth century, its development was slow, and the periodicals of the seventeenth and eighteenth centuries were neither numerous nor of great importance. Thus we find that of the 5,100 scientific and technical periodicals recorded in Bolton's catalogue as published during the period from 1665 to 1882, apparently not more than eighty were in existence before 1800, and of the 232 literary periodicals important

enough to be included in Poole's *Index to English Literature*, only three date back to 1800. The foundation of *The Edinburgh Review* in 1802 may be taken as the starting-point of this remarkable development of English periodical literature, and in tracing its course we find that the decade from 1840 to 1850 was notably prolific in new periodicals, as was also the decade from 1860 to 1870, which was marked by the rise of the shilling magazines. In the U. S. the periodicals of the eighteenth century were few, and, as a rule, had but a brief existence. It was not till about the middle of the nineteenth century that what we now regard as the distinctively American type of monthly magazine began to appear. The illustrations which form one of the characteristic features of this type, at first crude and coarse in execution, have now been brought to a high degree of perfection.

It is almost impossible to obtain accurate statistics of the number of periodicals now appearing throughout the world, but taking the best available statistics for the U. S. alone we find that in 1892 the total number of all kinds of periodicals published in the U. S., excluding newspapers and annuals, was 3,309. Of these, 307 appeared fortnightly, 2,754 monthly, 56 bi-monthly, and 192 quarterly. These figures may give some idea of the enormous number of periodicals now published. In every country of the civilized world each science, art, and industry has its own special journals.

The few really valuable and important papers which see the light in periodicals would soon lie buried in the mass of forgotten or neglected journals were it not for the existence of indexes and special bibliographies which furnish a clew to this labyrinth of literature. Among the more important of these indexes are the following: Poole and Fletcher's *Index to Periodical Literature* (from 1800 to 1882), with its two supplements (1883-87 and 1887-92); it includes only periodicals in the English language, and purely professional and scientific journals are generally omitted. A continuation of this is *The Annual Literary Index* (1892-93). An annual *Index to Periodical Literature* is also published by *The Review of Reviews*. *The Catalogue of Scientific Papers* (1800-63), compiled and published by the Royal Society of London, with its two supplements (1863-73 and 1873-83), is an alphabetical index, by authors, of scientific papers contained in the transactions of societies, journals, and other periodical works which have been published throughout the world since the beginning of the nineteenth century, excluding such papers as are purely literary, technical, or professional. For technical literature an admirable guide is provided by the *Repertorium der technischen Journal-Literatur*, now published annually in Berlin under the auspices of the German Patent Office. This index, begun by Schubarth, with an index covering the period from 1823 to 1853, and continued by Kerl and Rieth, gives under subject-headings the contents of all the important technical periodicals of the world. The *Index Medicus*, edited by Billings and Fletcher and published monthly, supplies a classified subject-index of the current medical literature of the world. A very full list of special bibliographies and of indexes to periodicals is given in the *Handbook for Readers*, issued by the Boston Public Library.

Of periodicals themselves there exists no universal catalogue. Probably the volumes of the British Museum *Catalogue* devoted to *Academies* and *Periodicals* give the largest and fullest general list of periodicals to be found anywhere. For scientific periodicals we have Bolton's *Catalogue of Scientific and Technical Periodicals, 1665-1882*, published by the Smithsonian Institution; this was intended to contain the principal independent periodicals of any branch of pure and applied science published in all countries down to 1882, but medical periodicals and serials published by scientific societies are not included. This is supplemented by Scudder's *Catalogue of Scientific Serials of all Countries, including the Transactions of Learned Societies in the Natural, Physical, and Mathematical Sciences, 1633-1876*, published by Harvard University.

For the current periodicals of different countries, reference must be made to such annual publications as the *American Newspaper Directory* for the U. S., May's *British and Irish Press Guide* for Great Britain, *Annuaire de la Presse française* for France, *Deutscher Journal-Katalog* for Germany, etc. The growth of the periodical press in the U. S. is well described in North's *History and Present Condition of the Newspaper and Periodical Press of the United States, with a Catalogue of the Publications of the Census Year*, in vol. viii. of the tenth census of the U. S.

G. W. HARRIS.

Periodic Law : See CHEMISTRY.

Periœci [— Lat. = Gr. *περιοικοί*, *plûr.* = *περιοικος*, dwelling around; *περί*, around + *οἶκος*, house, dwelling]: in Laconia and other ancient Dorian lands, the descendants of the more ancient inhabitants of the country. The Periœci were free-men, and not strictly vassals, much less serfs like the Helots, but they were inferior in social rank and political rights to the Spartiœtæ. They occupied the inferior kind of lands, were artisans, merchants, and sailors, and had at times a share in the government. They might, at least at some periods, intermarry with the Dorians, and they served in war even as hoplites, though not in the same corps with Dorians. They were in many cases people of wealth and refinement.

Revised by J. R. S. STERRETT.

Perios'teum [Mod. Lat., from Gr. *περίστωος*, surrounding bones; *περί*, around + *στέον*, bone]: the strong fibrous membrane which surrounds the bones, excepting only the parts covered with cartilage. It is found also around the roots of the teeth, and lines the sockets in which the teeth are fixed. That which covers the outside of the skull is the *pericranium*, and that within the skull is the *dura mater*; but the *dura mater* of the spinal cord is distinct from the periosteum. The periosteal membrane is called *endosteum* when it lines the medullary cavity of a bone. The periosteum is continuous with the tendons and ligaments. It is very vascular, and plays an important part in the growth and nutrition of bone. Thus, in operations for the removal of diseased bone the periosteum should be carefully peeled off and left *in situ*, and in many cases new and healthy bone will be developed from it, especially if the patient be young. See HISTOLOGY (Bone). Revised by W. PEPPER.

Periostitis [Mod. Lat.; *periostium* (which see) + suffix *-itis*, denoting a disease of]: the inflammation of the periosteum; sometimes caused by a syphilitic, scrofulous, or perhaps rheumatic dyscrasia, or by injury; it is also very commonly induced in boys and young men by a sudden exposure to severe cold, as by bathing in very cold water after violent exercise, by standing long in cold water, and the like. It is a very painful disease, and is best treated by local poultices, by opiates, and by free incisions. Cases due to any specific cause will require special constitutional treatment.

Revised by W. PEPPER.

Peripatetic Philosophy : See ARISTOTLE.

Peripatus : See ONYCHOPHORA.

Perissodact'yla [Mod. Lat.; Gr. *περισσός*, odd, liter., extra, over, superfluous (deriv. of *περί*, around, over, beyond) + *δάκτυλος*, finger, toe]: a sub-order—or, according to some authors, an order—of the hoofed animals (Ungulata), so named because the digits are unpaired or unequal. These are unpaired or uneven, the third being the largest and most exerted, the fourth nearly coequal in size and position with the second, and the fifth on the hind foot at least atrophied; the astragalus has the anterior or inferior articulate surface divided into two very unequal facets; the femur is provided with a third trochanter; the dorso-lumbar vertebrae are in increased number—i. e. not less than twenty-two (d. 18 — 19 + 1, 13 — 6). The skull has the intermaxillary bones tectiform or shelving in a roof-like manner above, and united at the symphyses, and the incisors, when present, are implanted nearly vertically, and are parallel to their roots; the stomach is caecal; the cæcum very much enlarged and sacculated. The sub-order thus distinguished includes three families represented by living forms: the tapirs (*Tapiridae*), rhinoceroses (*Rhinocerotidae*), and horses (*Equidae*). In previous geological ages numerous others, more or less related to them, flourished. The affinities of these forms were, to some extent, recognized by Cuvier, and still more by de Blainville, but the sub-order was first distinctly introduced with formal characters by Prof. Owen.

Peristaltic Motions [*peristaltic* is from Gr. *περισταλτικός*, clapping and compressing, deriv. of *περιστέλλειν*, wrap up, wrap around; *περί*, around + *στέλλειν*, send]: certain movements which take place in the alimentary canal, the term being generally restricted to the worm-like action by means of which the food is carried to and fro over the mucous membrane of stomach and intestines. The walls of both stomach and intestines are made up of two layers of involuntary muscular tissue, which are arranged as an external longitudinal and an internal circular; the outermost layer of the intestine is serous, and is simply a reflexion of the peritoneum. The internal coat consists of a mucous tissue, varying in structure in different parts. From the anatomy of the parts it is

easy to perceive how, by the simple action of its muscular walls, the food after its entrance into the stomach is first moved about in this organ, and then, having passed into the small intestine, is carried onward by the gradual contraction and relaxation, which, starting from above, is continued downward. During the processes of digestion this movement is readily observed by opening the abdomen of a living animal, and it will be seen that the movement continues for a short time, then ceases, to be renewed. Not only does the muscular wall carry the food toward the outlet of the canal, but often after the mass has been pushed, or rather squeezed, for a certain distance downward, it is carried back again in the opposite direction (antiperistaltic movement). There is probably little if any peristaltic action while the intestine is empty, it being the stimulus of food which causes it. The alimentary mass, coming in contact with the periphery of the nerves situated in the mucous membrane, imparts a certain amount of irritation, which is followed by muscular movement—i.e. contraction and relaxation—probably through the agency of the *ganglionic plexus*, situated in the walls of the intestine; and this slow, gradual passage of the food backward and forward is required for the processes of digestion. Various other theories are entertained in regard to the causation of peristalsis. The bile does probably aid by stimulating activity, but the direct irritation by food and effete products is the important agency.

Revised by WILLIAM PEPPER.

Peristeropodes [from Gr. *περιστέρη*, pigeon + *πούς*, *πόδος*, foot]: a division, or sub-order, of the *Gallinae*, including the curassows and mound-builders, distinguished by having the hind toe long and on a level with the others as in pigeons; contrasted with *Alectoropodes*, or true fowls, which have the hind toe short and elevated.

F. A. L.

Perithecia: See FUNGI.

Peritoneum: See PERITONITIS.

Peritonitis [Mod. Lat., deriv. of *peritoneum* (cf. PERIOSITIS), = Gr. *περιτόναιον*, liter., neut. of *περιτόναιος*, stretched or stretching over or all around, peritoneum; *πέρη*, around + *τείνειν*, stretch]: inflammation of the peritoneum, a serous membrane investing the viscera of the abdomen; popularly designated "inflammation of the bowels." The peritoneum has two layers, and constitutes a closed sac; the external layer lines the abdominal walls; the internal is reflected over the stomach and intestines, liver, spleen, ovaries, uterus, and bladder. These opposed surfaces are smooth and lubricated by secreted serum, permitting the free movements of the viscera, their ascent and descent in respiration, and the peristaltic movements of the bowels.

Peritonitis, or inflammation of the peritoneum, may be due to traumatism, to cold, to extension of inflammation from other organs, to general disorder of the blood, or infection. Traumatic peritonitis is the result of bruises, wounds, and surgical operations. Idiopathic peritonitis is a primary inflammation resulting from perverted conditions of the blood, or from exposure to cold. Local peritonitis from extension of inflammation is a frequent occurrence, the inflammatory process being limited to the peritoneal investment of a single organ, as the liver, uterus, or ovary. A very important source of localized peritonitis is the diseased vermiform appendix. Very many cases of so-called idiopathic peritonitis really begin as appendicitis. Puerperal peritonitis is inflammation of the uterus and peritoneum following confinement. (See PUERPERAL FEVER.) Tubercular peritonitis is an infective form due to the action of the same bacillus as that of pulmonary tuberculosis, which gains access to the peritoneum through the food, or through the blood from a primary tuberculosis of the lungs, intestines, etc. It is usually chronic, and consists in the deposition of inflammatory lymph and miliary tubercles, with interspersed masses of caseous matter, or yellow tubercle; tubercle usually coexists in the lungs and other organs. Acute peritonitis, as a rule, is of sudden onset. Abdominal pain is its prominent symptom, at first localized, but quickly diffused over the entire abdomen. The pain is increased by pressure, by the movements of respiration, and by tension of the abdominal muscles. The breathing is therefore chiefly thoracic, the diaphragm fixed to prevent abdominal movement, and the respiration is correspondingly shallow, restrained, and rapid. The limbs are retracted upon the body to relax tension of the abdominal surface. There is temporary paralysis of the muscular coat of the bowel; constipation results, also extreme flatulent distension of the intestines, and general tumefaction of the abdomen. The inflamed surface is so

extensive, invests so many important organs, producing extensive peripheral nerve-irritation as well as impressions on the plexuses of the sympathetic nerve, that the constitutional depression is very marked. The face is pale, haggard, and anxious, wearing an expression of great suffering. The teeth are set, the lips tightly drawn, the eye set and sunken, the cheeks collapsed—in extreme cases constituting the *Hippocratic facies*, or *facies griffé* of the French. Peritonitis is always a dangerous disease, but its termination depends upon early diagnosis and a correct treatment, conducted with vigor and persistence. When incipient, it may be aborted or limited by local use of ice or cold water, local dry cupping, cardiac sedatives, as veratrum, and a single prompt saline purge. If fully developed, opium is the supreme remedy to allay pain and secure absolute rest of the intestines from their physiological peristaltic action. In peritonitis the tolerance of opium is very great. In some forms of peritonitis, particularly in the puerperal, small doses of saline purges, given at short intervals to produce gentle looseness of the bowels, act with better success than opium. The cold water or ice pack, if judiciously used, will be of value during the acute period of the disease, but later warm and anodyne applications are preferable. Curiously enough, chronic tubercular peritonitis is sometimes curable by simple opening of the abdomen (coeliotomy or laparotomy) and flushing out the cavity with an antiseptic solution.

Revised by WILLIAM PEPPER.

Periwinkle: any one of various half-shrubby and herbaceous erect or trailing plants of the genus *Vinca* and family *Apocynaceae*. The *V. major*, *V. minor*, and *V. herbacea* of the gardens are hardy European plants. *V. rosea*, a fine greenhouse evergreen shrub, grows wild in most tropical regions, and also in Florida.

Periwinkle: the popular name for several small gastropodous molluscs of the genus *Littorina* and allied genera, and particularly *Littorina littorea*, a species much used for food in Europe, several hundred tons being eaten yearly. The species has become quite abundant on the eastern coast of the U. S. The name is also applied in the U. S. to several large molluscs, *Busycon carica*, *Sycotypus canaliculatus*, and species of *Purpura* which do great damage to the oyster beds of the eastern coast.

F. A. L.

Perizonius, JACOB (*Voorbroek*): historian and philologist; b. at Dam, in Holland, in 1651; studied under Grævius at Leyden; Professor of Ancient History at Franeker in 1681, at Leyden in 1693; d. Apr. 6, 1715. His principal works are editions of *Ælian*, *Dictys Cretensis* et *Dares Phrygius*, *Q. Curtius*, *Animadversiones historice* (1685; 2d ed. by Harles, with biography, 1771); *Origines Babylon. et Egypt.* (2 vols., 1711; 2d ed. 1736); *Adnotationes in Suetonium*, *Observationes in Valerium Maximum*. See W. KRAMER, *Elogium Perizonii* (1822); Hofman-Peerlkamp in *Bibl. critica nova* (v., pp. 545-552), and *Erseh und Gruber* (iii., pt. 17, pp. 108-113).

ALFRED GUDEMAN.

Perjury [viā O. Fr. from Lat. *perjurium*, a forswearing, a false oath, deriv. of *perjura're*, swear falsely, perjure; *per*, through + *jura're*, swear]: at common law, the crime of willfully giving false material testimony under a lawful oath in any judicial proceeding. Modern statutes have extended its scope. For example, § 5392 of the U. S. Revised Statutes provides that "every person who, having taken an oath before a competent tribunal, officer, or person, in any case in which a law of the U. S. authorizes an oath to be administered, that he will testify, declare, depose, or certify truly, or that any written testimony, declaration, deposition, or certificate by him subscribed is true, willfully and contrary to such oath states or subscribes any material matter which he does not believe to be true, is guilty of perjury, and shall be punished by fine of not more than \$2,000, and by imprisonment at hard labor not more than five years."

See OATH.

Whether the false testimony was material is a question for the court. If it was material, it does not matter that the witness was incompetent, or that his testimony was erroneously admitted, or that it was not believed. The essence of the crime is not the harm actually inflicted upon a particular litigant, but the false swearing with the intention to pervert justice. Hence one commits perjury who swears to something of which he is conscious he has no knowledge, although it turns out to be true. If the opinion of a witness is material, he commits perjury by a willfully false expression of it.

As perjury in a judicial proceeding is peculiarly an of-

fense against the system of laws under which the court is organized, it has been held in the U. S. that perjury committed in a Federal court is not punishable in a State court. In some cases, however, a State officer is authorized by Federal law to administer an oath in matters of Federal jurisdiction, and perjury before such an officer is a crime against the U. S.

The punishment for perjury has always been severe. Anciently it was death; then banishment or the cutting out of the tongue; later, the forfeiture of goods, while at present it is generally a fine or imprisonment and incapacity to be a witness. Formerly the evidence of two witnesses was necessary to convict one of perjury, on the theory that the oath of the witness for the prosecution was no weightier than that of the prisoner. The present rule is that the evidence of the prosecution must be sufficient to counterbalance the prisoner's oath, and the presumption of his innocence. See *U. S. vs. Wood*, 14 Peters 430.

FRANCIS M. BURDICK.

Perkins, ELISHA: physician; b. at Norwich, Conn., Jan. 16, 1741; established and supported an academy at Plainfield, where he practiced medicine with great success. In 1796 he announced the invention of metallic tractors for the cure of rheumatism, gout, and the like diseases. His son went to Europe with the tractors, where, as well as in the U. S., the new cure, called Perkinism, attracted great attention, and was favorably received even by physicians. Lord Rivers presided over a Perkinian institution in which many marvelous cures were wrought solely by the power of imagination, for the tractors were simply pins of iron and brass which were drawn over the affected part. In Copenhagen the medical faculty published a voluminous report in favor of Perkinism; and when in 1803 the British physicians had begun to see through the imposture, Thomas G. Fessenden produced his *Terrible Tractation* as a defense of Perkins and a satire upon the doctors. Perkins afterward invented a remedy of great alleged value in the cure of fevers, and during a yellow-fever season in New York went there to test its value, but fell a victim to the disease, Sept. 6, 1799.

Perkins, JACOB: inventor; b. at Newburyport, Mass., July 9, 1766; was in childhood apprenticed to a goldsmith; invented a new method of plating shoe-buckles; was employed in 1797 to make dies for the State coinage; invented soon afterward a machine for cutting and heading nails at a single operation, and was the originator of the use of steel instead of copper plates for engraving bank-notes. After residing some years in Boston and New York he engaged in business in Philadelphia in 1814 as a bank-note engraver; went to England in 1818; obtained a contract for supplying plates to the Bank of Ireland; was the inventor of the steam-gun, of the bathometer for measuring the depth of water, of the pleometer for registering the speed of vessels, and largely aided in perfecting the manufacture of the steam-engine. D. in London, July 30, 1849.

Perlidæ: See ENTOMOLOGY.

Perm: the easternmost government of European Russia. Area, 128,211 sq. miles (see map of Russia, ref. 6-II). The larger, central part of the country is covered by the Ural Mountains, which attain a height of 5,360 feet. The chief branch of industry is mining. Gold, silver, platinum, iron, salt, coal, alabaster, marble, and diamonds are found, and some of the mines are very rich. The platinum mines (see PLATINUM) are the richest in the world. The western part of the government, situated on the European side of the mountains, has some good agricultural land where rye, oats, barley, and potatoes are grown; on the Siberian side the country is fit only for pastures. Pop. (1890) 2,811,300. The capital, Perm, on the Kama, carries on an extensive transit trade between European and Asiatic Russia, and has a cathedral, distilleries, flour-mills, and a cannon-foundry. Pop. (1890) 39,281.

Permanent Way: in railway engineering, the road-bed, track, bridges, and buildings of a line of railway, as distinguished from the rolling stock, which consists of the locomotives and cars.

Permanganates: See MANGANESE.

Permangan'ic Acid: See MANGANESE.

Permeability and Permeance: See MAGNETISM OF IRON.

Permian Series: in geology, a group of rocks occurring in the province of Perm, Russia. Formations of various

other countries have been recognized as their equivalents, and by some taxonomists the corresponding portion of geologic time is styled the Permian period, and made co-ordinate with the Carboniferous and other great divisions of the Paleozoic era. A more prevalent usage recognizes the Permian epoch as the closing part of the Carboniferous period. In the U. S. approximate equivalents of the Russian beds have been noted in West Virginia, Kansas, and Utah. See CARBONIFEROUS PERIOD, and consult Bulletin No. 80, U. S. Geological Survey. G. K. G.

Permutations [from Lat. *permutatio*, deriv. of *permuta're*, change throughout, interchange; *per*, through, thoroughly + *muta're*, change]: the results obtained by writing a certain number of letters or factors in every possible order, so that all the letters shall enter each result, and each letter but once. Thus the letters *a, b*, and *c* may be written *abc, acb, bac, bca, cab*, and *cba*. Here there are three letters and $1 \times 2 \times 3$, or 6, permutations. To determine the number of permutations of *n* letters, *n* being any whole number, let us denote the number of permutations of *n* - 1 letters by *Q*; if we now introduce a new letter, it is obvious that it may have *n* places in each of the *Q* permutations of *n* - 1 letters; that is, it may be written before the first letter of each, between each two letters, and after the last letter of each; hence the whole number of permutations of *n* letters is *Q* \times *n*. Now, the number of permutations of 3 letters is $1 \times 2 \times 3$; hence the number of permutations of 4 letters is $1 \times 2 \times 3 \times 4$. Proceeding from this conclusion, we infer that the number of permutations of 5 letters is $1 \times 2 \times 3 \times 4 \times 5$, and so on indefinitely. Hence the number of permutations of *n* letters is the continued product of the natural numbers from 1 to *n*, inclusive, *n* being any whole number. If the actual product indicated by each permutation is found, it will be equal to a fixed quantity in each case. The theory of permutations finds an important application in the deduction of formulas for combinations and arrangements, and these in turn are used in developing the theory of probabilities. See Newcomb's *College Algebra*, or Oliver Wait and Jones's *Algebra*. Revised by S. Newcomb.

Pernambu'co: a state in the eastern part of Brazil; bounded N. by Ceará and Parahyba, E. by the Atlantic, S. by Alagoas and Bahia, and W. by Piahy. Area, 49,560 sq. miles. A sandstone reef follows nearly the whole coast, and the only harbors are formed by openings through it, as at the city of Pernambuco. A strip extending from the coast about 40 miles inland is low and partly flat land, originally covered with forest, well watered, and very fertile; this is known as the *Matta*. Beyond it the surface rises abruptly or gradually to the *Sertão*, or "desert"; this is properly a part of the Brazilian plateau, but much varied with hills and valleys and with a general southwest slope to the river São Francisco. Most of the *Sertão* is open land, resembling the neighboring parts of Ceará in its parched dry season (September to February) and its occasional destructive droughts. Most of the population is gathered in the *Matta* belt, where the prominent industry is sugar-planting; cotton is raised farther inland, and the *Sertão* supports large herds of cattle in favored places. There are considerable manufactures, and the state is one of the richest and most progressive in Brazil. Estimated pop. (1894) 1,254,159. The most important exports are sugar, rum, and cotton. The coast region was occupied by the Dutch 1630 to 1654.

HERBERT H. SMITH.

Pernambuco (officially *Recife*): capital and chief city and port of the state of the same name; on the coast at the mouths of the little rivers Caparibe and Beberibe (see map of South America, ref. 4-II). It consists of three parts—Recife proper and Santo Antonio, on narrow islands, one behind the other, and Boa Vista, on the neighboring mainland. These are all on flat ground, and are connected by bridges. Recife, nearest the sea, is the oldest, and its narrow streets and ancient houses, some of the Dutch period, are very interesting; it contains the principal wholesale commercial houses. The other divisions have wide streets, with many handsome buildings, and the beautiful suburbs are ornamented with stately old trees and extensive gardens. The harbor proper is formed by a sandstone reef, which has been artificially extended; it will not admit vessels of more than 17 feet draught, and large ships must anchor in the open roadstead, whence landing is often difficult. Pernambuco is nearer Europe than any other important Brazilian port, and it is almost the only commercial outlet of the state; several railways run to the interior. In population and com-

merce it is the third city in Brazil; sugar, rum, cotton, hides, tobacco, cigars, coffee, etc., are largely exported. The climate is generally salubrious; the heat is modified by regular trade-winds, and epidemics are infrequent. Under the Dutch (1630-54) Recife was a mere village; during the eighteenth century it gradually supplanted the original capital and port, OLINDA (*q. v.*). Pop. (1894) about 150,000.

HERBERT H. SMITH.

Peronospora'ceæ [Mod. Lat.; Gr. *περόνη*, brooch, pin + *σπόρος*, seed]: a family of fungi, including the Downy Mildews and White Rusts. See MILDEWS and RUSTS.

Pérouse, La: See LA PÉROUSE.

Peroxide of Hydrogen: See HYDROGEN PEROXIDE.

Perpetual Apparition, Circle of: See CIRCLE OF PERPETUAL APPARITION.

Perpetual Motion: a term applied to a mechanism which is assumed to put itself in motion and to possess sufficient inherent power not only to continue such motion indefinitely (or until the mechanism is worn out), but to have a surplus which can be used in doing useful work. The absurdity of such an idea is evident to most well-informed minds the moment it is clearly stated, but since the first recorded scheme for a mechanical perpetual motion (by Willars de Honecourt, an architect of the thirteenth century) numbers of persons have pursued this *ignis fatuus* of mechanics. In the nineteenth century there have been upward of 180 patents (the large majority of them English) granted for machines intended to move perpetually, and during that and the preceding century there have been printed descriptions of nearly 300 other schemes for perpetual motion that were not patented. The searchers for perpetual motion have employed every force in nature, but the majority employ the force of gravity in some way, a favorite contrivance being a wheel provided with movable weights intended to descend on one side at a distance from the center of rotation, and to be raised on the other side through a path much nearer that center.

The planets are examples of perpetual motion on a grand scale in that they revolve unceasingly, but even they do not fulfill the requirements of the problem of perpetual motion, inasmuch as their movements involve a perfect equilibrium of forces, and there is no surplus power for work outside of that required for their own rotations and stability in their orbits. See FORCE.

W. F. DUFFEE.

Perpetuity: a future contingent interest in property, real or personal, which is not to become a vested interest until a period so remote as to be obnoxious to law. The term is also, though improperly, employed to describe any future estate, whether vested or contingent, in which the absolute power of alienation is suspended for an improper length of time. It is in the latter sense that the term is used in New York and some other States. In the former sense, the Rule against Perpetuities is a rule against remoteness; in the latter, it is a rule against restraining alienation.

The prohibition of perpetuities was only one of a number of devices adopted at various times by the courts of common law, to restrain within reasonable limits the control of the living by the dead; to limit the power of the present owner to control the enjoyment and disposition of his property by those who should come after him. The English doctrine of tenures and estates in land, whereby a man might create any number of future interests to be enjoyed in succession, apparently opened the way for an indefinite control of property by the present owner; and the feudal notion of family permanence, fostered under the influence of PRIMOGENITURE (*q. v.*), was a powerful incentive to the great landowners, to avail themselves of this opportunity. The history of our law of property is in large measure a record of a long warfare between the landlords, assisted by Parliament, on the one side, attempting to make good this posthumous control of their property, and the lawyers, backed up by the courts, on the other side, forever attempting to set the present owner free from such posthumous control. In this contest the courts were finally successful, and the Rule against Perpetuities is one of the monuments of their success.

When this rule was devised, the efforts of the landowners to "tie up" their estates for their remote posterity had already been checked in other directions. Estates tail had been rendered alienable, and the creation of contingent remainders had been restrained by the artificial rule which forbade the limitation of "a possibility upon a possibility"—as, for example, a gift to the offspring of an unborn per-

son. There remained only those future estates known as executory uses and devises, and it was to meet the abuse of these limitations that the Rule against Perpetuities was adopted. It provided that all limitations of estates by way of springing or shifting use or executory devise must take effect within the period of a life or lives in being at the time of creating the limitations and twenty-one years afterward. Thus A may, by his will, give his property to his son, B, for his life, and then to his grandson, C, for *his* life, and then (if C has been born when the will takes effect, at the death of A) to the eldest son of C, when such eldest son shall attain the age of twenty-one years. Here the estate must finally vest within twenty-one years after the extinction of the two lives, B and C, both of which are in being at the time when the will takes effect. It is therefore within the rule. On the other hand, if an estate be given to A, a bachelor, for life, and after his death to his eldest son, when the latter shall marry, the latter limitation is void under the rule. A's son may not marry until more than twenty-one years after the death of A; and the circumstance that he does in fact marry within that period will not alter the case, as the validity of the gift is not determined by the actual event but by the possibilities of the situation at the time of the original limitation. If there is a possibility that the future estate may not vest within the period prescribed by the rule the limitation of that estate is void from the beginning.

In this form the rule is in force to-day in England, and generally wherever the common-law system of England prevails. In only a few of the U. S. has it been modified in any important respects. In New York and three or four other States, however, the common-law rule has been completely changed by statute, and converted into a rule forbidding the suspension of the absolute power of alienation for a longer period than two (or more) lives in being at the time of the limitation. In most of those States (though not in New York) the further period of twenty-one years allowed by the English rule may also be added.

For a fuller treatment of the subject, see Prof. Gray's *Rule against Perpetuities*. GEORGE W. KIRCHWEY.

Perpignan, pâr'pēn'yān': capital of the department of Pyrénées-Orientales, France; on the Tet, 7 miles from the Mediterranean (see map of France, ref. 9-F'). It is a fortress of first rank, and commands the passage between France and Spain. It has a cathedral and a Moorish-Gothic bourse dating from the fourteenth century, a college, a palace of justice, distilleries, bell-foundries, and manufactures of leather, cork, and woolen fabrics, and an active trade in oil, wine, grain, silk, and fruits. Perpignan belonged to Aragon from 1172 to 1475, when it was taken by France. It was given to Spain in 1493, but retaken by France in 1642. Pop. (1890) 27,613.

Perrault, pā'rō'. CHARLES: author; b. in Paris, France, Jan. 12, 1628; studied at the Collège de Beauvais, but left it in a moment of irritation and with a comrade finished his studies without instructors. He prepared for the bar by a rapid reading of the *Institutes* of Justinian, but did not practice long; became next clerk for his brother and cultivated letters. His verse won him some reputation and an election to the Academy (1671), and he found a protector in Colbert, whom he aided in the foundation of the Academy of Arts and who advanced him to the head of the bureau of royal buildings. In 1687 he read before the Academy a poem entitled *Le Siècle de Louis le Grand*, praising modern writers at the expense of the ancients, and this offended the admirers of antiquity and precipitated the quarrel of the "ancients and moderns." To this quarrel he owed his chief notoriety, being severely attacked by Boileau. His position was more fully stated in the *Parallèle des anciens et des modernes* (1688-96), a series of dialogues comparing Homer and Vergil with the French poets. Of more permanent value are the notices of men of letters composing the series *Les Hommes illustres qui ont paru en France pendant ce siècle* (1696-1701), and especially the volume of fairy stories, *Contes de ma mère l'Oye* (1697), containing *Cinderella*, *Blue Beard*, and others, by which alone he still remains popular. D. May 16, 1703. He left *Mémoires*, which were published in 1749, and two comedies. His *Œuvres Choieses* were published by Collin de Plancy (Paris, 1826); the *Contes* by Le-fèvre (Paris, 1875).

A. G. CANFIELD.

Perron, ANQUETIL du: See ANQUETIL DU PERRON.

Perrone, per-rō'nā, GIOVANNI, D. D.: theologian; b. at Chieri, Piedmont, 1794; studied at Turin; entered the Society of Jesus at an early age; taught at Orvieto; spent

most of his life at Rome as professor of theology; taught at the Roman college till 1853; visited England during the Roman revolution of 1848-49; d. at Rome, Aug. 29, 1876. He exercised considerable influence on Catholic theology in the first half of the nineteenth century, and his lectures at Rome were followed by numerous students from both sides of the ocean. He had a large share in the preparation of the papal bull that defined the Immaculate Conception, and in the preliminary labors for the Vatican Council. He was also a consultant of several Roman congregations, theologian to a number of cardinals, etc. His best-known work is the *Prælectiones Theologicæ* (9 vols., 1835 ff.), which contains the summary of his professorial teaching. It had reached its fortieth edition at his death, and the *Compendium* of the same work, equally successful, is yet much used. His other writings are chiefly polemical. The best of them is his *Protestantism and the Rule of Faith* (3 vols.). As a theologian he represents the positive doctrinal and the polemical element, as distinguished from the historical and the metaphysical school.

JOHN J. KEANE.

Perrot, pârô, Georges: archaeologist; b. at Villeneuve-Saint-Georges, department of Seine-et-Oise, France, Nov. 12, 1832; studied from 1855 to 1858 at the French school in Athens; made in 1861 a journey of exploration in Asia Minor; dwelt for some time at Aneyra investigating the famous inscription on the temple which the Galatians built there in honor of Augustus; became Professor of Rhetoric in the Lycæum Louis le Grand, Paris, in 1863; Professor of Greek Language and Literature in the higher normal school in 1872; Professor of Archaeology in the Faculty of Letters in 1877; appointed director of the higher normal school in 1883; wrote *Exploration archéologique de la Galatie et de la Bithynie* (Paris, 1863-72); *Souvenirs d'un voyage en Asie Mineure* (1864); *Essai sur le droit public et privé de la République athénienne* (1867); and other works, and with C. Chipiez, *Histoire de l'art dans l'antiquité* (5 vols., 1881-89).

Perry: city; Dallas co., Ia. (for location, see map of Iowa, ref. 5-F); near the Raccoon river; on the Chi., Mil. and St. P. and the Chi., Rock. Is. and Pac. railways; 34 miles N. W. of Des Moines. It is in an agricultural and coal region, and contains 7 churches, 3 public-school buildings, a business college, water and electric-light plants, a national bank with capital of \$50,000, a State bank with capital of \$50,000, and a semi-weekly and 3 weekly newspapers. Pop. (1880) 952; (1890) 2,880; (1895) 3,570.

EDITOR OF "CHIEF."

Perry: village (incorporated in 1814); Wyoming co., N. Y. (for location, see map of New York, ref. 5-D); at the outlet of Silver Lake; on the Silver Lake Railway; 40 miles S. S. W. of Rochester. There are 7 churches, united free academy and union school, a national bank with capital of \$50,000, a State bank with capital of \$50,000, a school library, a weekly newspaper, and salt and reaper works and a knitting-mill. The lake affords good power for manufacturing. The Silver Lake Assembly, a noted summer resort with over 200 cottages and a population of more than 2,000 in the height of the season, is 2 miles from the village. Pop. (1880) 1,115; (1890) 1,528.

EDITOR OF "HERALD."

Perry: city (settled in 1893); capital of Noble co., Okl.; on the Atch., Top. and S. Fé Railroad; 30 miles N. of Guthrie, 60 miles S. of the Kansas border (for location, see map of Oklahoma, ref. 2-D). It contains a U. S. land-office, several churches, public and private schools, a board of trade, a State bank, 2 private banks, and 3 daily and 3 weekly newspapers. It has a large general trade, as nearly all settlers within a circle of 50 miles do their outfitting here. Pop. (1894) fixed and floating, estimated, 6,000-8,000.

Perry, ARTHUR LATHAM: economist; b. at Lyme, N. H., Feb. 27, 1830; graduated at Williams College 1852; became Professor of History and Political Economy in that institution 1854, and in 1875 pastor of a church at Williamstown. He is author of *The Elements of Political Economy* (New York, 1865), a work which is considered the scientific exponent of free-trade doctrines; *Introduction to Political Economy* (1877); and *Williamstown and Williams College*.

Perry, EDWARD DELAYAN: Sanskrit scholar; b. at Troy, N. Y., Dec. 20, 1854; educated at Columbia College, and at the Universities of Leipzig and Tübingen; successively tutor in Greek, instructor in Sanskrit, and Professor of Sanskrit in Columbia College. His chief works are *Indra in the Rigveda* (in *Journal American Oriental Society*, vol. xi.), and *A Sanskrit Primer* (1885; 2d ed. 1886). B. I. W.

Perry, MATTHEW CALBRAITH: commodore; b. at Newport, R. I., Apr. 10, 1794. Known as an upright and energetic naval officer, he was intrusted by President Fillmore in 1853 with a letter to the ruler of Japan, its object being to establish international relations, especially with the view of protecting shipwrecked mariners. By an employment of the "gunboat policy," but happily without having to resort to actual bloodshed, he induced the frightened Japanese to sign their first foreign treaty at Kanagawa Mar. 1, 1854. Shimoda and Hakodate were opened to trade with the U. S., and good treatment was promised to shipwrecked crews. Perry died in New York, Mar. 4, 1858. See Perry and Hanks, *Narrative of the Expedition of an American Squadron under Commodore Perry*, and Griffin, *Matthew Calbraith Perry* (Boston, 1887). J. M. DIXON.

Perry, NORA: poet; b. at Dudley, Mass., in 1841. She has been Boston correspondent of *The Chicago Tribune* and *The Providence Journal*, and has written *After the Ball and Other Poems* (1875); *Book of Love Stories* (1881); *For a Woman*, a novel (1885); *New Songs and Ballads* (1886); and other works. H. A. B.

Perry, OLIVER HAZARD: naval officer; b. at South Kingston, R. I., Aug. 23, 1785; entered the U. S. navy as midshipman, Apr. 7, 1799; cruised with his father, a naval officer, in the West Indies 1799-1800; was engaged in the war against Tripoli 1804-05; became lieutenant Jan. 15, 1807, and at the outbreak of the war of 1812 was in command of a flotilla of gunboats on the Atlantic coast, when in Feb., 1813, he was transferred at his own request to serve under Commodore Isaac Chauncey on Lake Ontario. He took an active part in the attack upon Fort George; was appointed to fit out a squadron upon Lake Erie, which he successfully accomplished at Presque Isle (now Erie), Pa.; and having equipped nine small vessels, attacked and captured the British fleet near Put-in-Bay, O., Sept. 10, 1813. This action, known as the "battle of Lake Erie," or more commonly as "Perry's victory," obtained him an immense popularity, partly attributable to the sententious manner in which it was announced by the famous dispatch, "We have met the enemy, and they are ours." Congress rewarded him with a vote of thanks, a medal, and the rank of captain. Perry co-operated with Gen. Harrison in his operations at Detroit and at the battle of the Thames, Oct. 5, 1813, and in the following year was employed upon the Potomac and in the defense of Baltimore. He commanded the Java in Decatur's squadron in the Mediterranean 1815; was sent to the Spanish Main in command of a squadron, June, 1819; ascended the Orinoco to Angostura in July; was seized with yellow fever, and died at Port Spain, on the island of Trinidad, the day of his arrival there, Aug. 23, 1819. His remains were removed to Newport in a ship of war by order of Congress, and buried in the cemetery of that city, Dec. 4, 1826, where an imposing obelisk was erected by the State of Rhode Island. In Sept., 1860, a marble statue of Commodore Perry was erected at Cleveland, O., and on Sept. 10, 1885, a fine bronze statue was unveiled at Newport, R. I. See the *Life*, by Capt. Alexander S. Mackenzie (2 vols., New York, 1843).

Perry, THOMAS SERGEANT: critic; b. at Newport, R. I., Jan. 23, 1845; graduated at Harvard in 1866 and was for some years instructor there in English and German. He has resided much abroad, and has studied at French and German universities. His writings are mainly contributions to literary history, biography, and criticism, and include *Life and Letters of Francis Lieber* (Boston, 1882); *English Literature in the Eighteenth Century* (New York, 1883); *From Opitz to Lessing* (Boston, 1885); *The Evolution of the Snob* (1887); from 1872 to 1874 he edited the *North American Review*. H. A. BEERS.

Perry, WILLIAM STEVENS, D. D. (Oxon.), LL. D., D. C. L.: bishop; b. in Providence, R. I., Jan. 22, 1832; graduated at Harvard College in 1854; studied at the Virginia Theological Seminary and privately in Boston, preparatory for orders; ordained deacon in Mar., 1857, at Newton, Mass.; priest in Boston, Apr. 7, 1858; was rector of churches in Nashua, N. H., Portland, Me., Litchfield, Conn., and Geneva, N. Y., 1858-76; was Professor of History in Hobart College, Geneva, N. Y., 1871-73, and president of that institution for a few months in 1876. He was unanimously elected Bishop of Iowa in May, 1876, and was consecrated to the episcopacy in Trinity church, Geneva, Sept. 10; refused the bishopric of Nova Scotia in 1887. He was for nearly twenty years occupied in general church work in addition to his

parochial labors. He was deputy from New Hampshire in 1859; from Maine in 1862; assistant secretary to the House of Deputies in 1862; secretary in 1862-74; was appointed historiographer of the American Church in 1868, and still retains that position. He declined the foreign secretaryship of the board of missions in 1876; also the presidency of Kenyon College. Besides degrees received from seven institutions of learning in the U. S. and Canada, he received that of D. D. Oxon., at the ecnecia of the University of Oxford. In 1894 he received the degree of LL. D. from the University of Dublin. His writings, chiefly historical, number more than one hundred. Among them are *Journals of the General Conventions of the Protestant Episcopal Church* (Philadelphia, 1861) and *Documentary History of the Protestant Episcopal Church in the United States of America* (2 vols., New York, 1863-64), in which he was aided by Dr. Francis L. Hawks; *Historical Collections of the American Colonial Church* (1871-78); *Some Summer Days Abroad* (Davenport, Ia., 1880); *The History of the American Episcopal Church, 1587-1883* (2 vols., Boston, 1885); *Life Lessons from the Book of Proverbs* (4th ed. 1885). He is an associate editor of *Johnson's Universal Cyclopædia*.

S. R. J. HOYT.

Perseph'one, or Proserpina (in Gr. Περσεφόνη, Κόρη): in Grecian mythology, a daughter of Zeus and Demeter, the wife of Hades. Along with Hades she ruled over the shades of the dead and the monsters of the lower world, and listened to the curses of men. When, as a maiden, she was gathering flowers near Enna, in Sicily, she was seized by Hades with the consent of Zeus and carried in his chariot to the realm of the dead. In pity for the grief of Demeter (see CERES), who vainly sought her daughter the world over, Zeus sent Hermes to bring Persephone back; but as she had tasted a pomegranate (the symbol of marriage), offered to her by Hades, it was decreed by Zeus that she should remain one half of the year with Hades and the other half with Demeter. Persephone is thus the symbol of life and death in the vegetable kingdom, and because the decay and death of the corn must precede a new and more fruitful life, she became in the ELEUSINIAN MYSTERIES (*q. v.*) the symbol of the immortality of the soul. For a discussion of Persephone in art, see the article *Demeter und Kora* in Baumeister's *Denkmäler*.

J. R. S. STERRETT.

Persep'olis: the Greek name of the ancient capital of Persia, whose Persian name is not known. It stood in a vast and fertile plain (now called Merdusht), 35 miles N. E. of Shiraz, near the Medus (now Polwâr), about 14 miles above its confluence with the Araxes (now Bendemir). Of the age and history of the city very little is known. It was not the residence of Cyrus, who had his palace at Pasargada, unless this be the same city, as assumed by some antiquarians; but Xerxes, Darius Hystaspes, and others of the Achæmenidæ resided here, and in their time the city was known to the Greeks as a wonder of splendor and magnificence. It was said to be completely destroyed by Alexander the Great, and it is mentioned in history only once afterward, when Antiochus Epiphanes visited it for the sake of plunder (2 Macc. ix. 1). Of the city itself no traces can now be found, though it is probable that it occupied the same site as afterward the Mohammedan fortress Istakhr; but of the palaces some very interesting ruins are still extant, known by their local name, *Chehel Minâr* (Forty Columns), or Hall of Xerxes. They consist of a stupendous substructure of cyclopean masonry, forming a platform about 1,500 feet long, about 800 feet wide, and divided into three terraces, to which magnificent flights of stairs give access. Of the buildings, a magnificently sculptured staircase, the entrance to a propylæum, and a number of columns, 60 feet high, are still standing. See Fergusson's *Palaces of Nineveh and Persepolis Restored*; Rawlinson's *Five Great Monarchies*; and *Persepolis* (Berlin, 1882), by Stolze and Noldeke.

Per'seus (in Gr. Περσεύς): in Grecian mythology, the son of Zeus and Danaë, daughter of Acrisius, King of Argos; was driven into exile together with his mother, and educated in Seriphos, one of the Cyclades; conquered Medusa, by the aid of Hermes and Athene, and cut off her head; returned after many adventures to Argos, from which Acrisius fled to Thessaly; settled afterward at Tiryns and founded Midea and Mycenæ. In ancient art he is represented as similar to Hermes. See ANDROMEDA, GRÆÆ, GORGON, and PEGASUS.

Revised by J. R. S. STERRETT.

Perseus: the last king of the Macedonians; son of Philip V.; b. about 212 B. C.; succeeded to the throne in 179 B. C.,

and confirmed the treaty which his father had made with the Romans. After a preparation of seven years he commenced war against Rome with an excellent army, a full treasury, and important alliances. P. Licinius Crassus, the consul, was sent against him, but was defeated, and the Romans were generally unfortunate throughout the war. Perseus, however, lacked the energy to follow up his victories and the war dragged on for several years without decisive result. At last, L. Paulus Æmilius was sent as commander-in-chief to the theater of war. He arrived in March, began active operations in June, and finished the war, after a campaign of thirteen days, by the battle of Pydna, 168 B. C. The Macedonian army, although fighting with great valor, was completely routed, and Perseus fled with his money-chest to Samothrace. He was afterward delivered up to the Romans, and held in captivity at Alba, in Italy, where he died a few years later. F. M. COLBY.

Persia [= Lat., from Gr. Περσίς, from O. Pers. *Pārsa* (> Pers. *Fārs*, or *Pārs*), a province of Persia]: a country of Western Asia, called by the natives ERON or IRAN. It lies between lat. 25° and 39° 45' N. and between lon. 44° and 63° 20' E. By the Treaty of Turkomanchai the boundary between Russia and Persia, W. of the Caspian Sea, follows the bed of the river Araxes, from near Little Ararat to lon. 48° E.; thence southward the line has an irregular course to the Caspian near Astara. By the same treaty Persia renounced her right to float ships of war on that sea, thus virtually making the southern shore of the Caspian a boundary. The river Atak (Etrek) and the Domine Kuh, by acknowledgment of Russia, form the boundary on the N. E. The border-line of Afghanistan and Baluchistan was long a matter of dispute, but the question was referred to Great Britain for arbitration, and, after surveys, a decision and settlement was made by which Seistan proper and part of Baluchistan were given to Persia. The Arabian Sea, the Gulf of Ormuz, and the Persian Gulf give a continuous sea-coast to Persia on the S. The boundary between Persia and Turkey was unsettled until 1880, when Turkey accepted the decision of a commission which had been appointed by Great Britain and Russia, and had made extensive surveys. The area of Persia has been estimated at 640,000 sq. miles. The greatest extent from N. to S. is 973 miles, and from E. to W. about 1,042.

Physical Features.—The topographical outline is that of a vast plateau surrounded by mountain ranges. The plateau consists of elevated plains separated from one another by mountain spurs and ridges. The central portions are the most elevated, where the plain of Hamadan attains an altitude of 6,000 feet above the level of the ocean. Ispahan, Shiraz, Tabriz, and Oroomiah (Urumeyah), towns widely separated, have each an altitude of 4,200 feet, and Teheran 3,500 feet. The great ranges of mountains on the N. are the network of the Kara Dag and the Elbruz. The latter rises near the steppe of Mogan, and in a well-defined range follows the contour of the southwestern shore of the Caspian and thence pursues an eastward course through Northern Persia. On the E. are the Domine Kuh, the Shamshire, and the chain extending southward from near Mashhad. The Cotrells are rugged cliffs near the Persian Gulf, cut and worn by the drainage of the great plateau. In the S. E. the Zagros, in many parallel ranges, run diagonally S. by E. from the mountains of Kurdistan, which form a rugged border on the N. W. The highest peaks are Damavand, the cone of an extinct volcano, 18,600 feet above sea-level; Savalan, 11,000 feet; Sahund, 10,000 feet; and Elvand, 9,500 feet. There are no great rivers in Persia. The Kizil Uzen, or Safed, in the N., the Zanda Rud in the interior, and the Karun and Khirkah in the S. W., are small rivers, but are the chief streams of the country. The Euphrates, the Araxes, and the Helmund are rivers of the border. Many streams flow from the mountains to the desert of Khorassan, where they form kabeers or salt marshes, and disappear in the hot season. The only inland seas worthy of note are the Shahee Sea (Lake Urumeyah) in the N. W., and Niris and Mahala Seas in Farsistan. Nearly all the interior of Persia is described as desert, but nearly every part of the land, except Khorassan and Kerman, is so inhabited that the term desert applies properly to parts of those provinces only. The desert of Khorassan is 200 by 400 miles in extent.

Geology and Mineral Products.—The most common rocks are trap, shale, and limestone in nearly vertical strata. The beds of the valleys are to a great depth composed of gravel and clay and loam. Bituminous coal is found in the Elbruz



Mountains, and mines of it are worked near Casveen and Damavand. White and green marble are found in Khorassan; sulphur on Damavand; lead at Bast; gold near Nikpey; and iron and copper ores in several places. Rock salt and gypsum are abundant. The turquoise mines of Madan, near Nishapur, have been long considered the best mines of that gem.

The climate is distinguished by dryness, except along the seacoast, where moisture is excessive, by equality, salubrity, and heat. The greatest degree of cold on the plain of Teheran is 8° to 10° F. The cold of the northern sections is intense in winter on the elevated plains, and on the mountains. Malaria is excessive in widely irrigated sections and where drainage is deficient. The prevalent diseases are malarial fevers, typhoid, pneumonia, ophthalmia, and cutaneous diseases. Smallpox and measles are seldom of a malignant type.

Soil and Products.—The soil of the plains is a loam very fertile when irrigated. The northern slopes of the Elbruz are covered with pine, spruce, and olives; the lowlands on the border of the Caspian are noted for dense growth of forest, in which the oak, sycamore, boxwood, orange, and sugar-cane abound. Date-palms grow in the southern sections. In the interior the vine, pomegranate, mulberry, fig and olive trees flourish, also the peach, apple, quince, and other fruit-trees. The desert blossoms in many places with the poppy and rose. The chief agricultural crops are wheat, barley, rice, hay, cotton, tobacco, opium, and a great variety of cucurbitaceous and leguminous plants.

The fauna is much the same as that of Southern Europe, but the lion is found in the S., and the tiger and leopard in the N., and wild asses frequent the desert. Domestic animals include the camel (in all sections), horse, ass, and buffalo. Of the birds, besides those commonly found in like latitudes, may be mentioned the flamingo, stork, and nightingale. Brook trout abound in the mountain streams and salmon in the waters of the Caspian coast. Vipers, scorpions, tarantulas, and centipedes are numerous.

Population.—The people of Persia are of many races, Iranian, Turkish, Kurd, Arabic, Armenian, and Hebrew. The dominant races, however, are the Iranian or Persian and the Turkish, the latter of many tribes. The population was estimated in 1872 at 5,000,000; in 1881 at 7,653,600; in 1891 at 9,000,000; in 1894 at 10,000,000. In the absence of any census, for none is ever taken by the Government, these estimates are only approximate. The people are chiefly occupied in agricultural and pastoral pursuits, though a few are engaged in manufacturing woolen, silk, and cotton fabrics. Many are soldiers, but few are engaged in maritime pursuits. A large part of the population is nomadic, and robberies and insurrections are frequent.

Political and Administrative Divisions.—No survey and accurate territorial division has ever been made. The country has through many ages been divided into several great provinces, but these are not now necessarily administrative divisions. They are Khorassan (202,872 sq. miles, including Seistan), Astrabad (28,980), Mazanderan (9,660), Gilan (4,830), Azerbaijan (38,641), Irak-Ajemi (94,182, including Ardekan), Luristan (19,253), Khuzistan (28,981), Fars (57,963), Laristan (19,321), and Kerman (135,317, including Kohistan and Mekran). A subdivision of provinces is into mahāls, formed by grouping together villages or tribes. The administrative divisions are changed often to suit local interests or the wish of a governor.

Principal Cities.—These are Teheran (pop. estimated at 210,000), Tabriz (180,000), Mashhad or Meshed (60,000), Isfahan, Kashan, and Barfurush (each about 50,000), Kerman, Yazd, and Casveen or Kasbin (each about 40,000), and Hamadan, Shiraz, Kom, Bushire, and Resht (each from 25,000 to 30,000).

Education.—There is, strictly speaking, no educational system. Private schools are formed by the mollahs (priests) for teaching the Koran and writing. There are schools for the education of mollahs, usually built and sustained by a patron. The shah sustains a college in Teheran where students are taught, in part, the curriculum of European schools, and receive an allowance of clothing and funds.

Religion. The national religion is Mohammedanism, of that branch of the Sheahs known as Athna Ashara, or the Twelve, but there are many other sects. Of non-Mohammedans there are Jews, Armenians, Guebbers, and Nestorians, in regard to the number of whom no two authorities agree. Missions in Persia are sustained by the American Presbyterians, Church of England, and Roman Catholics. The

religious and social customs are intimately connected—religion is associated, in form at least, with every phase of life. Each sect has its own social laws and customs. All have in common certain customs distinguished as Oriental; these, however, are being modified by the introduction of European civilization and manners. The chief national observances are the mourning of Moharram, the fast of Ramazan, and the feast of No Ruz, or the New Year's Day of the secular and solar year. Both the Mohammedan era and the era of Yazdegird are observed.

Government.—This is an absolute monarchy. The reigning monarch, called shah, is Nasr-ed-din, who ascended the throne soon after the death of his father, on Oct. 20, 1848. He is assisted by a privy council, appointed and dismissed at his own pleasure. There is no representation of the people. The affairs of the general Government are supervised by a number of ministers, and departments of state are created and abolished at the shah's pleasure, and are constantly changing in number. The most permanent heads of departments are Ministers of the Interior or Finance, of War, of Foreign Affairs, and of Public Works, and Master of the Mint. The office of Prime Minister is periodically created and as frequently abolished. The governors, called *hoikim*, are appointed by the shah, as are many of his subordinates. Mollahs may exercise the judicial function, and their court is termed Sharah, or religious law. The Imām Junah and Sheik ul Islam are appointed by the shah under honorary titles, but they have no authority over other mollahs, except in their own mosques. The standing army is formed in general, as far as possible, on the European system of organization, and officers of the Austrian, French, and other armies are employed as drill-masters or commanders. Theoretically, the number of troops is 100,000, but it is rarely the case that the regiments have their complements. Arms are repaired and manufactured in Teheran, but most of the equipments are imported.

Finance.—The chief sources of revenue are the taxes—paid in money or produce—rents, presents, and customs. The tables or statistics of revenue are deficient in omitting known sources of income; also imperfect by reason of reckoning some of the income of districts separately, and also in the totals of provinces. In the course of fifteen years the maximum of revenue was £1,950,000, and the minimum £1,368,000. Under ordinary conditions the income slightly exceeds expenditures. The money of the country until 1889 was gold and silver only. At that date a bank was authorized by the shah. It now has branches in the principal cities and issues paper money.

Trade and Commerce.—The exports are wheat, cotton, tobacco, rice, opium, fruit, oil (olive), wood, wool, hides, silk, and carpets. The imports are chiefly cotton and woolen goods, tea, coffee, sugar, petroleum, and notions. The great routes of traffic and communication are, in the north, the caravan road via Mashhad, Teheran and Tabriz, thence to Erzeroum, and N. from Tabriz to Tiflis; the route from Resht on the Caspian via Teheran, Kom, Kashan, Isfahan, and Shiraz to Bushire on the Persian Gulf. Another route is from Mohammerah, at the head of the Persian Gulf, to Teheran via the Karun river. A route pursued by the pilgrims is from Teheran to Bagdad. The only wagon roads are from Teheran to Kom, and from Teheran to Casveen. Concessions have been made from time to time by the shah for the construction of a railway from Resht to Teheran, but though offered to companies to be formed under British, French, Austrian, or American auspices, no one has ventured to prosecute the plan. A company is (1894) undertaking the work under Russian protection. There is a railway 12 miles long (with extensions) from Teheran to the village of Shah Abd al Azim.

History.—A sketch of the early history of Iran is given in the article IRANIANS (q. v.). Since the Mohammedan conquest in the seventh century the Persians have been governed almost wholly by alien dynasties—Ommyiad, Abbassid, Ghiznevid, Mogul, Timurid, Saffavean, and others. During this period the boundaries of Persia were often changed. It was sometimes a province of a larger empire, and sometimes divided between two or more independent states. The present (Kajar) dynasty began with Aga-Mohammed, a eunuch, in 1795. His nephew, Fath-Ali, lost in wars with Russia the provinces of Georgia, Armenia, and Erivan. Mohammed Shah, the next ruler, failed to regain Herat on account of the resistance of Great Britain. Nasr-ed-din, the present shah, also failed for the same reason, but succeeded in extending his territories to the S. E. During his reign Eu-

ropean improvements have been introduced to some extent. See PARSEES, MOHAMMEDAN ART, PERSIAN LANGUAGE, etc.

BIBLIOGRAPHY.—For books of description and travel, see Arnold's *Through Persia* (1876); G. N. Curzon's *Persia and the Persian Question* (2 vols., London and New York, 1892); S. G. W. Benjamin's *Persia and the Persians* (Boston, 1887); Bassett's *Persia, the Land of the Imams* (New York, 1886); and Mrs. I. L. B. Bishop's *Journeys in Persia and Kurdistan* (2 vols., New York and London, 1891). For Persian history, see Sir John Malcolm's *History of Persia* (2 vols., 1815); the histories by R. G. Watson and Clements Markham; Rawlinson, *The Seventh Great Oriental Monarchy* (1876); Nöldeke's *Aufsätze zur Persischen Geschichte* (1887); Guttschmid's *Geschichte Irans* (1887). JAMES BASSETT.

Persian Berries: See FRENCH BERRIES.

Persian Gulf: an inlet of the Arabian Sea through the Gulf of Oman and the Strait of Ormuz, and between Arabia and Persia. It is 650 miles long, 250 miles broad, receives the water of the Shat-el-Arab, and contains many islands, most of which are barren and desolate. The pearl-fisheries along the Arabian coast are celebrated.

Persian Inscriptions: See PERSIAN LANGUAGE and CUNEIFORM INSCRIPTIONS.

Persian Insect Powder: See FEVERFEW.

Persian Language: in its broadest sense, the speech of the greater part of Iran from the period of the Achaemenian kings, five centuries before the Christian era, down to the present time. When no qualification is added, Persian is usually employed to designate simply the modern speech. Three stages in the history of the language may be recognized: (1) The language of the Old Persian inscriptions, (2) Middle Persian or Pahlavi, (3) Modern Persian.

1. *Old Persian inscriptions* (B. C. 521–335) are the great monuments of the Achaemenian dynasty preserved in cuneiform rock-cuttings, tablets, on vases and on some seals. These records are the oldest remains of the language of Western Persia, and they present an Iranian tongue closely allied to the idiom of the AVESTA (*q. v.*). The closeness of the relationship may be illustrated by such a sentence as this in Old Persian: *ḫatīy Dārayavauš ḫšayapiya, ima tyā adam akunavam vašnā Auramazdāha āha*, which would be represented in Avestan by *sahaiti Dārayafraxhuš ḫšayapiyō, imat yaṭ azm akunāiom vašna Ahurahe Mazdāo anahat*—"saith Darius the king: that which I have done was accomplished by the grace of Ahura Mazda." In its phonology the ancient Persian is characterized by a tendency to drop final consonants, e. g. Old P. *abara*, Av. *abarāt*, Skt. *ābharāt*, Gr. *ἄραρε* (*τ*), he bore. Old P. nom. sing. *puṣra*, Av. *puṣrō*, Skr. *puṣrā-s*, son; most of the phonetic features resemble the Avesta. (See IRANIAN LANGUAGES.) The declensional system is like the Avestan and the Sanskrit, though less complete; the dative, for example, is missing in Old Persian, the genitive having to assume its functions; in syntax the Old Persian is somewhat less perfect than the two languages mentioned.

The ancient Persian inscriptions are written in wedge-shaped characters. The oldest and most important monument is the noble rock-record of the great deeds of Darius, an inscription of a thousand lines engraven on the side of a mountain which rises 1,700 feet above the plane at Behistan, near Ecbatana. This record is inscribed in three languages: (1) In Old Persian, (2) in a language variously designated as Scythian, Median, or better New-Susian, and (3) in Assyrian. There are also tablets and inscriptions at Persepolis, Van, Susa, and elsewhere in Persia, preserving briefer memorials of Cyrus, Xerxes, and Artaxerxes; but the later monuments, especially those of the last Artaxerxes (Ochus), B. C. 335, show distinct signs of a decadence of the ancient speech. On the deciphering of the Old Persian inscriptions, see GROTEFEND.

2. *Middle Persian or Pahlavi.*—After the fall of the Achaemenidae and the triumphant invasion of Alexander the Great there follow five centuries during which Iran was under the dominion of the Seleucidae and of the Parthian Arsacids. From this period we have no literary remains of the Persian language other than a few names or words preserved on coins or in some similar manner. Toward the close of the Parthian sway and on the rise of the Sassanian dynasty (A. D. 226) the national spirit of Persia revived and there succeeded a period from the third to the seventh century of our era during which the Persian is represented by the Pahlavi with its literature of no inconsiderable extent.

(See PAHLAVI.) This period shows a form of language much worn down as compared with the ancient Persian, and characterized by a very considerable infusion of Semitic (Aramaic) words; the presence of this foreign element is more apparent than real, as discussed in the article PAHLAVI (*q. v.*). The stage of the language during the Sassanian period is nearer the Modern Persian than it is the ancient Persian.

3. *New or Modern Persian.*—The Mohammedan conquest of Iran in the seventh century was linguistically to Persia what the Norman conquest was to the English speech. The decay of the inflectional side of the tongue was still further hastened, and there was a large influx of Arabic words which tended to increase rather than to decrease with time. The oldest form of the Modern Persian is represented by FIRDAUSI (*q. v.*), the tenth century epic poet. The native purism of Firdausi in his *Shāh Nāmah* is not kept up in later writers, yet, in spite of the Semitic admixture of Arabic elements, Modern Persian has remained a true Iranian speech, just as much as English has remained true Germanic. The language has not preserved any more of its inflections than has the modern English, consequently Modern Persian in its syntax has passed from the synthetic stage of the inscriptions into that of an analytic speech. In phonetics a marked change from the Old Persian tongue may be noticed, e. g. Old P. *puṣra*, Pahl. *pusar*, Mod. P. *pusar*, boy; Av. *mahrka-*, Pahl. *mark*, Mod. P. *marg*, death; Old P. *naiba-*, Pahl. *nēvak*, Mod. P. *nēk*, beautiful; Av. *vāhrka-* (cf. Old P. *varkāna-*, Hyrcania), Pahl. *gurg*, Mod. P. *gurg*.

The alphabet employed in writing Modern Persian (the *taḥik* character) is a modification of the Arabic script (*neškhi*); there is current also a more running style of handwriting known as *šikastah*. The modern vernacular of Persia shows a number of dialects, among which is the antique Dari dialect, still preserved by the Zoroastrian guebbers of Iran. (See PARSEES.) Consult also CUNEIFORM INSCRIPTIONS, PAHLAVI, and IRANIAN LANGUAGES and LITERATURE.

BIBLIOGRAPHY.—On the Old Persian inscriptions, consult Rawlinson's *Cuneiform Inscriptions* (in the *Royal Asiatic Society's Journal*, London, 1846); Spiegel, *Die altpersischen Keilinschriften* (Leipzig, 1881); Weisbach and Bang, *Die altpersischen Keilinschriften* (Leipzig, 1893). (For references to Pahlavi, see under that language.) Modern Persian grammars are by Lumsden (Calcutta, 1820); Sir William Jones (ed. Lee, London, 1828); Chodzko (Paris, 1852); Vullers (Giessen, 1870); Fleischer (Leipzig, 1875); and Salemann and Shukowski, *Persische Grammatik* (Berlin, 1889). Dictionaries are: Richardson, *Persian and Arabic Dictionary* (London, 1852); Vullers, *Lexicon Persico-Latinum* (Bonn, 1855–64); Palmer, *Concise Dictionary, Persian-English* (London, 1875); Steingass, *Persian-English Dictionary* (London, 1892); and Horn, *Grundriss der NeuPersischen Etymologie* (Strassburg, 1893). On the dialects, consult Browne, *A Year among the Persians* (London, 1892), pp. 187, 388, where bibliography is given. In Geiger and Kuhn's *Grundriss d. iran. Philologie* (Strassburg) Shukowski is to treat the subject of Modern Persian dialects. A. V. WILLIAMS JACKSON.

Persian Literature: in the broader sense, all literary records, monuments, and writings of Iran from the earliest times to the present; the more ancient forms of the literature are discussed under AVESTA, PAHLAVI, and PERSIAN LANGUAGE. In the more usual and restricted sense Persian literature in its modern form may be said to date from about the ninth century of our era, although the real beginning is to be sought earlier, as there was no actual severing of the link between Pahlavi and Modern Persian by the Mohammedan conquest of Iran.

Modern Persian literature can justly boast of having fine examples of the epic and lyric poetry, of the romantic, the satiric, and of mystic poetry; the drama, however, is practically wanting, being a growth of the nineteenth century. As to the real origin of the national poetry of Persia, we are in uncertainty; the invention of metre and rhyme is attributed by legend to the popular Sassanian monarch Bahrām Gōr, or Bahrām V. (A. D. 420–439). Almost all modern Persian literature, even history, as in the case of the Arabs also, is written in verse.

Modern Persian Historical Literature.—For the history not only of Persia, but of the whole Eastern world, Persian literature possesses the amplest materials. Under the monarchs of the Sassanian dynasty (beginning 226 A. D.) materials had been collected for a history of Persia, and Yezdigird I. early in the fifth century ordered an abstract of them

to be made. This was translated from the Pahlavi, and continued by later princes up to the account of the Mohammedan conquest. From these old records the poet Firdausi (b. 940 A. D.; d. 1020) composed the *Shāh-Nāmāh* or Book of Kings, for the conqueror Mahmūd of Ghazni. This is a magnificent epic of 60,000 couplets, embracing the whole of the legendary history of Persia from the remotest times until the death of Yazdigird. See FIRDAUSI.

The oldest of the prose historians is Tabari (b. 838 A. D.; d. 922), who wrote a history of Persia down to the times of the khalifate. His work has been translated for the Oriental Translation Fund. (*Chronique d'Abou Tāhar Mohammed Tabari*, by Zotenberg, Paris, 1867-74.) The book was originally written in Arabic, but only the Persian version of it exists in a complete state. In the fourteenth century Yahya ibn Abd-ul-latif, Cuzwini (d. 1351 A. D.), published a comprehensive general history entitled *Lubb-et-tawarikh*, or Pith of History. Mohammed ibn Khavand-shāh Mirkhond (b. 1433; d. 1498 A. D.) was author of the *Rawzat as-Safa* (Meadow of Purity), a history of Persia from the Creation to A. D. 1471. (See MIRKHOND.) His grandson, Khavandamir, who was attached to the court of Bāber soon after the invasion of India (1528), wrote an abridgment of this work under the title *Khulasat el Akhbar* (Abstract of Information). It is in ten books, and is an excellent epitome of Eastern history. The *Habib us Siyar* (Biographer's Friend) is another esteemed historical work by the same author. There is a very excellent history of Persia, written about 1300 A. D. by Wassaf of Shirāz; an account of it is given by Sir Gore Ouseley in his *Notices of Persian Poets* (Oriental Translation Fund, London, 1846), where, among other extracts from the work (p. 232), he gives a story which is the exact counterpart of the well-known English legend of Whittington and his cat. Besides these general histories, there are a great many histories of particular reigns and periods.

All these are purely Persian works, but there is in addition a large number of works written in that language in India, and relating for the most part to the affairs of that country. Of these, the most important are the *Ayin i Akbari* (Institutes of Akbar the Great, Emperor of Hindustan); *Tarikh i Ferishta*, a general history of India by Muhammed Kasim Hindu Shah ul. about 1612 A. D., who was surnamed Ferishta, ed. by Gen. Briggs (2 vols., Bombay, 1831), translated by A. Dow (London, 1770-72), and by Gen. Briggs (4 vols., London, 1829); and the *Siyar ul Mutaakkerin* (Modern Biography), a history of India down to recent times (Eng. trans. by Gholam Hossein, 3 vols., Calcutta, 1789, and by J. Briggs, London, 1832). A complete account of the native historians of Persia is given in *A Descriptive Catalogue of the Historical Manuscripts in the Arabic and Persian Languages preserved in the Library of the Royal Asiatic Society of Great Britain and Ireland*, by W. H. Morley (London, 1854).

Poetry. Of the various forms of Persian poetry the most important are—(1) the *Masnavi* (rhyming couplets), which answer to our own "heroics," epic, narrative, and didactic pieces being generally written in this meter. (2) The *Ghazal* (ode). These are for the most part ostensibly anacreontic songs, love and wine being the constant theme, but they are really highly metaphorical religious writings, expounding the peculiar theosophic views of the most extraordinary sect the East has ever produced, the Sūfī dervishes. (3) The *Kasidah* (idyl), which is generally employed in panegyric. Among the principal poets of Persia is Rūdāgī. He lived in the reign of Nasr, grandson of Ismael Samani, founder of the Samany dynasty (about 940). He was born blind, but wrote magnificent lyrics, some few of which have come down to us. (See RŪDAGĪ.) Firdausi has already been mentioned in the account of the historians. In addition to his great work, the *Shāh-Nāmāh*, he wrote a bitter satire on his ungrateful master, Mahmūd, which is usually prefixed to the epic itself, and a poem entitled *Yūsuf u Zuleikha* (The Loves of Joseph and Potiphar's Wife), a favorite subject with the Persian bards. (See FIRDAUSI.) One of the most original and extraordinary poets of Persia was Omar Khayyām (d. 1123). He was a great astronomer and mathematician, and to him we owe the work called *Al-Jabr u el Mukabalah*, on the science which still bears the name "algebra" which he gave it. His poems consist entirely of *rubāiyāt*, or quatrains. They breathe a spirit of advanced free thought, which sometimes, indeed, verges on atheism; but they have at the same time a strange admixture of refined sentiment, philosophical cynicism, and manly feeling

which makes them unlike any other composition of the kind. (See OMAR KHAYYĀM.) Omar Khayyām in his youth was an intimate friend of Hasan Sabah, the original "Old Man of the Mountain" and founder of the celebrated sect of Hashashin or Assassins. Auhad-ud-din Anvari (d. about 1200) attracted the notice of Sultan Sanjar, the sixth of the Seljukian dynasty. He was an astrologer as well as poet, but having predicted a terrific storm on the occasion of the conjunction of the seven planets in Libra (Sept. 16, 1186), and failed signally, he relinquished the former profession. His principal works are *Kasidahs* (odes), which enjoy even now a great reputation in Persia. They are full of fine and even sublime conceptions, nervous and elegant language, and original conceits. The whole *divān* or "collected works" of Anvari were lithographed at Tabriz during the reign of Nasr-ed-din. (See ANVARI.) Sa'di Mushi-ud-din of Shirāz (b. about 1170 A. D.; d. 1291-92 A. D.), next to Hāfiz enjoys the greatest reputation of any Persian poet. He is a master of elegant style, and many of his works are marked by a very high tone of moral sentiment. That by which he is best known in Europe is the *Gulistan* (Rose-garden), a beautiful collection of moral stories in prose and verse. Mention should also be made of his *Bustān* (Fruit-garden.) (See SA'DI.) Ferid-ud-din Attār (d. at a very advanced age 1230 A. D.) was an eminent Sūfī and poet. His principal work is a collection of tales and parables in verse entitled *Mantik ul Tair* (The Language of Birds).

Abū Mohammad ibn Yūsuf, generally called Shaikh Nizāmī of Ganjah (d. 1203 A. D.), wrote a *Khamsah*—i. e. a collection of five didactic poems embodying Sūfistic doctrines. Of these the most celebrated are perhaps the *Laila u Majnūn*, an Arabian love-story, and the *Sikandar-Nāmāh* (History of Alexander the Great). Nizāmī's style is terse and rather difficult, but at the same time very forcible. Few poets contain more subtle thoughts and pregnant expressions; and while other Persian poets generally err on the side of verbiage and prolixity, Nizāmī frequently falls into the opposite extreme. Besides the five poems above mentioned, Nizāmī wrote a *divān*, or collection of odes, elegies, etc. (See NIZĀMĪ.) Maulavi Rumi, Jelāl-ud-din Rūmī, the founder of the sect of Mevlavi dervishes (b. 1207; d. 1273), is the great exponent of the mystic doctrines of the Sūfīs. He was a contemporary of Sa'di, the author of the *Gulistan*. His immortal work, the *Masnavi*, consists of six long books in rhyming couplets. It contains a complete exposition of the Sūfī doctrines, and forms a perfect *répertoire* of all the tales, legends, fables, and apologues current in the East. This narrative portion of the work is written in a lively, unaffected style, but the long speculative digressions, to which the stories serve merely as introductions, though instructive and often beautiful, are somewhat tedious to a European reader. So highly is the book esteemed throughout the Mohammedan world that it has acquired the title of the *Koran of Persia*. In addition to the *Masnavi*, Jelāl-ud-din wrote a *divān* of beautiful lyrics. The collection of Maulavi Rumi's minor poems is generally known in India by the name of *Kulliyat Shems Tabriz*, Shems Tabriz being his *takhallus* or *nom de plume*. (See RŪMĪ.) To the fourteenth century belongs the famous lyrical poet Hāfiz, or Shams-ud-din Mohammed, of Shirāz. His poems for the most part are short odes, or *ghazals*, and the collection of these, under the title *Divān i Hāfiz*, is the best known in literature. His death occurred in 1388. (See HĀFIZ.) Jāmi (b. 1414 A. D.; d. 1492 A. D.) wrote a *Khamsah* in imitation of Nizāmī, including a *Sikandar Nāmāh*, a History of Alexander the Great, and *Yūsuf u Zuleikha*, a subject also treated by Firdausi; it is by the last-named poem that he is best known. Jāmi also published a *divān* of lyrical odes. His poetry is much more light and elegant in character, and more full of feeling, than Nizāmī's, but it lacks the stately grandeur and profound thought which distinguish the latter. (See JĀMĪ.) Hatifi (d. about 1520 A. D.) was a nephew and pupil of Jāmi, and wrote many beautiful poems, among them one entitled *Laila u Majnūn*, which has been edited by Sir William Jones (Calcutta, 1787); his works gave promise of peculiar excellence, but he died prematurely. Khākāni, Afzal-ud-din Ibrahim (d. 1199 A. D.), was perhaps the most forcible writer in the Persian language, and his poetry is distinguished by a peculiar loftiness of thought and sublimity of style. He is best known by his odes and satires, and by a charming poem containing an account of the countries through which he passed on his way to Mecca, and called *Tuh fat ul Irāqain* (A Present from Persian and Arabian Irak). Amir Khosru of Dehli (b. 1253 A. D.; d. 1324 A. D.) was of Tartar origin, be-

ing sprung from the tribe of Hazara Lachin, near Balkh. He went to Hindustan, and settled at Puttiala, near Delhi, where, thanks to the influence of his father-in-law, he obtained an important post at the court of Tughlak Shah in Delhi. He was a very voluminous writer, and his poetry is marked by great wit and exuberance of fancy. He is best known by five Sūfistic romances after the model of the *Khamseh* of Nizāmī. We must not omit to mention the wild and stirring improvisations of the robber-poet Kurroglou, who flourished about the middle of the seventeenth century, and who, although writing in a half-Turkish *patois*, may yet be considered as a representative of the rustic muse of Persia. The reign of Nasr-ed-din produced a poet of no mean pretensions, Hakim Kaani, poet-laureate to the shah. His poems have been printed at the imperial press at Teheran, and form a large folio volume. Kaani has an astonishing command of language and rhythm, and while following closely the ancient traditions of Persian poetry as to the form, he has not disdained to infuse into his works a spice of modern learning which imparts a novel and pleasing character to his style. There is an immense crowd of minor poets in the ranks of Persian versifiers, but those mentioned above are the most important ones.

The aim of the Oriental poets is not, as with our own, to discover and produce new conceits and new trains of thought. Indeed, the introduction of an entirely novel and original simile is considered rather a breach of good taste than otherwise. Upon the other hand, the wealth of the language enables them to clothe a single idea in an almost infinite variety of forms of expression, and it is in this direction that their ingenuity and invention are exercised. In order, then, to become able to read any fresh poet with ease, it is necessary for the learner to adopt the native method, and make himself perfectly acquainted with all the minutiae of the works of one of the standard classical writers, and this will give him a ready key to all the rest. Dr. A. Sprenger's *Catalogue of the Arabic, Persian, and Hindustani MSS. in the Library of the King of Oudh* (vol. i., Calcutta, 1854), and Rieu's *Catalogue of the Persian MSS. in the British Museum* (3 vols., London, 1879-83), contain short biographical notices and accounts of the works of all the principal Persian poets.

Ethics, Science, Fiction, and Miscellaneous Works.—The number of these works which Persian literature contains is so numerous that it would require a large volume to give anything like an adequate account of them. The modern Persians, like other Oriental nations, have been stimulated into intellectual activity in recent times by their increased communications with the West, and the result has been that a number of useful works on educational and scientific subjects have been translated from the various European languages. The old standard authors, however, still hold their ground, and are studied with as much ardor as ever. The most esteemed and best-known miscellaneous works are *Akhlah i Jelali*, a treatise on Persian moral philosophy, by Jelāl-ud-din, translated by W. F. Thompson (1839); the *Akhlah i Muhsini*, by Hussein Vā'iz Kāshifi (translated by Keene, Hertford, 1852), another much esteemed work on the same subject, the *Gulistan* of Sa'di, already mentioned in the notices of poetical works; the *Anwar i Suheili*, the Persian version of the fables of Bidpai, by Hussein Vā'iz Kāshifi; the *Dabistan i Mazahib*, by Muhsin Fani, an interesting account of the rise, progress, and doctrines of various religious sects throughout the East. It contains, among others, a history of the ancient religion of Persia, of Hinduism, and of the different sects of Mohammedanism (translated by Shea and Troyer, Paris, 1843). The *Behāristān*, or Spring Garden, of Jāmi, is a charming collection of tales, anecdotes, and aphorisms, and contains, besides, short biographies of twenty-eight of the principal poets of Persia. One of the most interesting works in Persian is the *Tezkerah i Ahwara*, or Memoirs of the Poets, by Daulat Shah, who finished it about 1486 A.D. It is divided into a preface and nine chapters, each chapter containing biographies of about twenty poets, written in a most entertaining style, with extracts from and criticisms upon their works. It is also filled with historical details of great interest and importance, and displays great research and critical acumen in its compilation. It forms the groundwork of von Hammer's *Geschichte der schönen Redekünste Persiens*. E. H. PALMER.

Revised by A. V. WILLIAMS JACKSON.

Persigny, pār'scēn'ye', JEAN GILBERT VICTOR FIALIN, Duc de: statesman; b. at St.-Germain-Lespinasse, Loire,

France, Jan. 11, 1808; entered the army, but was discharged in 1830 on account of insubordination; became a contributor to the *Temps*; founded in 1834 *L'Occident français*, a Bonapartist organ; became very intimate with Louis Napoleon; took part in the affair of Strassburg, from which he escaped, and about which he wrote *Relation de l'Entreprise du Prince Napoléon-Louis* (London, 1837); took part also in the descent on Boulogne, where he was captured and imprisoned for several years, during which time he wrote *Utilité des pyramides d'Égypte* (1844), a rather singular performance, in which he tried to demonstrate that those gigantic structures had been reared in order to defend the Nile valley against the sand-flights; was restored to liberty by the Revolution of 1848, and at once set himself to work in the interest of Napoleon, who, on becoming president, appointed Persigny his aide-de-camp. In 1849 he was elected a member of the Legislative Assembly; played an important part in the *coup d'état* of 1851, and was Minister of the Interior from Jan., 1852, to Apr., 1854, and again from Nov., 1860, to June, 1863, having in the interval been ambassador to Great Britain. He was created a duke in 1863. D. at Nice, Jan. 13, 1872. The letters on public affairs which he now and then published are believed to have been inspired by Napoleon himself. See Delaro's *Le Duc de Persigny et les Doctrines de l'Empire*, 1865, and Delord's *Histoire du Second Empire*, 1868-75. F. M. COLBY.

Persim'mon [from Virginia Ind. name]: a tree of the U. S., the *Diospyros virginiana*, of the order *Ebenaceæ*, and its fruit. The common persimmon-tree has a fruit which is excessively astringent until over-ripe, but after hard frosts have brought it to the verge of decay it is a very sweet and agreeable fruit. The wood is used for last-making and other turnery. The kaki or Japanese persimmon (*D. kaki*) is the leading fruit-tree of Japan. It is now planted in California and the southern parts of the U. S. in many varieties, and its fruit is becoming of importance. See DIOSPYROS.

Revised by L. H. BAILEY.

Per'sius, AULUS PERSIUS FLACCUS: satirist; b. at Volaterræ, in Etruria, Dec. 4, 34 A. D., of a rich equestrian family; received a careful education in the schools of Rome; became a pupil of Cornutus the Stoic; moved in the most elegant circles of the capital; was acquainted with Lucan and Seneca. D. Nov. 24, 62. Six satires by him, comprising 650 hexameter lines, are extant, edited by Jahn in 1843 and by Heinrich in 1844; and it is probable that he wrote no more, and even left these in an unfinished state, as he wrote seldom and slowly. They were edited after his death by his friend the poet Cæsius Bassus, to whom the sixth satire is addressed. In antiquity these satires were read and appreciated more than any other production of Latin literature; they were studied and quoted, not only by the pagan authors, but also by the Christian Fathers, such as Augustine, Lactantius, and Hieronymus. In the darkest periods of the Dark Ages they were still read, and their present standing is indicated by the circumstance that there are fourteen English and twenty French translations of them. They are, nevertheless, not easy to understand. The language is obscure and pedantic, the metaphors often grotesque, the connection of ideas difficult to follow. Much is borrowed from Lucilius and Horace, and there is a constant straining after novel and piquant effects. On a more intimate acquaintance, however, a pure, enthusiastic, and earnest soul reveals itself, which, feeling itself fettered by the corruption and depravity of the age, fights the foe as best it can. There are later editions, with English commentary, by Gildersleeve (New York, 1875) and by Conington with an English translation (3d ed. revised by Nettleship, Oxford, 1893); revised text with Juvenal, by Bücheler (Berlin, 1893). Revised by M. WARREN.

Personal Equation: See EQUATION, PERSONAL.

Personal Property: See PROPERTY.

Person and Personality [*person* is viâ O. Fr. from Lat. *perso'na*, theater-mask, part (in a play), personage, person; loan-word from Gr. *πρόσωπον*, mask, face, adapted to presumed etymology of *per*, through + *sona're*, sound (i. e. speak)]: the word person is still sometimes used to denote the corporeal appearance of a man rather than his inner attributes, as when we say that he possesses an agreeable person, or is personally repulsive. Later, the relations that a man might sustain in the world as a "personage," *personam agens*, or *gerens*, became prominent, and later still the spiritual functions became the essential content of the notion. In common parlance to-day "person" means an individual

man in his typical completeness as uniting a human body to a free and rational soul. From this point of view personality has been denied to pure spirits and to the souls of the departed awaiting the resurrection, because they are bodiless; also to idiots because they are irrational; to maniacs because they are not free; and to animals, however intelligent, because they are not human. By emphasizing one feature of the conception or another, psychology, ethics, law, and theology have all developed the conception of personality in different ways.

In psychology "personality" designates individuality, or what is called "personal identity," and various opinions have been held concerning the foundations of this. It is either an ultimate and self-subsistent principle at the core of a man, or it is a result derived from other principles. Already in Hindu philosophy we have this opposition in the contrast between the Sankhya system, with its absolute plurality or independent finite souls, and the Vedanta system, for which there exists only one self, the supreme Brahman, with whom all particular selves (Atman) are really coincidental, but (until they are redeemed by knowledge) dwell in the illusion of finite personality through not distinguishing themselves from the organisms with which they are severally conjoined. These organisms have their psychic as well as their physical side. Their grosser body is resolved at death into its elements, but a finer body, together with the senses and active powers, the *manas*, or organ of consciousness and will, the breath, and the *karma*, or moral worth acquired, form principles of continued individuality which ever enter into other bodies, so that through an indefinite series of transmigrations the finite personal life is kept up. The modern theologians' doctrine of personality is derived from the Vedantic system.

Among the Jews the spiritual principle of personality was the "spirit" (*Ruach*) or warm breath of life which animated the dust, when breathed therein by Jehovah. This breath-spirit, which we find as the ruling conception in all primitive thought, maintains its place in both Greek and Christian philosophy, developing into the more physiological conception of "animal spirits" on the one hand, and into the Pauline doctrine of the "Spirit," or *pneuma*, on the other. The animal spirits filling the arteries, nerve-tubes, and brain cavities were supposed to mediate between the rational soul and the body; the theological "spirit" mediates between God and the soul or *psyche*.

In the Greek philosophy, passing over the confused utterances of the pre-Socratic masters, we find the *pneuma* or fiery air-current to play a great part in the systems of the Stoics. Being of a nature both material and immaterial, it was well calculated to serve as the animating principle of the world at large as well as of the individual person in it. Plato and Aristotle subordinated the principle of the breath to the immaterial and rational *psyche*. In Plato we find the germ of later spiritualistic conceptions of personality. The man is composed of two almost hostile principles, of which the soul is the one that is essential, being superior to Nature, pre-existing to the body, and possessing an immortal destiny to be attained by a course of rational and moral development. The body here is the soul's vessel or prison, and, although its necessary servant, is also the source of its errors and faults. This dualistic view was in Aristotle's psychology developed into that wonderful conception of soul as "form" and body as "matter" which dominated all Christian philosophy until the time of Descartes. For Aristotle the person is this organic unity of form and matter, this animated body in its completeness, this subject of biology and psychology in one; and nutrition becomes a function of the soul as much as thinking is. Scholastic peripateticism here, as elsewhere, elaborated the Aristotelian ideas into greater hardness and articulateness. Soul and body, separately taken, are incomplete substances. Only their union is a concretely subsistent substance, *suppositum* or *hypostases*; and since in the case of the human soul the nature of the substance is rational, the *suppositum rationale* thus composed is what is meant by *person*. *Individua substantia nature rationalis* is the definition of "a person," often quoted from Boethius.

It is not till Descartes's time that we find consummated with perfect sharpness the distinction, now so familiar to us, of Consciousness and the Unconscious. In the Cartesian philosophy the Conscious and the Extended, having absolutely nothing in common with each other, were raised to the rank of two mutually exclusive substances, and the commerce of soul and body in the human person, mediated

for Descartes himself by the animal spirits, had to be carried on for Malebranche and other Cartesians by a perpetual miracle of "divine assistance." The person was thus broken in two, or rather became a purely spiritual entity, while the rest of nature, including the body, was materialistically treated. In Cartesianism, however, as in Peripateticism, the finite souls still constitute a multitude of distinct substances, and are not, as with Spinoza, lost in the one substance of God. Personal identity, in a word, is *real*—a principle, not a result.

In Locke's *Essay Concerning Human Understanding* the great revolution toward empiricism begins. Personality is now explained as a result, and not assumed as a principle. It is not something which, by simply being, gives rise to consequences, but something which is made from moment to moment by a cause which can be assigned. Locke believes, indeed, in souls as substances and in their identity; but the mere ontological self-identity of such a soul would, he says, make no *personal* identity unless a recollecting consciousness were joined thereto. "Consciousness" is what makes a *person*, when it remembers past experiences, as having been also its own. If the same consciousness with its memories could migrate from one soul to another, we should have personal identity without identity of substance. And conversely, if one man were to have distinct incommunicable consciousness at different times, he would make different persons. As personality is annexed to consciousness, so punishment ought to be annexed to personality, and in the great day, wherein the secrets of all hearts are laid open, no one should be made to answer for what he knows nothing of, but should receive his doom, his conscience accusing or excusing. The importance of Locke's doctrine lay in this, that he eliminated "substantial" identity as transcendental and unimportant, and made of "personal" identity (the only practically important sort) a directly verifiable empirical phenomenon. Where not actually experienced, it is not. Hume went beyond Locke in discarding substances, whether spiritual or material altogether. Our sense of *gradual* change in the succession of our particular "ideas," in which "there is properly no simplicity at one time nor identity in different," is what Hume means by our personal identity. Locke's and Hume's views have been carried out both in Germany and England by the *associationist psychology*, which in consequence has been dubbed a "psychology without a soul."

Since Kant's time the consciousness of subjection to moral law, and the autonomy and freedom implied by such a consciousness, have often been referred to as the specific marks of personality. On this view "person" means a being with inner ideal ends, to which it freely acknowledges responsibility. Here the psychological notion passes over into the ethical and juridical conceptions of personality.

Recent psychology has, in the main, elaborated itself on Lockian lines. The succession of associated ideas inwardly held together by memory is regarded by all schools to constitute the content of the *empirical self*. For some writers these ideas themselves are compounds of simpler psychic units, so that the psychic person is a purely secondary result, with no special principle of unity. Others contend for such a primordial principle, either in the shape of a real spiritual being or soul, which owns the ideas, or in that of a "transcendental Ego" which performs their synthesis.

Multiple Personality.—That something beyond the mere contemporaneous connection of many ideas with one organism is needed to make one personal consciousness result, is shown by certain phenomena which psychologists are but just beginning to study with care. In a variety of ways one and the same "man" may successively or simultaneously have different consciousnesses that are, in Locke's words, incommunicable. The most familiar cases of this are ordinary forgetfulness, absence of mind, and rapid oblivescence of dreams, where subsequent recollection proves the apparently lost ideas to have been there all the time. In somnambulism, either natural or "hypnotic," the rule is for the subject to forget on waking all that he has done, but to remember it again on re-entering the somnambulist state. He may thus live two alternating personal lives with a distinct system of memory in each. It was first proved by Edmund Gurney that the memories of the hypnotic consciousness may coexist, after waking, with the normal consciousness of the subject, but be unknown to the latter. Taking subjects to whom it had been "suggested" in trance that they must perform certain acts after waking when a signal should be given (see HYPNOTISM), but whose waking

consciousness ignored the suggestion, he set their hands, when they woke, upon a *planchette* and got the order automatically and "unconsciously" written, while their normal consciousness was occupied in reading aloud, or in conversation. At about the same time Janet, Binet, and others found phenomena in connection with the anæsthetic surfaces of hysteric patients, which proved the anæsthesia to be relative only to the subject's principal consciousness, another consciousness appearing present which took cognizance of the apparently lost sensations. Thus one patient's anæsthetic hand can feel her toilet articles and handle them skillfully; in others, if the attention be distracted, the anæsthetic hand adapts its movements to objects that are placed in it, as scissors, matches, etc. Or if figures be traced on the anæsthetic palm, the patient will see them, vicariously, as it were; but the chief proof, as with Gurney, is by automatic writing. Janet used what he calls the "method of distraction" in these cases. In this the patient is kept absorbed in conversation with a third party, while the operator, approaching her quietly, whispers questions in her ear. The consciousness engaged in talking ignores the questions, but, if a pencil be placed in the hand, answers to them are automatically written. It is as if one consciousness animated the speaking mouth and another the writing hand, both, however, using the ear. Myers has given the name of *subliminal selves* to consciousnesses supernumerary to the principal one; and Janet and others have found that painful reminiscences split off from the principal consciousness, persisting thus subliminally and revealing themselves in the hypnotic trance, are prime factors of the hysteric condition. Cases of *alternating personality*, in which the man or woman passes at intervals into a "second" state with its own peculiarities, of which the normal state, when resumed, knows nothing, have been recorded at great length. "Léonie," "Felida X.," "Lurancy Vennum," "Ansel Bourne," and "Louis V.," may be named as types. In the last-named case there were as many as five different personalities with exclusive systems of memory and peculiarities both of bodily sensibility and character. A very large number of men and women can readily become *automatic* writers, either with *planchette* or pencil. The writing hand becomes sometimes anæsthetic, sometimes not; and there are all degrees of detachment of the principal consciousness from what is written. In no case, however, is the subject's "will" felt to be concerned. These writings tend in most cases to assume the character of messages from spirits who sign their names; and in its most developed degree automatic writing passes into *mediumistic trance* and may be succeeded by "*speaking under control*." Here again there are degrees; but the medium's normal consciousness usually remembers nothing of the trance-utterances, which may assume a character very unlike the medium's own. (See SPIRITUALISM.) The phenomena of *demoniacal possession*, so rare in ancient times and in primitive societies, seems to be essentially the same thing as our trance-mediumship, obeying, however, a different inspiration as regards its moral content. In both phenomena the "attacks" are short, no memory of them remains, and the patient between them is well. The subjects have nothing in common with the insane, technically so called.

All these facts have brought the question of what is the unifying principle in personality to the front again. It is certain that one human body may be the home of many *consciousnesses*, and thus, in Locke's sense, of many *persons*; but much in the temperament of the secondary persons seems unaccountable if they are only accidental improvisations, produced by certain groups of the patient's "ideas" separating from the rest and leading a quasi-independent life. They have a generic similarity in many cases, as in automatic writing and trance-speaking, which suggests some common cause as yet imperfectly known, or at any rate a context which if explored might make the phenomena, with their peculiar regularity, appear more rational. It is clear already that the margins and outskirts of what we take to be our personality extend into unknown regions. Cures and organic effects, such as blisters, produced by hypnotic suggestion show this as regards our bodily processes; while the utterances of mediums and automatic writers reveal a widespread tendency, in men and women otherwise sane, to personifications of a determinate kind; and these again, though usually flimsy and incoherent in the extreme, do, as the present writer believes, occasionally show a knowledge of facts not possessed by the primary person. The significance and limits of these phenomena

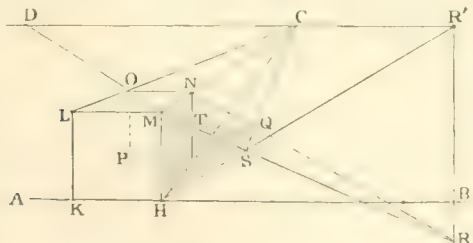
have yet to be understood, and psychology is but just beginning to recognize this investigation as an urgent task.

BIBLIOGRAPHY.—For opinions before Locke see all the histories of philosophy, especially Siebeck's *Gesch. d. Psychologie*; and for Hindu ideas, see Deussen's *System des Vedanta*. Locke's statements are in book II., chap. xxvii. of his *Essay*; Hume's in part iv., § vi. of his *Treatise on Human Nature*. In modern psychology Ladd's *Physiological Psychology*, part iii., and James's *Principles of Psychology*, chap. x., may be referred to, the one defending a Real Being as the principle of personal unity, the other placing it in the function of memory. General defenses of the spiritual view are A. W. Momerie's book *Personality*, and F. A. Shoup's *Mechanism and Personality*. The theosophic doctrine is conveniently expressed in Blavatsky's *Key to Theosophy*, *passim*. Binet's *Allérations de la Personnalité* and various essays by Myers in the *Proceedings of the Society for Psychical Research* give the facts of multiple personality in much detail.

WILLIAM JAMES.

Perspect'ive [from Lat. *perspi'cere*, look through; *per*, through + *spi'cere*, look]; the art of representing an object upon a plane surface, so that the representation shall exhibit the same appearance as the object itself. To conceive what is meant by the perspective of an object, imagine a transparent plane to be placed between the eye and the object, and let straight lines be drawn from every point of the object to the eye. Each of these lines will intersect the transparent plane in a point; and if each small area determined by an assemblage of such points is properly tinted, the resulting picture will present the same appearance as the object itself. The art of perspective is thus divided into two parts: (1) the correct delineation of the lines of the object, (2) the proper shading and coloring of the picture, so as to produce the desired effect of distance and tint. The first, which alone is considered here, is called *linear perspective*, and the second *aërial perspective*. The importance of attending to perspective becomes apparent if we consider the appearances presented by objects under certain conditions. For instance, two parallel rows of objects of equal size, if seen from a point midway between the rows, seem to converge as well as to grow smaller and smaller; and a circle, if seen obliquely, appears to be an ellipse. In what follows we suppose the perspective drawing to be made upon a vertical plane between the eye and the object. This plane is called the perspective plane, and any object lying on the same side as the eye is said to be in front of the perspective plane, and any object lying on the other side is said to be behind. The lines that are drawn from the different points of the object to the eye are called *visual rays*; all the visual rays that are drawn from a right line or from a curve in a plane passing through the eye make up a *visual plane*; and all the visual rays that are drawn from any other curve make up a *visual cone*. The art of linear perspective consists in passing visual planes and visual cones through the principal lines of the object, and finding their intersections with the perspective plane. The method of proceeding depends upon a few simple principles of geometry, of which the following are most frequently used: (1) If two lines are drawn through any point of an object their perspectives intersect, and the point of intersection is the perspective of the given point; (2) if visual planes are passed through any number of parallel lines of the object, they intersect each other in a visual ray parallel to the given lines, and the point in which this ray intersects the perspective plane is a point, called the *vanishing point*, common to the perspectives of all the given lines. If the perspective plane were made of glass, a sketch made on it by following with a pencil all the lines and shades of the objects seen by the observer would give a representation in absolute perspective; but this method is not practicable for various reasons. A series of rules, founded on observation and experience, has been formed by which painters are enabled to copy nature faithfully. After the objects to be introduced into the picture and the distance from which they are to be viewed have been determined, it is necessary to draw certain lines upon the perspective plane, (1) the *base line*—that is, the base line of the sketch—which is the boundary nearest the observer of the objects to be represented; (2) the *horizontal line*, representing the ordinary position of the horizon. It is supposed to be level with the observer's eye. When the latter is on a level with the horizon it is generally drawn at a height of about one-third of the entire height of the picture, but it will rise together with an increase in the elevation of the observer; (3) the *vertical*

line; it is perpendicular to both the other lines and meets the horizontal line in the *point of sight*. This point is generally placed so as to be the center of the picture—that is, on a line half way between the two sides. All lines in nature perpendicular to the perspective plane, called *perpendiculars*, are represented by lines intersecting in the point of sight, which is thus their vanishing point. The points of distance are two points on the horizontal line, twice as far apart as the eye is from the picture; they are equidistant from the point of sight when the horizontal lines, called *diagonals*, of which they are the vanishing points, are inclined to the base line at an angle of 45°. As a visual ray parallel to a system of diagonals inclines to the right or the left, the diagonals vanish at the right hand or left hand point of distance respectively. Of other groups of parallel lines the vanishing points are called accidental points. If such a point is above the horizontal line it is called the accidental point *aërial*, and if below, the accidental point *terrestrial*. It is easy to see that it may or may not lie within the limits of the picture. In the case of lines parallel to the perspective plane the perspectives are also parallel systems, and from a mathematical point of view have their vanishing points at infinity. Such a line is called a *parallel*. The object to be put in perspective may be given by its projection on a horizontal plane and by the distances of its points above or below that plane—i. e. its plan and elevation. (See PROJECTION.) The perspective of any point may be most easily determined as the intersection of the perspectives of a diagonal and a perpendicular passing through the point; and the perspective of the shadow of a point upon a horizontal plane may be determined as the intersection of the perspectives of a ray of light passing through the point and of the projection of that ray upon the given plane. As an illustration, let us find the perspective of a cube and the perspective of the shadow which it casts on the horizontal plane of its base, the rays of light being parallel. Take the perspective plane through the front face of the cube, and let A B represent the intersection of the plane of the lower base of the cube with the perspective plane. Let C be the center of the picture, and let D C, parallel to A B, represent the horizon; also let D be the left-hand vanishing point of diagonals, R the vanishing point of rays of light, and R' the vanishing point of horizontal projections of these rays; R' is in a perpendicular through R to A B, and also in the line D C. Construct the square H L to represent the front face of the cube, and it will be its own perspective. The edges of the cube that pierce the perspective plane at H, K, L, and M are perpendiculars, and their indefinite perspectives may be found by drawing lines from these points to C. The diagonal through the upper left-hand vertex of the back face pierces the perspective plane at M and M D in its perspective; the point O in which M D cuts L C is therefore the perspective of this vertex. The edges of the cube parallel to L M and K H are parallel to the perspective plane, as are also the edges parallel to L K and M H, and consequently their perspectives are parallel to the lines themselves. Hence, if we draw O N and O P parallel to L M and L K, and then construct a square on these lines, it will be the perspective of the back face of the cube. The figure H O is then the required perspective of the given cube.



To find the perspective of its shadow on the horizontal plane A B, we draw M R, which will be the perspective of the ray of light through M, and H R, which will be the perspective of the horizontal projection of that ray; the point S in which these lines intersect is the perspective of the shadow of the point M, and H S is the perspective of the shadow of H M. The shadow of the edge M N is a perpendicular; hence, we draw S C and N R, intersecting at Q; then is S Q the perspective of the shadow cast by M N. The shadow of N O is a parallel; hence, we draw Q T parallel to O N, and limited by a line from O to R; then is Q T

the perspective of the shadow cast by N O. The line T P is the perspective of the shadow cast by the edge O P. The perspective of the shade and shadow of the cube, so far as they are visible, are indicated by the shaded part of the drawing.

Revised by R. A. ROBERTS.

Revised by R. A. ROBERTS.

Perspiration: See SWEAT.

Per Stirpes: See DESCENT.

Perth: county-town of Perthshire, Scotland; at the foot of the Grampian Mountains, on the Tay; 43 miles N. N. W. of Edinburgh (see map of Scotland, ref. 10-H). It is a handsome city, with several fine buildings, including St. Ninian's Episcopal Cathedral and St. John's church, an old cruciform Decorated structure restored in 1891. The principal industries are dyeing, brewing, and manufactures of ink and linen. The salmon-fisheries are important. Pop. (1891) 30,525.

Perth: capital of the colony of Western Australia: on the Swan river, 12 miles above its mouth (see map of Australia, ref. 6-13). It is the financial center of the colony, and is connected by rail with Albany. The town was constituted a city in 1856, is the seat of Anglican and Roman Catholic bishoprics, and has a number of fine public buildings. Pop. (1892) 10,040.

Perth Amboy: city (incorporated in 1784); port of entry; Middlesex co., N. J. (for location, see map of New Jersey, ref. 4-D); at the mouth of Raritan river; on Raritan Bay, Staten Island Sound, and the Cent. of N. J., the Lehigh Valley, the Penn., and the Staten Island Rapid Transit railways; 21 miles S. W. of New York. It is in a fire-clay and kaolin region; has a large and excellent harbor; and contains 5 terra-cotta works, 2 large dry-docks, 4 machine-shops, iron-foundry, oil-refinery, chemical-works, emery-works, cork-factory, and immense coal and freight shipping dépôt and wharves of the Lehigh Valley Railroad. There are a Young Ladies' Seminary, a State bank with capital of \$50,000, a savings-bank, and a daily and 3 weekly newspapers. Pop. (1880) 4,808; (1890) 9,512; (1895) 13,030.

EDITOR OF "MIDDLESEX COUNTY DEMOCRAT."

Perthshire: a central county of Scotland. Area, 2,528 sq. miles. It is greatly diversified by mountains, forests, valleys, rivers, and lakes. It is largely occupied by the Grampian Mountains, whose highest peak, Ben Lawers, rises 4,000 feet. Hardly a fifth of the surface is in tillage, the rest being pasture, woods, deer-forests, grouse-moors, etc. Pop. (1891) 122,185.

Per'tinax: a Roman of humble birth who rose to a position of the highest esteem in military and civil life during the reigns of Marcus Aurelius and Commodus. On the assassination of the latter he was chosen to succeed him as emperor, Dec. 31, 192 A. D., but was himself murdered less than three months later (Mar. 28, 193 A. D.).

G. L. H.

Perturbations [from Lat. *perturba-tio*, disturbance, deriv. of *perturba-re*, disturb greatly; *per*, through, thoroughly + *turba-re*, disturb]; deviations in the motion of a planet from its elliptic orbit, produced by the attraction of other planets upon it. Were a planet attracted by no body except the sun, it would, in accordance with Kepler's laws, describe an ellipse, having the sun in one of its foci. In consequence of the attraction of other planets, every planet deviates from such an ellipse, and these deviations are called perturbations. Periodic perturbations are those which, in the long run, tend to compensate each other. Secular perturbations are those changes in the form of the orbit which go on in the same direction from century to century. The mathematical theory of perturbation forms the most difficult subject in astronomy, and has taxed the powers of the greatest mathematicians in modern times. Laplace's *Mécanique Céleste* and other works of this kind are mostly devoted to the subject. S. NEWCOMB.

S. NEWCOMB.

Pertz, GEORG HEINRICH: historian; b. at Hanover, Mar. 28, 1795; studied at Göttingen; published in 1819 a learned monograph on the Merovingian *maiores domus*; was appointed in 1823 secretary of the royal archives at Hanover, and devoted the rest of his life to the collection and critical editing of the oldest sources of German history. In the execution of that great work, whose results appear in the famous *Monumenta Germaniae Historica*, he was supported by the King of Hanover and other German princes. Among his other works is a biography of Stein (Hanover, 1849-54). D. at Munich, Oct. 7, 1876. — J. M. Coffey.

F. M. COLBY.

Peru: a republic in the western part of South America, bordering on the Pacific, between Ecuador on the N. and Chili on the S. In the N. a tract of about 90,000 sq. miles, on both sides of the Marañon or upper Amazon, is held by Peru, but is claimed by Ecuador. Tacna and Arica, formerly southern provinces of Peru, are held by Chili. It is impossible to calculate the area even approximately; the estimate of Reclus is 378,000 sq. miles.

Mountains.—The great mountain system of the Andes follows the coast, northwesterly, in two parallel chains—the Cordillera, with its base generally about 20 miles from the coast; and the Andes, 70 to 110 miles farther inland. Between these is a region of plateaus and high valleys, varied by numerous spurs from both chains, and cut by the Vilcañota Knot or cross range near lat. 14° 30' S., and the Cerro de Pasco Knot near lat. 9° 15' S. From Cerro de Pasco the Andes give off an eastern branch, sometimes called the Eastern Cordillera. The Cordillera proper has two crests in many parts, especially toward the S.; between them is a cold, arid table-land or *puna* over 13,000 feet high. The Cordillera is unbroken, and forms the divide between the short rivers which flow to the Pacific and the large ones which unite in the Amazon. Near the Ecuadorian frontier few of the mountains in either range exceed 10,000 feet in height; but from lat. 8° S. there is a succession of snowy peaks, with passes often 15,000 feet high. The highest summits are near lat. 10° S. in Ancachs; according to Hindle the Cerro de Huascan attains 22,050 feet. The limit of perpetual snow is from 15,500 to 16,500 feet.

Regional Divisions.—The parallel mountain ranges divide Peru into three habitable regions called the Montaña, the Sierra, and the Costa. The Montaña includes the lower eastern slopes of the Andes, together with the vast plains bordering the upper Amazon and its tributaries in the N. E. Here there are very heavy and frequent rains and a luxuriant forest growth. The few civilized inhabitants are gathered near the great rivers. The Sierra includes all the region between the Andes and the Cordillera. The southern part, to the Vilcañota cross range, is included in the Titicaca basin; it is nearly 13,000 feet high, and so cold that corn will not ripen. Between the Vilcañota and Pasco cross ranges is the finest and most thickly populated part of Peru, and the ancient center of Inca civilization; a wonderfully varied region of plateaus, mountain-slopes, and fertile valleys, from 3,000 to 12,000 feet high. The northern part of the Sierra includes the deep gorge of the upper Marañon and the head of the Huallaga valley, a wild and rather thinly settled region of difficult access. Rains are never abundant in the Sierra, and there is no true forest; but the valleys are well watered by streams from the mountain snows. The Costa, the narrow strip between the Cordillera and the Pacific, is a terrace a few hundred feet high, abutting on the coast in cliffs and varied by spurs and isolated headlands. It is an almost rainless desert, but crossed by valleys of great fertility wherever a stream comes down. The climate is temperate rather than tropical, and the winter months (May to October) are characterized by frequent thick mists (*garruas*), sometimes with a light drizzling rain, which brings out a sparse growth of herbs on the desert lands. Peru has few well-sheltered harbors, the most important being Callao. Several groups of small rocky islands—the Lobos, Chinchas, etc.—adjoin the coast; they are important only as shelters and for their deposits of guano, now nearly exhausted.

Volcanoes and Earthquakes.—The Peruvian volcanoes, only three or four of which are active, are all gathered in the southern part of the Cordillera; among the best known are Misti, Omate, and Ubinas. The region about them, with the whole of the Costa, is subject to frequent and sometimes severe earthquakes. Lima and Callao have been nearly destroyed four times, the most disastrous shock being that of Oct. 28, 1746. Arequipa and the coast cities have suffered even more, notably in 1868 and 1877. In the Sierra earthquakes are much less frequent and severe, and in the Montaña they are almost unknown.

Rivers and Lakes.—The short rivers of the Pacific slope are all unnavigable. E. of the Cordillera the streams at first follow the axes of the mountain-chains, generally N. or N. N. W.; ultimately they break through the Andes in deep gorges, and reach the northeastern plains, where they become navigable. The principal trunks are the Marañon or upper Amazon, the Huallaga, and the Ucayali. The Javary is a river of the plains on the boundary of Brazil; and the Madre de Dios, one of the four great branches of the Madeira, rises not far from Cuzco. These rivers, owing to the

difficulty of communication over the mountains, are used only for the small commerce of the Montaña, but they form the shortest routes from Peru to Europe. Lake Titicaca (*q. v.*), between Peru and Bolivia, is navigated by small steamers, forming part of the mixed route from La Paz to the Peruvian coast. There are several small lakes in the Sierra.

Fauna and Productions.—The Montaña animals are similar to those of Brazil. The mountain region has many peculiar animals, the most noteworthy being the domesticated llama and alpaca (the former used as a beast of burden, the latter for its fleece), with their wild congeners, and the condor, the largest bird of flight. At present rubber and cinchona are about the only utilized products of the Montaña forests. Coca, quinoa, and the potato grow wild, and are cultivated at higher altitudes. The Sierra and coast valleys, and nearly all the Montaña, are very fertile; owing to the diversity of climate almost any plant can be raised, but the principal agricultural products are sugar-cane, cotton, grapes (used for brandy), and tobacco in the Costa; maize and coca in the Sierra, with potatoes and quinoa at higher altitudes; and maize and manioc in the Montaña. Peru is pre-eminently a country of minerals, almost every department being rich in deposits, but in its output it is surpassed by Bolivia and Chili. Heretofore the silver mines have been the most important; the veins occur principally in the Cordillera. The celebrated mines of Cerro de Pasco yielded about \$475,000,000 worth of silver from 1630 to 1850; the yield in 1877 was 1,427,592 oz. Gold is found principally on the eastern slope of the Andes, and the washings have been only slightly developed. Other important metals are quicksilver (now but little mined), copper, and lead. Coal (Jurassic) is now mined near the coast, and occurs inland; extensive petroleum deposits have been found in the northwestern department of Piura, and are worked to some extent. The guano deposits have been a source of great wealth; from 1853 to 1872 8,000,000 tons were taken from the Chincha islands alone. The known residue is only a few hundred thousand tons, and has been transferred to a private company.

People and Government.—The population in 1894, besides some 150,000 wild Indians, was about 3,100,000. Most of these are descended from the ancient Kechua tribes or, in the Titicaca basin, from the Aymaras. In the cities there is an intermixture with Spanish blood, and a comparatively small proportion is of pure Spanish descent. The educated and ruling class includes portions of all these. Negroes (descended from the slaves who were finally liberated in 1855) are nearly confined to the coast, where, also, there are many Chinese. Spanish is the common language in the coast cities, but Kechua is still universally spoken in the Sierra, where many of the Indians retain their tribal organization under the Peruvian Government. The wild tribes are nearly confined to the Montaña, and few of them are hostile. The constitution now in force was adopted in 1859-60, but has been somewhat amended. Peru is a centralized or unitarian republic, all the principal powers being concentrated at Lima. The president is elected for four years, is not eligible for immediate re-election, and is assisted by a council of responsible ministers. Congress consists of a Senate and a House of Deputies. The state religion is the Roman Catholic, and the public exercise of other cults is forbidden. The University of San Marcos at Lima is the oldest in the New World, and is still well attended. The Government supports *colegios*, or high schools, in the principal cities, but popular education is still very backward. The better class of Peruvians are intelligent, well-read, generous, and sociable, but they are somewhat impulsive, and commonly hot partisans. See SPANISH-AMERICAN LITERATURE.

Commerce, etc.—The leading exports in the order of their value are sugar, silver ore, cotton, wool, and hides. More than half the trade is with Great Britain, and hardly one-fifth with the U. S. The total exports in 1891 were valued at 11,616,716 sols, total imports at 14,763,241. There are some 900 miles of railways, the most important being the Oroya route from Lima over the Cordillera (projected to Cerro de Pasco and the Montaña), and that from Mollendo to Arequipa and Lake Titicaca. The old Inca roads are still used in parts. There is telegraphic communication between the principal cities and by cable to other countries. The metrical system of weights and measures is legalized, but the old Spanish ones are used. The principal coin, the *sol*, is nominally worth a dollar, but really about fifty-five cents.

Finances.—In 1890 the whole of the foreign debt was, by agreement, assumed by the Peruvian Corporation, a private company; in return, the state railways and other public works, and nearly all the remaining guano, were transferred to the company, the Government agreeing to pay the bondholders £80,000 sterling annually for thirty years. The internal liabilities were estimated in 1888 at 109,287,000 sols, besides 83,747,000 sols paper money, worth about 10 per cent. of the face value.

History.—Vague traditions relate that a powerful dynasty, the Pirua, held the highlands of Peru and Bolivia in very ancient times; to it are ascribed the remains at Tiahuanaco and some near Cuzco. The Pirua empire is said to have been broken up about A. D. 1000. The Incas (*q. v.*) established their power at Cuzco about 1230, and at the beginning of the sixteenth century ruled the Andean highlands and the Pacific coast from lat. 35° S. to beyond the equator. The empire was weakened by its division between Huascar and Atahualpa in 1525, and a civil war in which the former was defeated. PIZARRO (*q. v.*) reached Peru in 1527; he invaded it in 1532, captured and killed Atahualpa, and easily conquered the country, securing an immense booty. This led to the conquests of Quito (Ecuador), Southern New Granada, Charcas (Bolivia), and Chili. Pizarro founded Lima as his capital in 1535; a formidable uprising of the Indians was repressed in 1537; and after the rebellions led by the ALMAGROS, GONZALO PIZARRO, and GIRON (*qq. v.*) Peru settled down under the quiet rule of the viceroys. It was the most valued of the Spanish possessions, but few improvements were introduced, and the riches of the country were constantly drained into the Spanish treasury. The viceroyalty embraced the whole of Spanish South America and Panama, with audience divisions corresponding, in part, to the modern republics. The separation of New Granada (1718) and La Plata (1776) reduced the rule of the viceroy to Peru proper, Chili, and Quito (Ecuador), with full powers only in the first. In 1781 the formidable Indian rebellion under Tupac Amaru was repressed with unspeakable cruelties. Peru, the center of Spanish power in South America, was the last region to throw off the yoke. Independence was declared at Lima, July 28, 1821, and the victory of Ayacucho, Dec. 9, 1824, practically ended Spanish rule in South America. Ecuador and Chili had already separated, and Bolivar's rule in Peru ended in 1827. The country, under military rulers, was distracted by civil wars. Santa Cruz, president of Bolivia, interfered, conquered Peru 1835–36, and united the two countries; but Gamarra and other malcontents, aided by Chili, overthrew him in 1839 and re-established the old division. Gamarra, made president, invaded Bolivia, and was defeated and killed in 1841. A firm government was finally established by Ramon Castilla in 1845. His successor, Echenique, was deposed after a civil war, in 1855, and Castilla was again president until 1862. Prado, by a bloodless revolution, usurped the Government in 1865, but was deposed in 1868; meanwhile a Spanish fleet, sent to enforce alleged claims, was brilliantly repulsed at Callao, May 2, 1866. The rich proceeds of the guano and nitrate beds induced a spirit of extravagance; railways and other vast works were undertaken by the Government, and the public debt was enormously increased; interest payments were suspended in 1876, but with constantly increasing revenues and more economical administrations the future seemed secure. This hope was destroyed by the disastrous war with Chili. That country suddenly claimed the coast lands of Bolivia and Southern Peru, and refusal led to a war for which neither Peru nor Bolivia was prepared. Their united armies were disastrously defeated in the south; the Peruvian navy was annihilated after a gallant struggle; by two bloody battles the Chilians took Lima, Jan. 17, 1881; public buildings, including the fine library, were sacked, and the rural districts were desolated. At length Iglesias, as nominal president, agreed to a peace by which Tarapacá was unconditionally ceded to Chili, the provinces of Arica and Tacna were ceded conditionally, and a great share of the guano beds was given up; the ceded territory included all the nitrate deposits. The Chilians evacuated Lima in Oct., 1883. Cáceres, who was the constitutional president, refused to acknowledge Iglesias, seized Lima Dec. 1, 1885, and, his claim being ratified by election, became president. Since then the country has been slowly recovering. The "revolutions" frequently chronicled by newspapers have been slight disturbances connected with elections.

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HERBERT H. SMITH.

Peru: city; La Salle co., Ill. (for location, see map of Illinois, ref. 3-E); on the Illinois river at the head of navigation, the Illinois and Michigan Canal, and the Burlington Route and the Chi., Rock Is. and Pac. railways; 17 miles S. of Mendota, 100 miles W. S. W. of Chicago. It is in a coal-mining region, is an important trade center, and has several manufactories, a national bank with capital of \$50,000, a State bank with capital of \$25,000, and a daily and a weekly newspaper. The river is navigable to this point at all seasons, and is here crossed by a railway bridge. Pop. (1880) 4,632; (1890) 5,550.

Peru: city; capital of Miami co., Ind. (for location, see map of Indiana, ref. 4-E); on the Wabash river, the Wabash and Erie Canal, and the Lake Erie and West. and the Wabash railways; 56 miles W. S. W. of Fort Wayne, 75 miles N. of Indianapolis. It is in an agricultural region, and contains a woolen-mill, carbon-works, flint-glass works, basket-factory, artificial-ice works, bagging-mills, carriage-factories, foundries, a brewery, 2 national banks with combined capital of \$200,000, and 2 daily and 2 weekly papers. Pop. (1880) 5,280; (1890) 7,028. EDITOR OF "JOURNAL."

Peru Balsam: a balsamic exudate obtained from a handsome tree (*Toluifera pereira*) of the natural order *Leguminosæ*, growing in San Salvador, Central America. Portions of the bark are bruised by beating with blunt instruments, and subsequently charred by flame. A week or so later the injured bark comes away, and the balsam, which now begins to exude from the exposed wood, is collected on cloths, from which it is afterward separated by gentle boiling in water. Peru balsam is a dark-brown, viscid substance, like thick molasses, of a rather fragrant odor, and a warm, bitterish taste. It is insoluble in water, but mixes perfectly with absolute alcohol and chloroform. It is combustible, giving forth white fumes and a fragrant balsamic odor. It contains a resin, a volatile oil, and cinnamic and benzoic acids. Balsam of Peru was probably introduced into Europe as a medicine about the year 1524, and was considered of great value in bronchial and other respiratory affections, and locally upon ulcers or wounds; but its medicinal virtues are feeble, and in the U. S. other balsams have almost completely superseded it in practice.

Revised by H. A. HARE.

Perugia, pā-roo'jāā (anc. *Perusia*): city; in the province of Perugia, Italy; 11 miles from the historic Lake Trasimeno (now Lake of Perugia); on a hill near the right bank of the Tiber, 1,600 feet above the sea-level (see map of Italy, ref. 5-D). The air is healthful, and the surrounding country is picturesque from the old towns, churches, and castles everywhere scattered over it. It is well walled, and entered by gates mostly mediæval or modern; but among them is one of the Etruscan period, bearing the inscription "Augusta Perusia," placed on it by Augustus. Some remains of the old Etruscan walls also still exist. The streets, though often steep, are broad, and the squares are flanked by imposing public and private edifices. In the Piazza del Duomo there is a superb fountain, the work of Niccolò and Giovanni Pisano, and a statue of Pope Julius III. (1555). Among the numerous churches are the Cathedral of San Lorenzo, a Gothic building in the plan of a Latin cross; San Domenico, a Gothic edifice rebuilt in 1632, containing a monument of Benedict XI. by Giovanni Pisano, and San Pietro de' Casinensi, a basilica with a triple nave and walnut stall-work designed by Raphael. Some of the palaces contain choice works by renowned artists, especially the Palazzo del Collegio del Cambio, which is rich in frescoes by Perugino. The Palazzo Pubblico has a fine Gothic façade dating from the fourteenth century. From many of the suppressed convents and other sources a valuable collection of pictures by the best masters of the Umbrian school, such as Perugino, Raphael, etc., has been brought together in the Academy of Fine Arts near the university. Perugia has always been renowned for love of art and literature, and its university (established in 1307) had (1891) 21 teachers and 179 students. Without the gates there are some remarkable

antiquities; among others, the Torre di S. Manno, on which is a celebrated Etruscan inscription. The chief industry of the city is silk-manufactures; there are also manufactures of woollens, liqueurs, wax candles, etc. Perugia was one of the oldest of the twelve chief Etruscan cities, and one of the last to fall before the Romans. In the quarrel between Anthony and Octavianus this town espoused the cause of the former, and was cruelly punished by the latter, who afterward rebuilt it. During the Middle Ages it was alternately independent and subject to the papacy. It is said to have been an episcopal see from the earliest Christian times, and continues such to the present day. Though always restive under the papal yoke, this town was not united to the kingdom of Italy till 1860. Pop. (1893) 54,500.

Perugia, Lake of (anc. *Lacus Trasimenus*): a lake of Central Italy; in the province of Perugia. It is 30 miles in circumference, and is surrounded by beautifully wooded hills. Here Hannibal defeated the Romans in 217 B. C.

Perugino, pā-roo-jee'nō, PIETRO VANNUCCI: called Perugino, or the Perugian; painter; b. in Castello della Pieve, a dependency of Perugia, 1446. It is disputed who his teacher was, probably Verrochio. He became a remarkably skillful painter and a master of technical execution, and was one of the first Italians to use oil-painting freely. A gentle and rather meaningless grace and sweetness characterizes his female heads, and his whole composition is rather formal and deliberate than truly inventive. His great celebrity is caused by his having preceded Raphael in some of that great painter's peculiarities; and, indeed, Raphael was his pupil for a time. D. probably at Perugia in 1523. Among his important existing pictures are, at Florence, in the Uffizi Gallery, a *Madonna with Saints*; in the Academy, an *Assumption of the Virgin*, with many figures; in the Pitti Palace, a *Pietà* and a *Madonna Adoring the Infant Christ*; in the National Gallery in London a *Virgin and Child with the Archangels Michael and Raphael*; and in Rome, in the Sixtine Chapel, a large fresco of the *Delivery of the Keys to St. Peter*. RUSSELL STURGIS.

Perunite, or Terrorite: See EXPLOSIVES.

Peru, Upper, or Alto: See BOLIVIA.

Peruvian Bark: See CINCHONA.

Peruvians, Ancient: See INCAS and INDIANS OF SOUTH AMERICA.

Peruzzi, pā-root'see, BALDASSARE: painter and architect; b. at Accajano, near Siena, Italy, in 1481. His early training in art was received in Siena, but he became noted in Rome in the beginning of the pontificate of Julius II. He is sometimes supposed to have been a pupil of Raphael, with whom he became intimate, and whose manner of painting he emulated, especially in his designs for holy families and his fresco-painting. The chapel of the high altar at Sant' Onofrio, Rome, is one of his most important works. He designed the Villa Farnesina, and probably the Farnesino palace also, for Agostino Chigi, and decorated certain parts in fresco. The *Sybil Preaching to Augustus*, in the Church of Pontegiusta at Siena, is one of his most admired compositions. He succeeded Raphael as architect of St. Peter's, and has higher rank in architecture than in painting. D. in Rome in 1536. W. J. STILLMAN.

Peruzzi, UBALDINO: statesman; b. in Florence, Apr. 2, 1822; was educated at the École des Mines in Paris; and in 1848 was appointed gonfalonier of Florence. He was a Liberal in politics, and strongly in favor of the unity of Italy under the house of Savoy. After the overthrow of the grand duke in 1859 (to which Peruzzi himself contributed) he was elected member of the Tuscan Assembly; afterward deputy from Florence to the Italian parliament. In 1861 Cavour offered him the post of Minister of Public Works, an office which he retained until the fall of the Ricasoli ministry. While Rattazzi was in power Peruzzi threw himself into the opposition, but under the presidency of Minghetti he took the portfolio of the interior, and thus became a member of the ministry which negotiated with Napoleon III. the convention of Sept. 15, 1864, for the transfer of the capital from Turin to Florence. Peruzzi succeeded Count Cambray Digny as syndic of Florence, and showed great energy in suggesting and executing important projects for the improvement and embellishment of the city. In 1882 he was president of the commission appointed to examine the project of a commercial treaty with France. D. at Florence, Sept. 9, 1891. F. M. COLBY.

Pesado, pā-saa'dō, JOSÉ JOAQUIN, de: poet; b. at San Agustín de Palmar, province of Puebla, Mexico, Feb. 9, 1801; d. in the city of Mexico in 1861. His youth and early manhood were passed at Orizaba. As a young man he took an active part in public affairs, being Minister of the Interior in 1838, and Minister of Foreign Affairs in 1846. With advancing years he became more conservative in politics and more intensely Catholic in belief; and in 1854 he withdrew from office to take the chair of Belles-lettres in the University of Mexico. As a poet he was the chief representative in Mexico of the sentimental neo-Catholicism which in France began with Lamartine and reached its perfection in Montalembert and de Maistre. He delighted in biblical subjects, though he was perhaps quite as much an artist in his descriptions of nature. Three editions of his poems have appeared in Mexico, *Poesías originales y traducidas*, in 1839, 1840, and 1886 (the last much the fullest and most satisfactory). A. R. MARSH.

Pesarese, SIMON, da: See CANTAVIUS, SIMONE.

Pesaro, pā-sā-rō (anc. *Pisaurum*): town; in the province of Pesaro and Urbino, Italy; on the right bank of the Foglia, 1 mile from the Adriatic and 37 miles by rail N. W. of Ancona (see map of Italy, ref. 4-E). Pesaro is strongly walled and commanded by a citadel, and from the promenade upon the ramparts the view embraces the neighboring hills dotted with castles and villas, the distant peaks of the Apennines and the near Adriatic. The streets are broad and well paved, and the town contains many churches and private palaces of interest. The cathedral is remarkable as showing by its three superimposed pavements the great changes of level which have taken place on this coast. Rossini, who was a native of Pesaro, left all his fortune to found a musical lyceum here. The maritime trade of Pesaro is of some importance, and there is an active traffic in fruits, grain, beans, silk, and hemp. There are manufactures of leather and majolica. Pesaro is probably of Pelasgian origin, was enlarged and adorned by the Romans, and had a bishop as early as 251 A. D. It suffered from barbarian invasions, and its mediæval life was much agitated. Pop. (1893) 24,500.

Pesellino, pā-sel-lee'nō, FRANCESCO: painter; b. at Florence, Italy, in 1422; grandson of Francesco Peselli, who gave him his artistic training. He is supposed to have been a pupil also of Fra Filippo Lippi. He painted for Santa Croce a beautiful altarpiece now in the Louvre, representing St. Francis of Assisi receiving the stigmata and St. Dominic visiting a sick man. His works are in private collections for the most part, and are distinguished by great beauty of color and delightful invention. He died in Florence in 1457. W. J. STILLMAN.

Peshaw'ar: a town in the Punjab, India; on the border of Afghanistan, opposite the mouth of the Khyber Pass (see map of N. India, ref. 3-C). It is a British defensive military station, famous as "the bulwark of the Indian empire against Afghanistan." Pop. (1891) 84,181. C. C. A.

Peshi'to, or **Peshitto** [from Syriac *peshittā*, simple]: the standard Syriac translation of the Old and a part of the New Testament. It was probably made in the second and third centuries of the Christian era, and is now generally believed to be the work of Christian Jews. It is a generally faithful and scholarly piece of work. Jude, 2 Peter, 2 and 3 John, and the Apocalypse are wanting, as they are not in the canon of the Syriac Church, but were translated into Syriac in much later times. The Peshito of to-day is a revision of a primitive text, of which the Gospels were discovered in the convent of Mt. Sinai in 1892 by Mrs. Agnes Smith Lewis, and published in London, 1894.

Revised by S. M. JACKSON.

Pessimism [from Lat. *pessimus*, worst]: in popular usage, a term often applied to any doctrine or opinion, or even to any mood, which appears to be predominantly gloomy, especially when such a view or state of feeling leads the one who possesses it to make an unhappy forecast of the future.

Philosophical Pessimism.—In technical philosophical usage pessimism denotes any doctrine concerning the universe, and especially concerning the life of man as a whole, which leads to an explicit condemnation of the world, and of life, as being essentially and radically evil. Philosophical pessimism has almost always laid considerable stress upon the assertion that pain, as a most obvious and important form of evil, is predominant in the world; but it is by no means a logical necessity that a pessimist should

condemn the world merely because of the supposed prevalence of painful experience involved in its existence. The moral ideals of philosophers have varied widely, as well as the æsthetic criteria that have governed their judgments of reality, and it would be quite possible that one should be a philosophical pessimist not at all because of his belief in the painfulness of conscious existence, but solely because he was assured that the highest ideal (e. g. the ideal of rationality of life) which his doctrine recognized was doomed to such disastrous defeat in the actual world as to warrant his condemnation of the real, because of its radical opposition to this ideal. As a fact, while the painfulness of existence has played a large part in pessimistic literature, few pessimists have given this painfulness as the *sole* reason for their criticism of reality. Philosophical pessimists have frequently coördinated with the painfulness of life the necessary failure of finite beings to attain satisfactory knowledge; and this inevitable "ignorance" has been a fruitful source of pessimistic condemnation of existence. Yet some thinkers, not pessimists, have made pain a prominent and, in fact, a predominant feature in finite existence, as such, and have nevertheless explicitly defined the universe as essentially good, on the ground that the realization of the ideal, at least in some due measure, is possible, despite, or even through, the very presence of pain in the world. Such views, for instance, are represented in the doctrine of Hegel.

In any case, in order to avoid numerous vulgar misapprehensions, it is well to remember that no one is a pessimist merely because he calls life painful, but rather because he regards life as a "failure." Pessimism depends, then, upon first assuming or maintaining some sort of ideal of what life ought to be or to become, and upon then asserting that this ideal can not be attained, owing to the radically evil constitution of the world.

Hindu Pessimism.—Pessimism as a universal doctrine is first known to us in Hindu thought. In the post-Vedic period of Brahmanical speculation a belief that all finite existence is an evil, from which some sort of "deliverance" is required, became a prominent notion of the Hindu mind—a notion which early received philosophical expression, and which has continued, as a sort of insistent national idea, ever since, leading to developments of great importance for the history of religion. The doctrine of transmigration associated itself with Hindu pessimism from the outset, and the endless succession of births through which every one must pass unless he should be "delivered" is constantly made use of by Hindu teachers to emphasize the weariness of existence, and the need of the "deliverance" itself. The radical evil of finite existence, from which one needs to be "delivered," is very often defined as pain; but it is also often defined as ignorance; and the fault of all finite life appears, even in the very early philosophical and religious writings called the *Upanishads*, as in large measure due to the fact that, in this consciousness of ours, knowledge is necessarily sundered from its objects, so that nobody here knows the true "Self," or Absolute, whom to know would be peace. Hence the essential restlessness and worthlessness of all definable life. Deliverance from particular existence thus appears as identical with absolute knowledge, which no one can reach who remains in this world, or who retains the life that belongs to the world. (See TRANSMIGRATION.) In Buddhism the philosophical formulations of the earlier Hindu schools were neglected, and the doctrine of deliverance was given a more distinctly practical form; but the essential pessimism still remained, and in fact was even more decidedly emphasized than before. Life is always an evil, being full of pain. The deepest root of pain is desire. Desire once "seen through" and absolutely negated, the peace of Nirvana is attained; and hence comes the release both from the endless succession of births and from all the other intolerable responsibilities of our world.

Pessimistic Tendencies in Greek Philosophy. In European thought pessimistic tendencies were never prominent until after the Christian era. Classic Greek philosophy was acquainted, in a measure, with some portions of the problem of evil, but, except in a few scattered passages, does not appear disposed to regard the highest good as out of human reach; but after the Christian era the Neoplatonic school, with which the history of ancient philosophy closes, comes nearer to a consciousness of something essentially evil about finite existence, and seeks a deliverance through an union with the absolute—a notion which reminds one in many ways of the thoughts current among the Hindus. Plotinus, the leading Neoplatonic thinker, explicitly declares that the finite

world, although indeed a world with much evil in it, is an emanation from the highest good itself, and is therefore as good as the nature of its own finitude will permit; yet he declares that no wise man can remain content to live as a finite being, but, finding all more or less evil here, longs for superconscious union with the divine "One," which union is above all explicit knowledge or definition, although the "One" is the source of all things.

Christian Mysticism.—While it would be wrong to call this doctrine of Plotinus pessimism in the strict sense, its historical importance lies in the fact that the severe condemnation of finite existence in which the Neoplatonic thinkers indulged was later influential in determining the formulations current among the Christian Mystics, who all followed Neoplatonic traditions; and, as a fact, Christian mysticism has very frequently made use of language nearly as pessimistic as that of the Hindus. Mysticism, widely represented both in the Catholic and later in the Protestant branches of the Christian Church, has often indeed tended toward actual heresy; but even in its more orthodox or less heretical forms it has often insisted upon the doctrine that, in order to get into real "union with God," one has to "despise," or to forsake, every possible form of finite existence, not only as represented in this present lower world, but also as represented in any future or heavenly world. All "creatures," so the Mystics of the Church have often been disposed to say, must first be regarded as "naught" or as "worthless," or even as "evil"; else one can never learn to love God aright, and to attain the final superconscious oneness with him.

General Relations between Christianity and Pessimism.—Much stress has been laid, both by supporters and by opponents of pessimism, upon the assertion that the condemnation of all finite existence thus insisted upon by the Mystics was really involved, as a conscious motive, in the fundamental ideas of orthodox Christianity itself; and there can indeed be no doubt that the tendency to condemn and forsake "the things of this world," which has always formed one motive of Christian piety, has been easily confused in some minds with an actually pessimistic condemnation of the whole finite universe; and it is necessary to mention this confusion here, from the light that it tends to throw upon the history of modern pessimism; for there can be no doubt, in any case, that the importance given to the problem of evil by the whole Christian consciousness has had much to do with making pessimism a prominent topic of discussion in the recent generations of religious unrest.

Pessimism in Earlier Modern Philosophy.—In modern thought Leibnitz is well known as the author of a carefully considered reflective doctrine which he intended as a "theodicy," or proof that the present world was chosen by its creator as "the best of possible worlds." This optimism of Leibnitz was a favorite topic of discussion in the eighteenth century, and was satirized, together with other less philosophical forms of optimism, by Voltaire in *Candide*. Kant, although upon ethical grounds an optimist, still, during his critical period, regarded all attempts at a theoretical theodicy as necessarily doomed to failure. In his own analysis of the worth of life Kant lays stress upon the necessary prominence of the painful in our sentient existence, and distinctly asserts that, viewed as a mere experience, our life is full of conflict, and has no abiding worth. Its true worth, however, lies in what our free will can give it—namely, conformity to a moral ideal, which we seek without any reference to happiness. This worth, the worth of a "good will," is indeed absolute. Meanwhile it is a "postulate" of our moral faith that in an immortal life happiness will be apportioned according to desert.

The ethical optimism of Kant, joined as it was with a strong realization that, viewed merely as sentient experience, life is rather an evil than a good, determined the interesting syntheses of ethical and religious optimism with a frankly avowed pessimism concerning life viewed as mere finite experience, which were above referred to as present in the doctrine of Hegel. The life in union with the moral ideal, or with the knowledge of the absolute, is good; but finite life, as such, apart from its union with the ideal, is essentially painful and worthless; this is the classic doctrine of German idealism, in which many still see the solution of the whole problem.

Schopenhauer.—It was reserved, however, for Schopenhauer, while actually building on the basis of the general tendencies of the idealism of his country, first to deny the rationality of the world-principle, or absolute, and then, in

consequence of the first denial, to affirm that the evil of all existence is radical. Schopenhauer is consciously affiliated with Hindu pessimism. The world is the expression of an irrational and blind principle called the Will, similar in tendency to the "desire" of the Buddhists, but defined in more explicit and positive metaphysical terms. The expression of this Will is a world of insatiable striving and longing, which, being in the main painless, can come to consciousness only as a desire to change whatever it finds into something else, and so to enter into an endless conflict with itself, and pain is simply the experience of unsatisfied desire. The only remedy for the life of the Will lies in a certain transcendent form of self-possessed knowledge, only attainable by a sort of supernatural accident, an absolute resignation, identical with the insight that led Buddha to Nirvana. This resignation Schopenhauer called "the denial of the will to live."

Von Hartmann.—More recently von Hartmann, in his *Philosophy of the Unconscious* and in other of his numerous philosophical essays, has attempted, with great ingenuity, an exposition of pessimism whose metaphysical basis lies in an union of Schopenhauerian with other elements, largely Hegelian in their source, while the method undertakes to be mainly one of induction. Schopenhauer's proof for pessimism is in great measure rejected by von Hartmann, and a more empirical estimate of the "balance" of pleasure and pain in life is substituted. The result of this estimate is, however, once more the condemnation of all conscious life. The escape from the world-evil can be attained only in the far-off future, when, in the course of evolution, consciousness, wise enough to see the necessary evil of existence, becomes predominant in the universe. Then, by the general consent of conscious beings, who will then be wise enough to have the springs of existence under their control, a common act of self-denial can annihilate not only the then existent sentient life, but its whole physical basis, and so bring the world to an end.

The minor defenders of pessimism are numerous, and its influence upon modern literary tendencies is considerable. For a fuller account the reader may be referred to James Sully's *Pessimism: A History and a Criticism* (2d ed. 1891).

JOSHUA ROYCE.

Pessi'nus (now *Bala Hissar*): ancient city of Galatia; in Asia Minor; on the Sangarius; the center of the worship of Rhea or Cybele, mother of the gods. The almost shapeless stone image of the goddess, fabled to have fallen from heaven, was kept in her chief temple and attracted worshippers from all over the eastern world. The temples and public buildings of Pessinus then surpassed in magnificence those of any other city in Asia Minor. The image of Cybele was taken to Rome in consequence of an oracle which foretold that the Roman state would endure forever if once possessed of it. Thereupon Pessinus rapidly declined and is not mentioned after the sixth century. Its splendid and extensive ruins have been identified by Texier. E. A. G.

Pestalozzi, JOHANN HEINRICH: educational reformer and chief founder of modern pedagogy; b. at Zurich, Switzerland, Jan. 12, 1746. Always enthusiastic and philanthropic, he studied first theology, then law, and, finally, his health somewhat impaired, turned to farming. In 1767 he bought a farm near the village of Birr and built a house, Neu Hof. Hither in 1769 he brought his bride, Anna Schulthess, after one of the strangest and frankest courtships ever recorded. The farming was a failure, the firm that advanced the money withdrew from the enterprise, and finally in 1775 Pestalozzi, who from the first was deeply impressed by the abject condition of the peasantry and had been greatly interested by the doctrines of Rousseau's *Emile*, started a kind of pauper school. He housed, boarded, and clothed the children in return for such work as they gave in the field. By 1780 this experiment had failed. His wife's fortune was now exhausted, and the next eighteen years were a period of great distress. He turned now to writing, and in 1780 published *Abendstunde eines Einsiedlers* (Evening Hour of a Hermit); in 1781 appeared *Lienhardt und Gertrud* (Leonard and Gertrude), a simple tale of life in a Swiss village, which shows incidentally and strongly the effects of right education. The book was an immense success, and on it Pestalozzi's fame as an author mainly rests. The vicissitudes of war settled Pestalozzi in 1798–99 in charge of an orphan asylum in Stanz, where from stern necessity in one year the main elements of his educational system were developed. In 1799 he joined Krüsi in opening a new school in Burgdorf Castle, for which

he obtained Government aid in 1802. In 1801 appeared the result of his educational experience in his work *Wie Gertrud ihre Kinder lehrt* (How Gertrude Teaches Her Children). In 1802 he was elected a member of the deputation sent by the Swiss people to Paris. In 1804 he was obliged to remove his school to Münchenbuchsee, the chief authority here being given to Fellenberg, the same year he moved on to Yverdon. The Yverdon Institute very soon had a worldwide reputation. His chief helpers here were Niederer, Ramsauer, Schmid, Steiner, and Krüsi. Schmid, though a famous teacher of mathematics, was not calculated to appreciate his leader, or his methods. He ultimately obtained complete ascendancy over Pestalozzi's mind, finally causing the departure of the other masters and the downfall of the institute. In 1825 Pestalozzi retired to Neu Hof. He died at Brugg, Feb. 17, 1827, and is buried near the schoolhouse at Birr, where, Jan. 12, 1846, on the 100th anniversary of his birth, a memorial was erected to him. It is impossible to summarize Pestalozzi's services to education, for he rather set on foot ideas than originated methods. He was pre-eminently a man of feeling and imagination. He would never admit that he had a carefully thought-out system. Judged by ordinary standards, he would have been considered anything but a good teacher. His true function was to educate ideas. Raumer sums up the services Pestalozzi did for education in these words: "He compelled the scholastic world to revise the whole of their task, to reflect on the nature and destiny of man, and also on the proper way of leading him from his youth toward that destiny." Doubtless the best single biography in English is *Pestalozzi, his Life and Work*, by Roger De Guimps. A very interesting and valuable biography is *Pestalozzi, his Life, Work, and Influence*, by Hermann Krüsi, son of Pestalozzi's assistant (New York, 1875); *Pestalozzianism*, by Henry Barnard (New York, 1862), contains a great amount of valuable material selected from Barnard's *Journal of Education*. See also Quick's *Educational Reformers* and Williams's *History of Modern Education*. German literature on the subject is extensive.

C. H. THURBER.

Pesth: See BUDAPEST.

Pestilence: See EPIDEMICS and PLAGUE.

Petals: See FLOWER.

Petalu'ma: city; Sonoma co., Cal.; at the head of navigation on Petaluma Creek; on the San Fran. and N. Pac. Railway; 16 miles S. of Santa Rosa, 42 miles N. by W. of San Francisco (for location, see map of California, ref. 7–B). It is in an agricultural, stock-raising, and wine-making region; has a daily line of steamers to San Francisco; and contains 8 churches, high school, 3 grammar schools, Ursuline convent, an academy, a public library (founded in 1867), a national bank with capital of \$200,000, 3 State banks with capital of \$600,000, and 2 daily and 3 weekly newspapers. There are flour, planing, silk, and woolen mills, tannery, and fruit drying, canning, and distilling works. Pop. (1880) 3,326; (1890) 3,693. PROPRIETOR OF "IMPRINT."

Petasos: See HEAD-DRESS.

Petan, pe-tō', DENIS (*Dionysius Petavius*): chronologist and Catholic theologian; b. at Orleans, France, Aug. 21, 1583; became professor at Bourges in 1603, in Rheims 1612, in La Flèche 1613, in Paris 1617; died there Dec. 11, 1652. Following in the footsteps of Scaliger, but equipped with a profounder mathematical knowledge, he endeavored with singular success to systemize and harmonize the numerous chronological eras of the ancients by ascertaining with the aid of mathematics the various cycles upon which they were based. The results of his labors are laid down in his *Opus de doctrina temporum* (2 vols., 1627), and in the more famous *Uranologium* (Paris, 1630). Both are combined in the Verona edition of 1734. His *Tabulæ chronologicae* (Paris, 1628) and the *Rationarium temporum* (1633; new ed. 1849) remained standard schoolbooks for centuries. He is also the author of a celebrated theological work *De theologicis dogmatibus* (5 vols.). The best edition is by Thomas (Barle-Duc, 1864). See F. Stanonik, *Dionysius Petavius* (Graz, 1876). ALFRED GUDEMAN.

Peteh'ora: a river of European Russia, rising in the Ural Mountains. It flows through wild forest regions to the Arctic Ocean, which it enters through a large estuary in lat. 68° N. and lon. 53° E.

Peter, SAINT [*Peter* is viâ Lat. from Gr. Πέτρος, liter., masc. form of πέτρα, rock, stone]: the first in the list of the twelve apostles; b. in Galilee, at Bethsaida, on the shore of

the Lake of Gennesaret, whence he removed to the adjoining village of Capernaum. He was a fisherman, like his brother Andrew, and, like him, he was probably a disciple of John the Baptist, but he followed Christ immediately when called. His original name was Simon, which Christ changed, declaring, "Thou art Peter, and upon this rock I will build my Church" (Matt. xvi. 18). From his call to the office of apostle, and up to the time of the apostles' council in Jerusalem, the events of his life are told in the Gospels and the Acts, and are familiar to all. His personal character is so distinct and strongly marked that there probably are no readers of the Bible who have not a vivid conception of it, or any two whose conceptions differ very much; but after the apostles' council in Jerusalem (50 A. D.) he is only heard of at Antioch (52), when his inconsistency exposed him to Paul's stern rebuke (Gal. ii. 11), and in 57, when he is incidentally referred to by Paul (1 Cor. ix. 5). From that point on tradition is the only authority, and the circumstance that the papal see rests its whole claim of primacy on events related by this tradition has caused it to be very much doubted by Protestants. Jerome (*De viris illustribus*) relates that Peter was Bishop of Antioch for several years, preached in Pontus, Galatia, Bithynia, and Cappadocia, and spent the last twenty-five years of his life in Rome, where he suffered martyrdom; but Paul makes no reference to such a fact in his Epistle to the Romans, and the long residence can only be maintained by denying a tradition that both Paul and Peter suffered martyrdom there under Nero. At the time of the Reformation it was even contended—for instance, by Spanheim—that Peter never was in Rome; but at present most critics, Protestant as well as Roman Catholic, agree in accepting the tradition in its principal traits—namely, the residence of Peter in Rome and his suffering martyrdom there—though it has not been possible to establish an agreement with respect to the dates of these events. The most probable date is 66 or 67. Ramsay maintains that he survived the Neronian persecution and was living in 80.

Revised by S. M. JACKSON.

Peter I., the Great: Czar of Russia; b. at Moscow, June 12, 1672; son of the czar Alexis Michailowich; in 1682 succeeded Feodor, but Ivan V., Peter's brother and the lawful heir, was soon after announced as joint-sovereign through the efforts of their sister Sophia, who for several years directed the affairs of the empire. After seven years of tutelage Peter thrust the princess-regent into a convent, where she died twenty-two years later, and the inactive Ivan in 1689 abdicated his share of the government. The new czar aided by his able minister LE FORT (*q. v.*) reorganized the army; built a small navy; went to sea in person on Dutch and English ships, so as to learn the practical part of navigation, and took Azof from the Turks 1696, thus realizing his ambition of gaining for Russia a port on the Black Sea. He lived abroad (1697-98), chiefly at Saardam in the Netherlands and at Deptford and London; worked as a ship-carpenter and blacksmith, and for some months studied the sciences. In 1698 he took 500 English mechanics, engineers, etc., to Russia, and in the same year, the Strelitzes having revolted, he ordered them all to be put to death, and assisted the executioners with his own hands; but pardoned a few upon the scaffold, noteworthy among whom was the young Orloff, founder of the princely house of Orloff. The czar now reformed the calendar, founded schools, introduced arithmetic (hitherto unknown in Russia), compelled rich merchants to engage in foreign commerce, and enacted rules for dress and deportment; entered upon a war of conquest against Sweden, supported by Denmark and Poland, 1700, and in the same year was defeated by Charles XII. at Narva; founded St. Petersburg 1703; invaded Courland 1705; overthrew the Swedes at Pultava 1709; seized the Baltic provinces 1710, and Finland 1713; married Catherine I., his mistress, 1707, and declared her czarina 1711; waged an unsuccessful war against the Turks 1711; finally gave up most of Finland in the peace of 1721; made the tour of Europe 1716-17, and returned with many books and works of art; put to death his son Alexei 1718, on the ground of treasonable conduct; conquered three Caspian provinces from Persia 1722. D. Feb. 8, 1725. He was succeeded by Catherine I., his wife. Peter was the first Russian to take the title of emperor 1721. See Eugene Schuyler's *Peter the Great* (2 vols., 1884).

Peter II., Alexeievitch: Czar of Russia; b. at St. Petersburg, Oct. 22, 1715; a grandson of Peter the Great, a son of Alexei; succeeded Catherine I. in 1727. The most

prominent features of his short reign were the desperate intrigues between the families of Mentchikof and Dolgoruki. The czar was only twelve years old and completely under the sway of Mentchikof, who had him betrothed to one of his own daughters and jealously kept him away from the court and all business; but the Mentchikofs were overthrown by the Dolgorukis, who planned a marriage between the czar and a daughter of their house; this was prevented by Peter's death, which occurred Feb. 9, 1730.

Peter III., Feodorovitch: Czar of Russia; b. at Kiel, in Holstein, Jan. 29, 1728; a son of Peter the Great's daughter Anna, who had married a duke of Holstein; was designated as heir to the Russian crown in 1742 by his aunt, the Empress Elizabeth; married, in 1745, the Princess of Anhalt-Zerbst, afterward Catherine II.; ascended the throne Jan. 5, 1762. He had two very prominent passions—admiration of Frederick II., with whom he immediately made peace, restoring to him the conquered provinces, and hatred of the royal dynasty of Denmark, against which he was on the point of waging war when a revolution, headed by his wife, broke out at St. Petersburg. Taken completely by surprise, he was deposed, and Catherine was proclaimed empress. He was strangled in his bed at Ropscha by the brothers Orloff, July 17, 1762.

Peterboro: town; Hillsboro co., N. H.; on the Contoocook river, and the Boston and Maine and the Fitchburg railways; 18 miles E. by S. of Keene, 33 miles S. W. of Concord (for location, see map of New Hampshire, ref. 10-E). It contains several cotton and woolen mills, iron-foundries, and shoe-factories, and has a town library (founded in 1833), a national bank with capital of \$100,000, a savings-bank with deposits of over \$875,000, and a weekly newspaper. Pop. (1880) 2,206; (1890) 2,507.

Peterborough: town; capital of Peterborough County, Ontario, Canada; on the river Otonabee, and on the Grand Trunk and Canadian Pacific railways; 85 miles N. E. of Toronto (see map of Ontario, ref. 3-F). It is handsomely built on a fertile plain; has good water-power, manufactures of lumber, leather, machinery, castings, farm implements, etc. It has a good trade in grain, pork, lumber, and flour. A handsome bridge connects it with the village of Ashburnham. There are 2 daily and 2 weekly newspapers, and a monthly periodical. Pop. (1881) 6,812; (1891) 9,717.

Peterborough: city; partly in Northamptonshire, partly in Huntingdonshire, England; on the Nen, 76 miles N. of London (see map of England, ref. 9-J). It is celebrated for its beautiful cathedral, built between 1118 and 1528, chiefly in the Norman style. Its length is 476 feet; the height of the nave to the ceiling 81 feet, and of the lantern-shaped tower 135 feet; its breadth is 202 feet across the transept. The Early English west front, consisting of three arches, is one of the grandest products of mediæval architecture. The town has a large trade in agricultural produce, coal, and malt. It is the seat of a bishopric and returns one member to Parliament. Pop. (1891) 25,172.

Peterborough. CHARLES MORDAUNT, Earl of; soldier; b. in England about 1658; joined Narborough's fleet in the Mediterranean; won distinction in Cloudesley Shovel's engagement with the dey's fleet off Tripoli; took part in the defense of Tangier, and on returning to England became an active politician, working in the Whig interests. He joined William, Prince of Orange, and accompanied him to England in 1688. He was appointed First Lord of the Treasury and created Earl of Monmouth, but retired from office Jan., 1690. He fell into disfavor with the court, and in 1697 was imprisoned in the Tower by order of Parliament, on an accusation of complicity in Sir John Fenwick's plot against the king's life. In the same year he succeeded to the earldom of Peterborough by the death of an uncle. Restored to favor on the accession of Queen Anne, he was placed in command of the land forces sent to the aid of the Archduke Charles of Austria in asserting his claim to the Spanish crown, and sailed for Spain in May, 1705. His chief exploit was the capture of Barcelona, to which against his judgment he had been obliged to lay siege. Early in September the siege was about to be abandoned as impracticable, when Peterborough obtained leave to undertake a seemingly desperate night-assault upon the citadel of Monjuich, one of the strongest fortresses in the world. This was successfully executed, and led to the capture of Barcelona. He then began a brilliant campaign, overran Catalonia, Aragon, and Valencia with the greatest rapidity, and successfully defended Barcelona against the formidable army of Philip

V. (1706), but resigned in 1707, in consequence of dissensions with his associate commanders. Employed for some years in diplomatic posts, he became governor of Minorca 1713, sided with the Tories during the last years of Anne, lived in retirement during most of the reigns of George I. and George II., was an associate and friend of the chief literary celebrities of the time, and became general of the marine forces of Great Britain 1722. D. at Lisbon, Oct. 25, 1735. Peterborough was a chivalrous and eccentric character, of vast military genius, and considerable literary taste, as shown by several occasional publications. He wrote his own *Memoirs*, but they were destroyed by his widow, the celebrated singer, Anastasia Robinson. See Macaulay's *Essays*, Lord Mahon's *History of England*, and Eliot Warburton's *Memoir of Charles Mordaunt, Earl of Peterborough* (1853), which contains selections from Peterborough's correspondence. Revised by F. M. COLBY.

Peter, Epistles of St., THE FIRST: one of the catholic or general epistles; was written from "Babylon" (perhaps symbolical for Rome, but more likely the name of the actual city, which contained many Jews), about 64 A. D. Ramsay maintains that it was not written till 80 A. D.; cf. his *Church in the Roman Empire*, pp. 279, seq. It is evidently the product of perilous times and inculcates the duty of patience under suffering. It is a practical epistle, and addresses itself to various classes of readers, to each assigning the appropriate duty. It is the subject of one of the great religious classics—the commentary by the saintly Archbishop Leighton.—**PETER, EPISTLE OF ST.**, THE SECOND, has suffered more from doubts as to its authenticity than any other book of the New Testament. It is directed against heretics and corrupt men, and the second chapter, in which they are described, bears a striking resemblance to the Epistle of St. Jude. There is, however, no good reason to abandon the Petrine authorship. The author claims to have been a witness of the transfiguration, and uses Petrine expressions. Upon both epistles a good commentary is that by J. Lillie (New York, 1869). Revised by S. M. JACKSON.

Peter, Gospel and Revelation of: two apocryphal writings contained in very fragmentary form in a Greek MS., found in a tomb of a monk at Akhmim in Egypt, the site of Panopolis, and not far from Assiout, by U. Bouriant in the winter of 1886-87. The MS. dates from the eighth century. The writings were previously only known by allusions in early Christian literature. Of the Gospel, the fragment is but about 150 lines long, and gives only, and that very imperfectly, the passion and resurrection history of Jesus. The date of original composition is the early part of the second century; the place is somewhere in Western Syria. The Revelation fragment is still shorter, only about 131 lines, but dates from the same time and place. It is mostly a description of a revolting character of the punishments of hell. Naturally most attention has been given to the Gospel, which is valuable. See for text and translation J. A. Robinson and R. J. Montague, *The Gospel according to Peter and the Revelation of Peter* (London, 2d ed. 1892); H. B. Swete, *The Akhmim Fragment of the Apocryphal Gospel of St. Peter* (1893); H. von Schubert, *The Gospel of Peter, Synoptical Tables with Translations and Critical Apparatus* (Edinburgh, 1893); *The Gospel according to Peter*, by the author of *Supernatural Religion* (London, 1894). SAMUEL MACAULEY JACKSON.

Peterhead: a seaport and burgh in the district of Buchan, Aberdeenshire, Scotland; 44 miles by rail N. N. E. of Aberdeen (see map of Scotland, ref. 6-J). It stands on a narrow peninsula, across which a canal has been cut connecting its three rock-hewn harbors. The town is irregularly built, chiefly of granite. Among its buildings may be mentioned the town-hall, built in 1788, with a spire 125 feet high, the parish church, with a spire 125 feet high, a free library and museum, and an academy. It was formerly the chief seat in Scotland of the seal and whale fisheries, and is now noted for its herring-fishery, in which over 500 boats and 5,000 persons are employed. An immense harbor of refuge was begun, chiefly for their benefit, in 1886, and will be finished in 1921. The chief industries of the place are woollen manufactures, boat-building, and granite-polishing. Peterhead unites with Elgin, Banff, Cullen, Inverurie, and Kintore in sending one member to Parliament. Pop. (1891) 12,198. R. L.

Peterhof: an imperial palace in the government of St. Petersburg, Russia, on the Bay of Cronstadt, built by Peter the Great. It contains a fine collection of pictures, and is

surrounded with beautiful parks and gardens. A small town has grown up around it.

Petermann, päter-maan, AUGUST: geographer; b. at Bleicherode, in Prussian Saxony, Apr. 18, 1822; received a gymnasium education and entered (1839) the geographical institution of Prof. Berghaus at Potsdam, where he assisted in the preparation of Berghaus's *Physical Atlas*, and prepared the maps to A. von Humboldt's *Asie Centrale*; in 1845 went to Edinburgh to superintend the English edition of the *Physical Atlas*, and in 1847 to London, where he became a member of the Royal Geographical Society, and wrote a number of geographical essays and articles; in 1854 returned to Germany as director of Justus Perthes's geographical institution in Gotha, and (1855) began the publication of *Mittheilungen*, a monthly which is considered as the central organ and the highest authority in present geographical literature. D. by suicide (like his father and brother before him) at Gotha, Sept. 25, 1878.

Peters, CHRISTIAN AUGUST FRIEDRICH: astronomer; b. in Hamburg, Germany, Sept. 7, 1806. On the foundation of the Pulkowa Observatory he became one of the principal astronomers, and published noteworthy papers on the parallaxes of stars, the constant of nutation, etc. In 1849 he resigned and went to the Königsberg Observatory, but left to become director of the observatory at Altona and editor of the *Astronomische Nachrichten*. He continued the publication of this journal until his death, at Kiel, May 8, 1880. S. N.

Peters, CHRISTIAN HENRY FREDERICK, Ph.D.: astronomer; b. at Coldenbüttel, Schleswig, Germany, Sept. 19, 1813; graduated at the University of Berlin; engaged in scientific researches, after which he settled in the U. S.; was employed upon the Coast Survey; became Professor of Mathematics and Astronomy at Hamilton College 1859, where he took charge of the Litchfield Astronomical Observatory, and made very extensive investigations concerning comets and asteroids, discovering more than forty of the latter bodies; catalogued 16,000 zodiacal stars, and recorded over 20,000 solar spots. He took a prominent part in the observation of the total solar eclipse of Aug. 7, 1869, at Des Moines, Ia.; was chief of the party sent by the U. S. Government to New Zealand to observe the transit of Venus of Dec. 9, 1874, and was the only observer on that island who had complete success, having obtained 237 photographs of the transit. D. at Clinton, N. Y., July 19, 1890. Revised by S. NEWCOMB.

Peters, JOHN CHARLES, M.D.: b. in New York, July 6, 1819; studied homœopathy in Europe, and returned to New York to practice his profession. He edited the *North American Journal of Homœopathy* (1856-61), was one of the translators of Rokitsansky's *Pathological Anatomy*, and was the author of medical treatises. S. T. A.

Peters, PHILLIS (*Wheatley*): a Negro poet; b. in Africa about 1750; was taken as a slave to Boston 1761; was taught to read by the family of her master, John Wheatley; made rapid progress in letters; soon displayed so much poetical talent, stimulated by the reading of Pope's *Homer*, that a volume of her verses was printed in London 1773, with a copperplate portrait and a dedication to the Countess of Huntingdon. She visited England in that year; wrote some notable verses to Gen. Washington. Her poem was printed by his direction in the *Pennsylvania Magazine* for Apr., 1776. She married a Negro named John Peters, who seems to have fallen into great poverty during the Revolution. D. at Boston Dec. 5, 1784. Her *Letters* were printed in 1864. Revised by H. A. BEERS.

Peters, RICHARD: judge; b. at Belmont (now part of Philadelphia), Pa., Aug. 22, 1744; after graduating from college, studied law, and became a successful lawyer, distinguished for wit and brilliant social qualities; was a captain in the Revolution; secretary to the continental board of war 1776-81; was in Congress 1782-83; was U. S. district judge 1792-1828, and his decisions upon admiralty questions (published in 2 vols. in 1807) had much influence in shaping the admiralty law of the U. S. D. at Belmont, Pa., Aug. 21, 1828.—His son, RICHARD PETERS (b. at Belmont, Aug., 1780; d. May 2, 1848), succeeded Mr. Wheaton as reporter of the U. S. Supreme Court, and published *Reports of the United States Circuit Court, Third Circuit, 1803-1818* (17 vols.); *Condensed Reports of Cases in the United States Supreme Court to 1827* (6 vols.); *Digest of Cases in the United States Supreme Court and District Courts to 1847* (2 vols.); and *Case of the Cherokee Nation against the State of Georgia* (1831). He also edited *Chitty on Bills* (1819),

Washington's Circuit Court Reports (Third Circuit, 1803-27; 4 vols.), and the *United States Statutes at Large*.

Revised by F. STURGES ALLEN.

Peters, SAMUEL: clergyman; b. at Hebron, Conn., Dec. 12, 1735; graduated at Yale College in 1757; went to England for ordination, and returned in 1760 to become the Church of England minister at Hartford. He fled to Boston in 1774 to escape molestation at the hands of the Sons of Liberty on account of his aggressive Toryism, and from Boston, in October, he sailed to England, where he obtained a small pension from the crown, and remained until 1805. In 1781 he published *A General History of Connecticut from its First Settlement under George Fenwick, Esq.*, etc., as being written "By a Gentleman of the Province," which book gave rise to the widespread misconceptions concerning the Connecticut Blue Laws *q. v.* In 1794 he was chosen Bishop of Vermont, but the Archbishop of Canterbury and the bishops of the American Church refused him consecration. On his return in 1805 to the U. S. he published *A History of Rev. Hugh Peters* (New York, 1807), alleged by him to be his granduncle, and also a short history of Hebron; in 1817 he endeavored to get possession of a tract of land in what is now Minnesota. D., in great poverty, in New York, Apr. 19, 1826. Peters was notorious for his habit of falsification, and his autobiography was wholly untrustworthy. He wrote his name variously Samuel Peters, Samuel Andrew, and Samuel A., and appended to it the letters LL. D., although how he came by the right to the title is unknown. Some books of reference make him D. D., and some books make him both D. D. and LL. D. He is the Parson Peter in Trumbull's *McFingal*.

F. STURGES ALLEN.

Petersburg: city (laid out by Abraham Lincoln in 1835); capital of Menard co., Ill. (for location, see map of Illinois, ref. 6-D); on the Sangamon river and the Chi. and Alton and the Chi., Peoria and St. L. railways; 20 miles N. W. of Springfield. It is in an agricultural, timber, coal-mining, and stock-raising region, and has medicinal springs, water-works, public square, 2 flour-mills, a national bank with capital of \$50,000, 2 private banks, and 2 weekly papers. Pop. (1880) 2,332; (1890) 2,342. EDITOR OF "OBSERVER."

Petersburg: town; capital of Pike co., Ind.; on the Evansville and Terre Haute Railroad; 20 miles S. E. of Vincennes, 44 miles N. N. E. of Evansville (for location, see map of Indiana, ref. 10-B). It is in a coal, dairy, tobacco, and stock-raising region, and has flour and woolen mills, brick and tile works, lumber-working and other factories, a State bank with capital of \$25,000, and three weekly newspapers. Pop. (1880) 1,193; (1890) 1,494.

Petersburg: city in Virginia (settled in 1733, incorporated in 1748, reincorporated in 1781); port of entry; formerly in Chesterfield, Dinwiddie, and Prince George Counties, but now independent; on the Appomattox river at the head of tide-water, and the Petersburg, the Norfolk and Western, and the Richmond and Petersburg railways; 12 miles W. of the confluence of the Appomattox and James rivers, 22 miles S. of Richmond (for location, see map of Virginia, ref. 7-II). It is the third city in population in the State, is built on the declivities of a hill sloping to the river bank, and derives abundant power for manufacturing from the falls in the river. There are 16 churches, 2 high schools, 9 public-school buildings, public-school property valued at over \$75,000, St. Paul's Female School, the Southern Female College, Protestant Episcopal School for Girls, 3 libraries containing over 13,000 volumes, 2 public parks, a national bank with capital of \$100,000, a State bank with capital of \$200,000, and a quarterly, 2 daily, and 4 weekly periodicals. The city has a copious supply of pure water for domestic purposes, has electric-lighting and street-railway plants, and is the most important shipping-point for manufactured tobacco in the U. S. The census returns of 1890 showed that 223 manufacturing establishments (representing 56 industries) reported. These had a combined capital of \$3,879,151, employed 5,315 persons, paid \$1,283,612 for wages, and \$4,200,936 for materials, and had products valued at \$6,876,352. There are 5 large tobacco-warehouses, 9 tobacco-factories, 5 cotton-mills, 6 factories for preparing peanuts for market, 5 corn and 3 flour mills, 3 bark and sumac factories, 3 foundries and machine-shops for the manufacture of heavy machinery, silk-mills, fertilizer-works, and granite-quarries. The city is on the site of an Indian village burned by Nathaniel Bacon in 1676; was twice occupied as headquarters by British commanders dur-

ing the Revolutionary war; received the popular name of "Cockade City of the South" because of the gallantry of its company of volunteers in the war of 1812; and has been called the "last citadel of the Confederacy" from its heroic defense in the war of 1861-65. The Army of the Potomac, under Gen. Grant, being induced by the result of the second battle of Cold Harbor to abandon its advance upon Richmond by the line of the Chickahominy, crossed the James river below City Point June 14-16, 1864, and made formidable assaults on Petersburg June 15, 16, 17, and 18, carrying portions of the exterior lines on each of the first three days; but, being generally unsuccessful in the assaults of the 18th, the ground occupied at the close of the day was intrenched and held up to the close of the war, forming part of the line of investment. The Union losses in these assaults in killed, wounded, and missing was 10,566. The siege of Petersburg began on June 19, and was continued by constantly gaining and intrenching ground to the left and moving against the railways with a view to isolating the city, combined with the explosion of a mine under one of the works, with the resulting "battle of the crater," and numerous other actions. The siege was continued until Apr. 2, 1865, when, the place being no longer tenable, Lee withdrew his army, the Union troops taking possession on Apr. 3, the surrender at Appomattox occurring Apr. 9. Pop. (1880) 21,656; (1890) 22,680. Revised by JAMES MERCUR.

Petersen, J. J. DESCH, JOHANN WILHELM: theologian; b. at Osnabrück, Hanover, June 1, 1649; studied theology at Gießen, Rostbach, and other German universities; became a disciple of Spener, with whom he met at Frankfurt in 1675; was in 1677 appointed superintendent of Lübeck and in 1688 of Lüneburg. In the meantime he had made the acquaintance of Juliane von Asseburg, who claimed that the Saviour often revealed himself to her in visions and spoke to her of his second advent. Petersen, who was a strong and outspoken chiliast, put implicit confidence in those revelations, and laid them in a solemn manner before the German clergy. The municipal council of Lüneburg, however, took another view of the case. He was deposed in 1692, and lived afterward at Thymen, near Zerbst, where he died Jan. 23, 1727. Of his works, which are very numerous, the principal are *Wahrheit des heiligen Reiches Jesu Christi* (Münster, 1692-93, 2 vols.) and *Geheimniss der Wiederbringung aller Dinge* (Frankfort, 1700-10, 3 vols. fol.). He also wrote exegetical works, Latin and German poems (the former edited by Leibnitz, who also showed great sympathy for Juliane von Asseburg), and an autobiography (2d ed., Frankfort, 1719). See H. Corrodi, *Kritische Geschichte des Chiliasmus* (Frankfort, 1871; 2d ed. 4 vols., Zurich, 1794).

Revised by S. M. JACKSON.

Petersen, NIELS MATTHIAS: scholar; b. at Sanderup, island of Fünen, Denmark, Oct. 24, 1791; studied philology and history, and became Professor of the Ancient Scandinavian Language and Literature in 1845 at the University of Copenhagen. His works relating to ancient Scandinavian mythology, literature, history, and language, *Det Danske, Norske og Svenske Sprogts Historie* (1829), *Den Nordiske Mythologi* (1849), *Danmarks Historie i Hovedtræet* (1834), *Haandbog i den gammel-nordiske Geographi* (1834), etc., though now superseded, exercised a great influence at the time of their appearance. His *History of Danish Literature* (5 vols., 1853-64; 2d ed. 1867-70) is the most elaborate work on that subject, and is the standard authority. D. at Copenhagen, May 11, 1862. Revised by D. K. DODGE.

Peterson, FREDERICK, M. D., Ph. D.: neurologist and poet; b. in Faribault, Minn., Mar. 1, 1859; studied medicine at the University of Buffalo, New York, graduating M. D. in 1879; Professor of General Pathology, University of Buffalo, 1882-84; lecturer on nervous diseases, New York Polyclinic, 1888-91; instructor in nervous and mental diseases, College of Physicians and Surgeons, New York, from 1888; Professor of Neurology, University of Vermont, 1893-94. He has published two volumes of poems: *Poems and Swedish Translations* (Buffalo, 1883); *In the Shade of Ygdasil* (New York, 1893); and is the author of important monographs on neurological subjects.

S. T. ARMSTRONG.

Peterson, PETER ARCHIBALD, D. D.: b. at Petersburg, Va., Sept. 28, 1828; received only common school training; served as a lieutenant in Company E, First Regiment, Virginia Volunteers, in the Mexican War, 1846-48; in 1852 joined the Virginia Conference; was a member of every general conference from 1866 to 1890; served as chaplain in

the Confederate army 1861-62; delegate to Ecumenical Conference, Washington, 1891. His last pastorate was in Trinity church, Richmond, Va., where he died Oct. 6, 1893. He published *Handbook of Southern Methodism* (1882 and 1891).

A. OSBORN.

Peter's Pence, or Romescot: an ancient tax for the benefit of the pope, probably first levied as a tax for the support of the English school at Rome. (See Lappenberg's *History of England under the Normans*.) Peter's Pence was paid the pope, with some interruptions, until 1534, during the reign of Henry VIII., when it was finally abolished. The levy of Peter's Pence was customary in various other countries at different times. During the nineteenth century it has been revived as a voluntary popular contribution, and is one of the chief sources of the pontifical revenue, especially since the establishment of the Italian monarchy. See Cancellieri, *La visita de' sacri limini ed il denaro di S. Pietro* (Rome, 1821); Paul Fabre, *Étude sur le Liber Censuum de l'Eglise Romaine* (Paris, 1892).

Revised by J. J. KEANE.

Peter's, St.: a basilica in Rome. It consists of a Latin cross 613 feet long and 450 feet across the transept, surmounted by a dome which rises 434½ feet above the pavement with a diameter of 195½ feet. The façade is 368 feet long and 145 feet high. The building was begun under Pope Nicholas V., after a plan by Rossellini, in 1450, but the work was neglected for nearly half a century. Under Julius II., Bramante prepared a new plan, which was subsequently followed out in the main. Raphael had charge of the building for some time. Michelangelo designed the dome and nearly completed its erection. The façade is by Carlo Maderno, the colonnade by Bernini. The church was consecrated by Urban VIII. Nov. 18, 1626, the 1300th anniversary of the day on which St. Sylvester consecrated the basilica which originally occupied the site. This was built by Constantine the Great on the spot where, according to the tradition of the Roman Catholics, the apostle Peter suffered martyrdom. St. Peter's is the largest church in Christendom, and is exquisitely proportioned. See Fontana, *Tempio Vaticano*; Cancellieri, *De Secretariis Vaticanis*; Letarouilly, *Le Vatican et la Basilique de Saint Pierre* (Paris, 1882).

Revised by J. J. KEANE.

Peter the Hermit: religious leader; b. at Amiens in the middle of the eleventh century; was educated in Paris and Italy; served in the army in Flanders, but gave up the military career and married; became a monk after the death of his wife, and finally a hermit; made in 1093 a pilgrimage to Jerusalem, and, deeply impressed by the indignities and cruelties inflicted on the Christian pilgrims by the Mohammedan rulers of the city, he began immediately on his return to Europe, and with the authority of Pope Urban II., to preach a general war for the delivery of the holy sepulchre. His preaching in Italy and France stirred up the whole populace, and a crusade was actually determined upon by the Council of Clermont in 1095. Peter himself led the first army toward the Holy Land—an undisciplined and disorderly swarm, containing as many women and children as men. After unspeakable sufferings on their way through Hungary, Bulgaria, and Constantinople to Asia Minor, they were routed and massacred at Nice by Sultan Solymán. Next year a regular and brilliant army, comprising the flower of European chivalry, undertook the second crusade, under the command of Godfrey of Bouillon. Peter accompanied also this expedition, and after the conquest of Jerusalem in 1099 he preached to the crusaders on the Mount of Olives. Shortly after he retired to Belgium, where he founded a monastery, at Neu-Moutier, near Liège, and died there July 7, 1115. Some consider the story of his activity in inciting the crusades as unauthentic, and deny that Peter ever was in Palestine prior to his expedition. See H. Hagenmeyer, *Peter der Eremit* (Leipzig, 1879).

Revised by S. M. JACKSON.

Peterwardein: city of the county Syrmia, Austria-Hungary; formerly capital of the Slavono-Servian military frontier; a strong fortress on the Danube with barracks for 10,000 men (see map of Austria-Hungary, ref. 8-H). Here (1096) Peter the Hermit reviewed the first crusade and (1716) Prince Eugene of Savoy disastrously defeated the Ottomans under Damad Ali Pasha. Pop. 3,603.

E. A. G.

Petigru, JAMES LEWIS: lawyer; b. in Abbeville co., S. C., Mar. 10, 1789; graduated at Columbia College (now the University of South Carolina) in 1809; after his admission

to the bar in 1812 settled in Charleston, S. C., and rapidly rose to the leadership of the bar in his State. He was a decided adherent to the principles of the Federal party, and in the days of nullification he was the acknowledged leader of the Union party. He opposed the doctrine of secession, but, by reason of his sincerity, integrity, and ability, retained the respect and esteem of his fellow-citizens, and held various public and private positions of trust. Upon the secession of South Carolina he remained loyal to the State, although he took no active part in the work of secession. He was appointed by the State Legislature to codify the laws of South Carolina, and completed the work a short time before his death, in Charleston, Mar. 3, 1863. See his *Biography*, by W. J. Grayson (New York, 1866), and the *Memorial* (1867) containing the proceedings of the Bar of Charleston, S. C., shortly after his death.

F. STURGES ALLEN.

Pétion, pā'ti ōn', ALEXANDRE: soldier and politician; b. at Port-au-Prince, Haiti, Apr. 2, 1770. He was a quadroon, the son of a wealthy planter; was educated in Paris; served with the French army in Haiti; joined the revolt of 1791, and was commandant of artillery under Toussaint Louverture, but went over to Rigaud in 1799, and was forced to leave the island with him in 1800. Going to France he was attached, as colonel, to Leclerc's expedition, destined to subdue Haiti; he did efficient service, but at the end of 1802 joined the new revolt of those who feared that slavery would be re-established. On the death of Dessalines, Christophe seized the government of the northern provinces, but the rest of Haiti remained in the hands of the mulatto party, which declared a republic and made Pétion president Mar. 10, 1807. He was re-elected in 1811 and 1815. Christophe and the black party, who still held the north, waged an almost continual war against Pétion, whose many enlightened measures were often defeated by ignorance and malice. He protected whites and opened the ports to all flags. D. at Port-au-Prince, Mar. 29, 1818.

HERBERT H. SMITH.

Petit de Julleville, pe-tee'de-zhūl'veel', LOUIS: historian; b. in Paris, July 18, 1841; graduated at the École Normale; studied in the French school at Athens; was instructor in the Collège Stanislas, Paris; then professor in the faculty of letters of Dijon; and in 1886 was called to a professorship in the faculty of letters of Paris. His best-known works are in connection with the dramatic history of France, *Histoire du Théâtre en France: Les Mystères* (2 vols., 1880); *Les Comédiens au moyen âge* (1885); *La Comédie et les mœurs en France au moyen âge* (1886); *Répertoire du Théâtre comique en France au moyen âge* (1886); *Le Théâtre en France* (1889).

A. G. CANFIELD.

Petition of Right: (1) a celebrated English statute passed early in the reign of Charles I. (3 Car. I., c. 1, A. D. 1627) for the purpose of restraining and limiting the acts and prerogatives of the crown, and securing the personal and civil liberties of the subject. Although a legislative act, yet, as it does not profess to establish any new rule, but simply to reaffirm those already in existence, it is in the form of a petition, and is entitled, "The Petition exhibited to His Majesty by the Lords and Commons, etc., concerning divers rights and liberties of the subjects, with the King's Majesty's royal answer thereto in full Parliament." After reciting the most important provision of Magna Charta and certain old statutes passed in the reigns of Edward I. and Edward III., which prohibited unlawful taxes and assessments, and forced loans, and illegal arrests and imprisonments, and quartering of soldiers upon private citizens, and a resort to martial law in civil cases; and after reciting in detail the various acts done by or in the name of the king which violated all of these prohibitions—viz., his unwarrantable levies of taxes, his forced loans, his arbitrary arrests and imprisonments, his quartering of soldiers in private houses, and his commissions authorizing the use of martial law—the Parliament prays that all these acts and proceedings should be discontinued and not repeated, recapitulating the violations of law above mentioned in detail, and concluding in the following language: "That you would be pleased to declare your royal will and pleasure that in the things aforesaid all your officers and ministers shall serve you according to the laws and statutes of this realm, as they tender the honor of Your Majesty and the prosperity of this kingdom." The king's assent, given in full Parliament, is indicated by the formula, "*Soit droit fait come est desire*" (Let right be done as prayed). This declaration of the legislature is justly considered one of the fundamental and

constitutional guaranties by which civil and political liberty is secured to the British people. Although it does not contain in express terms the statement of broad principles, but rather deals with particular instances of executive wrongdoing, yet it is regarded as including and establishing the principles of personal right and liberty in the most comprehensive manner.

(2) A common-law proceeding by which a subject sought to establish his title to and recover possession of property which was held by the crown. (See INQUEST OF OFFICE.) As the sovereign is not liable to an ordinary suit at law, a petition setting forth the facts of the case and praying for the proper relief is presented to him, upon which he indorses the words "*Soit droit al partie*" (Let right be done to the party), and delivers it to the law officers of the crown. The subsequent proceedings resemble those in an ordinary action between subject and subject; the issues are tried before a court, and judgment is rendered for or against the petitioner according to the merits of the case. The Petitions of Right Acts (20 and 21 Vict., c. 44; 23 and 24 Vict., c. 34; and 36 and 37 Vict., c. 69) provide an alternative remedy for the claimant in these cases. Revised by FRANCIS M. BURDICK.

Petit Mal: See EPILEPSY.

Petit-Thouars: See DUPETIT-THOUARS.

Petoskey: village; Emmet co., Mich.; on Little Traverse Bay, Lake Michigan, and on the Chi. and West. Mich. and the Grand Rapids and Ind. railways; 60 miles N. N. E. of Traverse City, 120 miles N. by E. of Reed City (for location, see map of Michigan, ref. 3-1). It is in an agricultural region, has lime-kilns and leather and woodenware factories, is connected by a line of steamers with Chicago, Detroit, Escanaba, Buffalo, and other lake ports, and is a popular summer resort. There are a State bank with capital of \$50,000, a private bank, and a monthly and three weekly newspapers. Pop. (1880) 1,815; (1890) 2,872; (1894) 3,649.

Petra [= Lat. = Gr. *πέτρα*; cf. *πέτρα*, rock]: the Selah of 2 Kings xiv. 7, taken from the Edomites by Amaziah (839-810 B. C.), in the hands of the Moabites about 700 B. C., and the capital of the Nabathæans (descendants of Nebaioth, the eldest son of Ishmael) about 300 B. C., when the Greeks first knew it as Petra. During the reign of Trajan (in 105 A. D.) it was conquered by the Romans; is mentioned several times by Eusebius and Jerome as an ecclesiastical metropolis, but is not heard of after about 536 A. D. Whether destroyed by the Mohammedans in the seventh century, or previously by the hordes of the desert, is not known. Its identification, suggested by Ritter on the basis of facts gathered by Seetzen in 1807, was established by Burckhardt in 1812. A good description of the ruins may be found in Robinson's *Biblical Researches* (Boston, 1841), as also in Murray's (*Porter's*) *Handbook for Syria and Palestine* (London, 1875), and with numerous illustrations in E. L. Wilson's *In Scripture Lands* (New York, 1890). The little valley, now called *Wady Musa*, is about 28 hours N. E. of Akabah, the eastern head of the Red Sea. The ruins, shut in by cliffs from 150 to 300 feet high, occupy an area of about half a mile square, are approached through a narrow and dark cañon, and burst upon the traveler in a way never to be forgotten. A stream still flows through the valley. The ruins of tombs, a theater, and a building supposed to have been a temple are exceedingly picturesque, as all these were cut from the living rock, and not built. The Bedouins who infest Petra have a bad reputation, and dragomans are afraid to conduct small parties thither.

Revised by S. M. JACKSON.

Petrarch (Ital. *Petrarca*), FRANCESCO: Italian poet and scholar; b. at Arezzo, July 20, 1304; d. at Arquà, near Padua, July 18, 1374. At the time of the poet's birth his family was in exile from Florence, his father, Petracco (name later modified to *Petrarca* by the son), being, like Dante, one of the White Guelphs banished in 1302. The first seven years of the boy's life were spent with his mother at Incisa; in 1310 he went with the family to Pisa, where he began his studies under Convevole da Prato; but in 1313 his father decided to settle in Avignon, in France, then the papal residence. For many years this last city was Petrarch's real home. From 1315 to 1319, however, he was studying at Carpentras under his old master, then removed to France. His father now destined him for the career of jurisprudence, and he went first to Montpellier (1319), then to Bologna (1323), to study for this. His tastes were all for letters, however, and he had already conceived

that passion for the Latin classics which was to make him the first of the humanists, the true initiator of the intellectual life of the Renaissance. In 1326, after the death of his father and mother, the young man returned to Avignon, and there entered the Church, receiving, however, only minor orders. He continued his favorite studies, and also took part in the gay and licentious life of the place.

At Avignon, on Good Friday, Apr. 6, 1327, as the poet himself tells us (but in 1327 Good Friday was Apr. 10), occurred an event that affected his whole after-life. In the Church of Sta. Clara he saw for the first time the woman he was to celebrate in verses of more lasting fame than was to be obtained by any other product of his pen. Few literary questions have been more discussed than that of the reality or unreality of this lady, Laura, as the poet calls her. Like Beatrice, she has been made out to be almost every form of poetical abstraction; but, in spite of all, the probability remains that she was Laura de Noves, wife of Hugues de Sade, a lady of whom we know that she died in 1348, having been the mother of eleven children. Whoever Laura was, there can be no doubt that the poet's love for her was profound, and that it deeply affected his whole spiritual life. It did not, however, prevent him from intrigues of a lower kind or from bringing into the world illegitimate children by a nameless mother.

It was not long after he had first seen Laura that Petrarch began to feel that restlessness which for many years made him a constant traveler. We can not follow his many peregrinations, but the reader will find them briefly and clearly enumerated by d'Ancona and Bacci in their *Manuale della letteratura italiana*, vol. i., p. 361-372 (2d ed., Florence, 1893). Suffice it to say that before he died he had visited the most notable cities of Italy, France, and Southern Germany, and had even been as far as Prague in Bohemia. These journeys, however, did not impede his study of the classics; they rather helped it. Wherever he went he was ever on the lookout for manuscripts of his favorite authors, and he first rescued from oblivion Cicero's *Letters to Atticus* and several of his orations, as well as a considerable portion of Quintilian. He also inspired all those with whom he came in contact with a passion for collecting similar manuscripts, and thus he began the necessary task of gathering together the productions of the ancient world in order that they might really be studied and known. His letters, of which a great number are preserved to us, show us how eagerly and consistently throughout his mature life he labored for the restoration of classical learning, and how abundant were the results of his efforts.

Naturally the encyclopedic scholarship of the poet, as well as the remarkable beauty of his Italian verse, speedily brought him great fame. In 1340, while he was at his favorite retreat of Vaucluse, near Avignon, he received a striking evidence of this renown in the form of simultaneous invitations from the University of Paris and from Rome to accept the laurel crown. He decided in favor of Rome, and Apr. 8, 1341, he was with great solemnity crowned upon the Capitol. The next years of his life were spent in many places, mostly in Italy, though he several times returned to Avignon and his beloved Vaucluse. In 1353, however, he abandoned Avignon forever, and his last years were spent in Italy—in Milan, Padua, Venice, and other places. In 1370, full of rejoicing at the return of the papal curia to Rome, he undertook a journey thither, but fell ill on the way, and retired to Arquà, in the Euganean hills, twelve miles from Padua. Here he lived till the day when his friend Lombardo da Serico found him dead in his study, with his head reclining upon the pages of a book.

It is rare that a man obtains fame as great as Petrarch's in two distinct fields. It is chiefly as the poet, the singer of Laura, that he is known to the world at large; and, in fact, though he is far from having the high seriousness of Dante, it would be hard to exaggerate his importance in the history of Italian literature. Yet this is perhaps not his best title to the memory of men, but rather the fact that in him we have the initiator of the movement which has had such profound consequences for the modern world—the movement of return to the classics, to humanism, to the life and art of the natural man. Both he and his contemporaries were guilty of much exaggeration and misapprehension as to the true character of this movement. His own firm belief, for instance, in the superior excellence of his Latin epic, *Africa*, has not been justified by the judgment of posterity; and yet it is certain that from the huge mass of his Latin works have come influences of deeper im-

port than any that the *Canzoniere* gave rise to. The very titles of these works, however, are forgotten, except by the professed students of the Renaissance, and can be mentioned here only in the most cursory way. They fall into three groups—works of erudition, works of criticism or invective, and works of a personal or moral character. To the first group belong *Rerum memorandarum libri IV.*, *Itinerarium Syriacum*, *De viris illustribus*. In the second group fall *Invectiva in medicum*, *Invectiva in Gallum*, *De sui ipsius et multorum aliorum ignorantia*. The last group contains the poetical *Carmen bucolicum* (twelve eclogues) and *Epistole metricæ*, and the prose treatises *De contemptu mundi*, or *Secretum*, *De vita solitaria*, *De otio religiosorum*, *De vera sapientia*, *De remediis utriusque fortune*. Most of these last are in dialogue form. Finally should be mentioned the letters, *Epistole*, of which Petrarch himself made several collections.

The literature about Petrarch is now enormous, and can be found best enumerated in Willard Fiske, *A Catalogue of Petrarch Books* (Ithaca, N. Y., 1882). There are countless editions of the Italian poems, *Canzoniere*, e. g. edited by C. Pasqualigo, Venice, 1874. The Latin poem *Africa*, edited by F. Corradini, is printed in the volume *Padova a Francesco Petrarca nel quinto centenario dalla sua morte*, 1874. Of the other Latin works there is no good edition, the best being still that in folio, Basel, 1554. Of the *Epistole de rebus familiaribus* and *Epistole variae* there is the excellent edition of G. Fracassetti (3 vols., 1859-63), and the same scholar has published an Italian translation of these and the remaining letters (7 vols., 1863-70). For Petrarch's life and literary character, see the following: A. Mézières, *Pétrarque*, etc. (Paris, 1867); L. Geiger, *Petrarka* (Leipzig, 1874); G. Koerting, *Petrarcas Leben und Werke* (Leipzig, 1878); G. Voigt, *Die Wiederbelebung des classischen Alterthums* (2d ed. 2 vols., Berlin, 1880); A. Bartoli, *Storia della letteratura italiana* (vol. vii., Florence, 1884); P. de Nolhac, *Pétrarque et l'humanisme* (Paris, 1892).

A. R. MARSH.

Pet'rel [from Fr. *pétrel*, dimin. of Lat. *Petrus*, Peter]: any member of a family (*Procellariæ*) of sea birds belonging to the order *Tubinæ*. The name was originally applied to the smaller species which, like the MOTHER CAREY'S CHICKEN (*q. v.*) flutter over the water with their feet just touching the surface, seeming, like Peter, to walk upon the sea. Petrels have long, narrow, pointed wings, hooked beaks with the nostrils opening in a tube. The plumage is thick, soft, rather oily, and has a peculiar, ineradicable musty smell. These birds feed on almost any animal matter, but are particularly fond of fat, and when captured not only defend themselves with beak and claw, but eject from their mouths a thick, oily, ill-smelling liquid. They dwell in communities and breed in holes, rarely laying more than a single egg, and come to and go from the nest at night. (For

sailors, a bird about 3 feet long and 7 feet in spread of wing, of a sooty color, lighter below. The bill is whitish. This species ranges N. in the Pacific to the coast of California, but the southern seas are its true habitat. The fulmar (*Fulmarus glacialis*) is the best known in the northern hemisphere, the CAPE-PIGEON (*q. v.*; *Daption capensis*) in the southern. Those petrels belonging to the genus *Puffinus* and related genera, which have a short nasal tube and rather slender beak, are commonly termed shearwaters, but it is rather a "book name." The ALBATROSS (*q. v.*) is a near relative of the petrels.

F. A. LUCAS.

Petrie, W. M. FLINDERS: Egyptologist; b. June 3, 1853; educated privately; engaged in mapping and measuring ancient British earthworks 1874-80; devoted much labor to the theory of the recovery of ancient measurements from monuments; has made several exploring expeditions in Egypt, in the third of which he discovered the city of Naukratis. Author of numerous works on Egyptology and archaeology, among the most important being *Stonehenge: Plans, Descriptions, and Theories* (1880); *Tanis* (1885); an article on *Weights and Measures* in the ninth edition of the *Encyclopædia Britannica* (1887); *Historical Scarabs* (1888); *A Season in Egypt* (1888); *Hawara, Biahmu, and Arsinoe* (1889).

Petrifactions: a general name applied to fossils in reference to the mineralization of the organic tissues which were buried in the muds and sands from which the rocks were made.

Petrography [from Gr. *πέτρα*, rock + *γράφειν*, write]: that branch of natural science which has for its object the study of rocks. The terms *lithology* and *petrology* have thus far usually been used as synonyms with *petrography*, but some authors, as A. H. Green and Wadsworth, have attempted to differentiate their meanings. From their derivation it would be natural to divide these three terms so as to reserve *lithology* for the study of stones or rocks as hand specimens, especially with reference to their constituent minerals; *petrography* for the description of rocks both as mineral aggregates and in their broader field relations as geological bodies; and *petrology* for the philosophical discussion of questions of origin, relationships, metamorphism, etc., which can only follow a considerable advance in the two foregoing departments. Petrography is the most generally employed of these three terms to cover the entire field of rock study. See ROCKS.

The investigation of rocks as a separate department of GEOLOGY (*q. v.*), though by no means new, dates its modern importance from the successful application of the polarizing microscope to the study of rock sections, cut thin enough to be transparent, the way to which was first pointed out by Sorby in 1858. Petrography includes the investigation of the nature, origin, composition and structure, genetic relationship, and secondary alterations in all rocks. The subject is one whose importance was clearly recognized at the dawn of geologic science, but for a long time it yielded no satisfactory results because of the lack of adequate appliances. It is now possible not merely to identify under the microscope (the most valuable appliance) the constituent minerals of even the finest-grained rocks, to determine their optical and other physical constants, and to make out their relative ages, modes of growth or the rock structures which they produce, but by means of various high specific-gravity solutions and the electro-magnet these constituents may be separated in a pure state and subjected to a complete chemical analysis. Much has also been done in the way of rock synthesis.

Rocks of a highly crystalline character have been most studied, both because, in the nature of the case, they are best suited to yield definite optical and chemical results, and because they are without those palæontological and stratigraphical aids to geological correlation which the sedimentary deposits possess. Field and laboratory study of rock masses have furnished and are still furnishing material for the comparative study of petrographic provinces, as well as for conclusions regarding the cause, extent, and nature of rock alterations, which promise to throw light on the darkest chapters of our earth's history. GEORGE H. WILLIAMS.

Petro'leum [Gr. *πέτρα*, stone, rock + Lat. *o'leum*, oil]: the fluid form of bitumen, distinguished from maltha by its lessened viscosity, and its occurrence, in even its most dense forms, free from water. It is known also by the names rock-oil, mineral oil, and others. For its origin, see the article BITUMEN.



The fulmar petrel.

a description of the nest of the fork-tailed petrel, see NESTS OF BIRDS.) Petrels are pre-eminently sea birds, only coming ashore to breed, and are found in all oceans, very sparingly in the tropics, most abundantly in the colder portion of the south temperate zone. The largest species is the giant fulmar (*Ossifraga gigantea*), frequently called the Cape-hen by

History.—In the production of petroleum the U. S. has taken the lead, although it has been known in Persia, China, Japan, and other countries for an immemorial period. In China it was obtained from artesian borings before the dawn of history. In Japan and Burma dug wells have been employed for centuries. In Persia it has been obtained from springs from a very remote period. Springs of petroleum early attracted the attention of travelers in the far East. Herodotus in 500 B. C. wrote of the springs of Zante, which are still flowing; and he describes how the oil was collected on a myrtle branch dipped into the spring. Pliny and Dioscorides mention the oil of Agrigentum, which was used in lamps under the name of "Sicilian oil." The wells of Amiano formerly supplied oil for lighting in the city of Genoa. At Point Apscheron, near Baku, on the Caspian Sea, at the eastern end of the Caucasus Mountains, springs of petroleum have been known from very early times. At Yenangyoung (earth-oil river), on the Irawadi, a heavy sort of petroleum has long been obtained from dug wells or pits, and sold under the name of "Rangoon tar."

The earliest reference to petroleum in North America is found in Sazard's *Histoire du Canada* (1632), in a letter in which a Franciscan missionary—Joseph de la Roche d'Alion—mentions the springs in what is now Alleghany co., N. Y. The oil of these springs, as well as that of Oil Creek, now in the State of Pennsylvania, was used by the Indians for medicinal and other purposes, and was sold under the name of Seneca oil. The early settlers in Northwestern Pennsylvania dug pits about the springs and curbed them.

From 1790 to 1820 numerous wells were drilled along the western slope of the Alleghany Mountains for brine, from which to manufacture salt. These were located along the Alleghany, the upper Ohio, the Muskingum, between Marietta and Zanesville, the Kanawha, above Charleston, the Big Sandy, and the head-waters of the Tennessee and Cumberland rivers. In all of these localities wells were occasionally drilled that yielded petroleum, and in some of them the amount was sufficient to spoil them for brine. One of these abandoned wells was drilled in Wayne co., Southeastern Kentucky, in 1819, and it has flowed a small quantity of black petroleum ever since. Another drilled on Little Rennox Creek, near Burkesville, Cumberland co., Ky., in 1829, was the first important flowing well in the U. S. The oil flowed out of the creek and into the Cumberland river, where it covered the water and was finally set on fire, burning for a distance of 56 miles. It ceased flowing in 1860, after other wells had been drilled in the vicinity. For many years the product ran to waste, but it was finally put up in bottles and sold as "American Medicinal Oil, Burkesville, Ky.," throughout the U. S., and in Europe.

As early as 1834 Selligie had manufactured in France shale oil that was used for lighting purposes. In 1850 James Young, of Scotland, introduced into commerce paraffin oils, made from the Torbane Hill shale, commonly known under the name of "Boghead coal." This industry soon extended to other European countries and to the U. S. Abraham Gesner in 1854 took out several patents in the U. S. for a process and apparatus for the manufacture of "kerosene." The manufacture of this article rapidly developed in the U. S. into an important industry. On the Atlantic coast of New England in 1860 there were forty establishments using Boghead coal, imported from Scotland, and albertite from New Brunswick. W. of the Alleghanies the rich canal coals of Breckinridge co., Ky., those found at Cannellton on the Kanawha river, and at Canfield and Newark, O., were distilled for oil. The most extensive works for this purpose in the U. S. in 1859 were the Lucaseo works in Westmoreland co., Pa., with a capacity of 6,000 gal. per day. The advent of petroleum finally caused all these concerns in the U. S. to abandon coal and take up petroleum. The Pennsylvania Rock-oil Company was organized in 1854 for the purpose of procuring petroleum on Oil Creek, Pa. After many vicissitudes, by 1858 this company had leased its land near where Titusville now stands to a portion of the stockholders, who employed Col. E. L. Drake to drill an artesian well. Drake first attempted to dig a well in one of the old timbered pits; but quicksands thwarting him, he drove an iron pipe 36 feet to the bed-rock. The following season men were engaged to drill, and, on Aug. 29, 1859, after many vexatious delays, the drill struck a crevice, into which it fell 6 inches. The next day the well was found to be nearly full of petroleum. Oil was struck in this well only 69 feet from the surface.

The success of this well was the signal for a grand rush.

Speculators came from all directions, and in the next few years hundreds of wells were drilled along the tributaries of the Alleghany river. The farmers along Oil Creek, who could not have realized more than a few dollars an acre for their farms, suddenly found themselves wealthy. As the wells in one locality failed new ones were drilled to take their places, until they had exhausted the valley land in the neighborhood of Oil City, Tidioute, Titusville, and Franklin. Then borings were made on the table-land between Oil Creek and the Alleghany river, and at other places, without regard to the present configuration of the country. Test-wells were bored all over the country E. of the Mississippi river wherever an oil or gas spring rendered the production of oil possible. While a great many such enterprises proved fruitless, there were opened up a number of minor fields at some distance from the so-called "oil-regions of Pennsylvania," where the famous Pithole excitement was at its height. In Beaver co., Pa., the Smith's Ferry field was opened up, and in Ohio the Mecca district in Trumbull County, the Belden district in Loraine County, and the region that extends from the northern part of Washington co., O., southward through Pleasants and Ritchie into Wirt co., W. Va. Another locality in West Virginia was found along the Great Kanawha river, above Charleston, in Kanawha County. Still another region was developed in the southeastern part of Kentucky, near Glasgow, in Barren County. With the exception of the Mecca and Kanawha districts, which have been practically worked out, all of these localities are (1894) producing oil. From 1865 to 1875 operations in Pennsylvania gradually extended down the Alleghany river into Butler and Clarion Counties, and N. E. into Warren and McKean Counties. The Butler and Clarion, or "Southern Country," was at its height of production in 1872-75; then began the development of the Bradford field, which reached its height in 1880-81. In 1885-86 the Washington and Greene Counties, Pa., fields were opened up, and later the region in Alleghany and Washington Counties W. of Pittsburgh.

In the northwestern counties of Ohio, particularly in the vicinity of Findlay in Hancock County, and Lima in Allen County, natural gas had been known since the settlement of the State. In drilling wells for gas in 1884 oil was encountered, often in such quantities as to prove troublesome. Wells for oil were first drilled in Lima and its vicinity in 1885, and their success soon led to the development of a large production over a wide area in Northwestern Ohio and Northeastern Indiana, known as the Trenton limestone or Lima oil-field.

On the Pacific coast another area next in importance has been developed in the Coast Ranges of Southern California. For more than a century bitumen has been observed floating upon the sea in the Santa Barbara channel. Exploration of the mainland E. of Point Conception and S. of the line forming the northern boundary of Santa Barbara County showed that an immense amount of bitumen was reaching the surface in the form of maltha that soon became asphaltum upon exposure to the elements. In 1865 companies were formed in New York, Philadelphia, and San Francisco, but their wells were improperly located, and failed to produce oil. In 1880-87 their properties passed into the hands of men of large experience in the oil-regions of Pennsylvania, and after several unsuccessful attempts, and a careful examination of the stratigraphy of the country, wells were obtained, principally in Ventura and Los Angeles Counties, which have produced steadily since. Other locally valuable regions are found in Wyoming and in South-eastern Colorado.

Outside the U. S. the regions furnishing petroleum to commerce are those of Russia, which extend along the Caucasus Mountains; those of Galicia and the Danubian principalities, Wallachia and Moldavia; and a small area in Peru. The Russian oil-fields are chiefly confined to a small area of very productive territory near Baku, which yields wells remarkable for their enormous output and for the long time during which it is discharged. Operations have been carried on here since 1873. The Galician and Roumanian oil-fields have been worked in a rude way for more than a century. Although attempts have been made for many years to utilize Peruvian petroleum, it is only quite lately that it has been imported in tank-steamers into San Francisco and sold in competition with the oils of California. See the article PETROLEUM AND NATURAL GAS, GEOLOGY OF.

Properties.—Petroleum is a liquid varying in color from

a light straw, through amber, red, and brown, to black; oils from the same locality are usually of nearly the same color. The Trenton limestone oils are very black; those of Oil Creek, Colorado, South America, Russia, Germany, Japan, and India are brown; the Bradford oils and those of the lower Alleghany and the vicinity of Washington, Pa., are amber-colored, as well as that of Amiano in Italy. The oil found at Smith's Ferry is a very light amber, and in a few instances natural petroleum has been obtained almost colorless. The colors given above are observed when the light is transmitted through the oil. The same oils, from the lightest to all but the darkest shades, when viewed by reflected light, are tinged with green. Hence petroleum is said to be dichroic, or of two colors. In specific gravity it varies from .7 to 1.2, water being 1. As it escapes from the earth it is usually accompanied by water and a varying amount of gas, which latter it holds in solution. It is insoluble in water, but itself dissolves about 2 per cent. of water. It is partially soluble in all of the varieties of NAPHTHA (*q. v.*), in all varieties of alcohol, ether, chloroform, bisulphide of carbon, turpentine, and the other solvents of bitumen. The lighter colored varieties are highly refractive.

The chemical composition of petroleum varies greatly. Taken together they are found to contain nearly all the members of all the series of HYDROCARBONS (*q. v.*) known; but no single variety contains nearly all of them. The Trenton limestone oils of Canada and the U. S. consist of members of the paraffin and olefine series, holding in solution small quantities of more complex compounds, into which either nitrogen, sulphur, or oxygen enter as constituents. The oils obtained in the Devonian and Subcarboniferous rocks of Eastern Ohio, New York, Western Pennsylvania, and West Virginia are mixtures of paraffins and olefines, with only a trace of nitrogen or sulphur compounds. They are the most easily refined into commercial products of any petroleum known. The oils of Kentucky and Tennessee partake of the characteristics of both the Trenton and Devonian oils. The oils of Colorado contain paraffins. Those of the Pacific slope apparently consist of members of the benzole series, holding in solution considerable though varying amounts of pyridins and chinolins (basic oils containing nitrogen), combined with an acid resembling hippuric acid, in the form of an *ester* or compound ether. These nitrogen compounds make these oils very difficult to refine, and by their decomposition from natural causes cause the oils to pass rapidly into maltha and asphaltum. Russian oils consist of a mixture of the hydrides of the benzole series; Burmese petroleum (Rangoon tar) consists of a mixture of olefines and benzoles.

Development of Oil-territory.—The successful location of oil-wells on any proved territory requires sound judgment and experience. Each owner of a tract is likely to drill along the border of it, in order to draw oil from beyond the border. If the drilling is done under a lease, it is customary to give the owner of the land a royalty of a certain sum per barrel, or a certain proportion of the oil, or a certain percentage of the gross receipts. One well to 5 acres is considered a proper ratio, but they have been drilled as closely as five to an acre. Wells drilled so closely exhaust the oil-sand more rapidly; they have sometimes been exhausted in a few months.

Great differences are found in the oil-sand of different localities. The pebble sands of the Alleghany river and its tributaries are masses of rounded or flattened white quartz pebbles of the size of beans or grapes, that adhere at their points of contact, constituting a friable rock with large interstitial spaces. It varies in thickness from 10 to 125 feet. The Warren sand is blue, fine-grained, and muddy. The Bradford and Washington sands are coarse sandstones of a brown color. In California the sand is fine-grained, blue sandstone of marine origin. In Russia the sand is a sort of quicksand, very fine and blue in color. It often accompanies the oil in its outflow. It has been proved by experiment that the Venango pebble sand will hold about 1,000 barrels per acre for every foot in thickness.

For the method of drilling wells, see WELL-DRILLING. When an oil-well is drilled into a firm rock it is customary to introduce into the bottom of the well from 2 to 15 gal. of nitroglycerin and explode it by causing a mass of iron to drop on a fulminating cap. The effect of generating in the limited space a large volume of gas is to drive the oil, gas, etc., back into the rock until an equilibrium is established; then a reaction follows, and the expansion of the compressed gases forces everything before it up the drill-

hole in a geyser of oil until the expansive force subsides. Torpedoes are not used in the oil-regions of California. After a well has been torpedoed it is prepared for flowing by introducing into it a 2-inch pipe, at the lower end of which is attached a strainer. At some point below the casing the pipe is arranged with a joint in such a manner that the portion above the joint will slide on that below. The joint is secured by a cylindrical mass of India-rubber, called a packer. The weight of the upper portion of pipe presses the rubber against the well in such a manner as to plug the drill-hole around the pipe, and prevent any oil or gas from escaping from the rock except by ascending the pipe. So long as the pressure of gas within the rock is sufficient to force the oil to the surface, the well will flow. When the well ceases to flow a pump is introduced, and the oil lifted to the surface until it ceases to be remunerative.

In the early days on Oil Creek the oil was transported in barrels holding 42 gal. each; along rivers bulk-barges were employed. In 1871 wooden tanks on flat cars came into use, and later these were followed by plain iron cylinders, holding about 5,000 gal. each, which are still used for transporting crude and refined oil in America and Europe. Crude oil is also transported by means of pipe-lines, which are best described in connection with the means employed for storing the oil. Every well is supplied with a tank holding 250 barrels, from which a 2-inch pipe connects with a larger tank holding perhaps 10,000 barrels. This large tank is connected by a 4-inch pipe, through a pumping-station, with a general system of 6-inch pipes, extending often for hundreds of miles. At convenient points along these main lines storage-tanks are placed, holding 35,000 barrels each; and pumping-stations are located about 40 miles apart. These pipe-lines are made of wrought iron, the sections screwed into couplings, the whole of which is tested to a pressure of 2,000 lb. to the square inch. Pipe-lines extend out of the oil-regions to Chicago, Cleveland, Buffalo, Jersey City, Philadelphia, and Baltimore. In California they extend from the wells in the mountains to Santa Paula and Ventura. In Russia a line has been laid from Baku on the Caspian Sea to Batum on the Black Sea, a distance of about 600 miles.

Petroleum in Commerce.—Petroleum, suitable for refining into illuminating oil, enters the market in enormous quantities through the pipe-lines. The more dense oils, which are suitable for use as lubricating oils in the crude state, and also as reduced oils, are handled in barrels and tank-cars. The handling of oil in pipe-lines has rendered banking in oil possible. This business is conducted as follows: When oil is run into the pipe-line the owner receives for it certificates, which, having been properly indorsed, are negotiable after the manner of certified checks. Certificates for 1,000 barrels are negotiable on the Stock Exchange, like any other declaration of indebtedness, and their purchase and sale makes speculation in oil possible. Certificates for less than 1,000 barrels are sold to consumers of oil. The oil is held against these certificates in storage-tanks, holding 35,000 barrels each, to the amount of millions of barrels, under regulations that insure its proper care.

Technology of Petroleum.—The apparatus employed for distillation consists of an iron still connected with a condenser of wrought-iron pipe, which is submerged in water. The first products of distillation are gases; at ordinary temperatures they pass through the condenser and escape. By cooling the condenser with ice and salt the very volatile liquid rhigolene is obtained; and by using a condensing-pump a still more volatile liquid, cymogene. The first fluids that condense at ordinary temperatures have a gravity of about 95° B.; in most establishments it is customary to run the product into one tank until the gravity of the distillate reaches 65°–58° B. This product is known as crude naphtha, and is subsequently separated by redistillation into gasoline and A, B, and C naphthas. When the stream of oil has a gravity of 59° B. it is run into the kerosene-tank until the gravity reaches about 38° B. or until the color becomes yellow. After taking off this second fraction, the kerosene, the stream is run into the paraffin-oil tank until there remains in the still only a thick, heavy tar, called residuum. The last products have a gravity of about 25° B. The paraffin oil is put into barrels and chilled, to crystallize the paraffin, and is then put into cloths and pressed, in order to remove the oil. The solid paraffin is purified by repeatedly melting it in naphtha, chilling, and pressing.

While this is a general outline of the process by distillation, it should be remarked that refiners differ in the de-

tails of the operation. A single firm at Rochester, N. Y., distill their oils in a vacuum, producing what are known as vacuum oils. Formerly very large stills were in use; at present the largest hold about 1,200 barrels. In these, by slow distillation, the heavier lubricating oils are "cracked" into lighter oils, so that the refiner need not produce any heavy oils, but only crude naphtha, illuminating oil, and residuum. The naphthas, burning, and lubricating oils are decolorized and decolorized for market by treatment, which consists in thoroughly agitating the crude distillate with strong sulphuric acid and allowing the mixture of the acid and the impurities of the oil, called sludge, to subside; the oil is removed, and then agitated with a solution of caustic soda, ammonia, or lime; this removes any free acid, along with any other impurities not removed by the acid. After treatment the burning oils are sprayed, in order to remove any light vapors that might render the oil unsafe. The lubricating oils, or reduced oils, produced by partial distillation, are sometimes treated and sometimes filtered through animal charcoal, to remove both color and odor; they are sometimes distilled with superheated steam. The residuum is distilled in small stills, and yields a large quantity of paraffin and paraffin oil, and a solid residuum that is run out of the still while it is hot, called coke-pitch, as it always contains a considerable percentage of coke. A variety of solid and semi-solid preparations are made by filtering the melted materials through animal charcoal; vaseline and various light-colored lubricating oils are examples. Nearly every natural petroleum is found to possess some peculiarity that renders some modification of this general technology necessary. Russian petroleum yields a second grade, as compared with the best American illuminating oil, excellent lubricating oil, and white solids, that are not paraffin, sold under the name of "Alboline." No first-class illuminating oil has ever been made from California petroleum, and very little, if any, is now being manufactured from that material. In the few refineries of the Pacific coast the articles turned out are gasoline, naphthas, lubricating oils, and several grades of both fluid and solid asphaltic residuums. These residuums resemble in some respects the natural asphalt; but in others they are very unlike. The dense black California petroleum is also reduced, and the fluid residuum is found to be especially valuable for use as an asphaltic flux in the preparation of street-paving.

The yield of these different products varies greatly with the variety of oil and with the refinery. The following is a fair average for Pennsylvania oil of about 45° B.:

	Per cent.
Gasoline.....	1½
Naphthas.....	14
Kerosene.....	55
Lubricating oil.....	17½
Paraffin.....	2
Loss, gas, and coke-pitch.....	10
Total.....	100
By cracking, the same oil could be made to yield:	
	Per cent.
Naphthas.....	20
Kerosene.....	66
Loss, gas, and coke-pitch.....	14
Total.....	100

Kerosene is the most important product of petroleum. It is a mixture of many hydrocarbons, and has the consistency of the essential oils, a burning taste, and aromatic odor. It is nearly colorless by transmitted light, and slightly fluorescent by reflected light. Its density should be from 43°–45° B. At ordinary temperatures it should extinguish a match as readily as water. It should not evolve an inflammable vapor below 110° F., and should not take fire below 125° F. As kerosene containing even a small percentage of naphtha is very dangerous, it is almost universally required by law that kerosene be tested before it is sold. A suitable apparatus is required, consisting of a cup to hold the oil, surrounded by a vessel of water, which is heated by a small spirit-lamp. The bulb of a thermometer is immersed in the oil, not far below the surface. The oil should be heated very slowly; the temperature should not rise faster than 2° per minute. The oil should be stirred before applying the flame. The flashing test determines the lowest temperature at which the oil gives off an inflammable vapor. The burning test fixes the burning-point of the oil,

or the lowest temperature at which it takes fire. One per cent. of naphtha will lower the flashing-point of an oil 10° without materially affecting the burning test. The burning-point of an oil is from 10° to 50° higher than the flashing-point. The flashing test should therefore be the only test mentioned in laws framed to prevent the sale of dangerous oils.

Uses of Petroleum.—The earliest use of petroleum, both in Europe and in the U. S., was as a therapeutic agent, in diseases of the skin of both men and animals, in rheumatism and consumption; it is still largely a constituent of embrocations in popular use. A filtered paraffin residue, under the name of vaseline, cosmoline, or petroleum ointment, is very extensively used, not only as a basis of medicated ointments by the apothecary, but very generally in households. Rhigolene has been used as an anæsthetic; cymogene has been used in ice-machines.

Various products of petroleum besides kerosene are used for purposes of illumination. Gasoline is used in large quantities in carburetors. These are machines in which air is made to bubble through the gasoline and dissolve a sufficient amount of the volatile liquid to form a combustible mixture, which may be burned like ordinary illuminating gas. Illuminating gas has been made by causing crude petroleum to drip into a retort upon red-hot coke. Naphtha is burned like gas in an apparatus in which it is vaporized by the heat generated during its combustion. A product of petroleum known as gas-oil, which consists of the naphtha and kerosene distillates run together without treatment, is used to enrich gas deficient in illuminating power. Astral oil is an oil of high flash-point, especially prepared with reference to illuminating power and safety. Mineral sperm is an illuminating oil of very high flash-point, for use in lighthouses and on locomotives.

The paraffin and other lubricating oils prepared from petroleum, in innumerable brands, have largely superseded animal and vegetable oils throughout the world, while for coarse and heavy bearings the use of crude petroleum has become universal. Crude petroleum is used very extensively in Russia and on the Pacific coast of the U. S. for fuel, chiefly for steam purposes. The residuum of the refineries is also used on steamers on the Volga and the Caspian Sea, and on locomotives throughout Southern Russia. It has also been successfully used in the Eastern U. S. for steam purposes, but the low price of coal in the Mississippi valley renders competition impossible. On the Pacific coast coal is scarce and high-priced, and petroleum is used extensively for stationary boilers, petroleum having the advantage over coal in freedom from dirt, and the small expense for labor attending its use. Gasoline is very widely used for domestic heating and cooking, notwithstanding the well-known danger attending its use. It is more satisfactory than kerosene, which is also used for the same purpose, and, like gasoline, in stoves especially constructed for its combustion. The most volatile products of the distillation of petroleum are used for explosion in the cylinders of motors, after the manner in which gas is exploded in the cylinders of gas-engines. The asphaltic residues of California petroleum, as well as coke-pitch, are used for coating paper and in the manufacture of varnishes, paints, lacquers, etc.

The influence of petroleum and its products upon civilization is hardly less potent than that of the steam-engine and electricity. While thousands of wells have ceased to produce, and many localities in all of the regions that contribute to the world's supply have ceased to be important factors therein, still the aggregate amount appears to be sufficient to meet all of the enormous and varied demands; and, from a careful survey of the prospective supply, there seems to be no reason to fear that these demands of commerce will not be adequately met for an indefinite period.

The following statistics, from the *Mineral Resources of the United States for 1894*, show the annual production of petroleum throughout the world, in barrels:

PRODUCTION OF PETROLEUM.	
Pennsylvania and New York.....	20,314,513
West Virginia.....	8,445,172
Eastern Ohio.....	2,602,965
Lima, Indiana.....	15,982,097
Florence, Colorado.....	594,390
Southern California.....	466,179
Other fields in the U. S.....	7,110
Total barrels for the U. S., 1893.....	48,412,666

PRODUCTION OF PETROLEUM—CONTINUED.

Russia, Baku, 1893.....	33,104,126
Russia, elsewhere, 1890.....	251,543
Austria-Hungary.....	816,000
Canada, 1893.....	798,406
Peru, 1890.....	350,000
India, 1891.....	146,107
Germany, 1892.....	103,323
France, 1891.....	70,000
Japan, 1890.....	48,027
Argentine Republic, 1891.....	21,000
Italy, 1891.....	8,085
Great Britain, 1892.....	1,526
Other countries (estimated).....	200,000

Total number of barrels..... 84,330,809

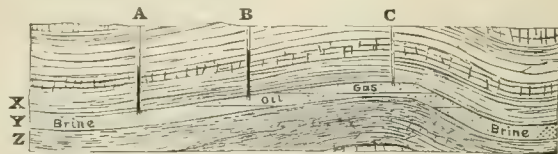
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Petroleum and Natural Gas, Geology of: Petroleum and natural gas appear to be inseparably connected. Wherever large supplies of the one exist the other is in almost all cases not far distant. Hence any statements concerning the geology of the oil are equally applicable to that of the gas. Then, too, the flow of large petroleum-wells is always accompanied by an immense output of natural gas, which doubtless is dissolved in the oil under the great pressure of its rock reservoir.

The quantity of gas occurring immediately with the oil varies greatly, depending upon the depth of the oil-reservoir below the surface and the permeability of the overlying rocks. When the rock reservoirs lie near the surface, as at Volcano, W. Va., Mecca, O., and Franklin, Pa., most of their volatile contents escape into the air, leaving a heavy or lubricating oil, with little or no gas present, while if the reservoir lies upon the surface, or its included oil is transported to the surface in any manner, evaporation and oxidation reduce the liquid to the condition of asphaltum, as in the island of Trinidad and at many places in Kentucky, Tennessee, and the Western States and Territories of the U. S. In Ritchie co., W. Va., a vertical fissure from 2 to 3 feet wide and extending down to the oil-sand group has been thus filled with grahamite. From this universal occurrence of oil and gas together, or in close proximity to each other, it is evident that they have had a common origin, and that natural gas is one of the by-products in the genesis of petroleum. Until 1884 geology played a very insignificant part in guiding the drill in its search for oil and gas deposits. Since that date, however, the laws of oil and gas distribution and occurrence have been quite thoroughly worked out, and it is now possible to predict from geological structure the general regions where productive areas of oil and gas may be found, as well as to define the boundaries of nearly all those regions where a search for either must prove fruitless. These laws have been formulated under three heads—*Structure, Reservoir, and Cover*.

Structure.—All of the great areas of petroleum and natural gas occur along lines of disturbance in the rocks, where anticlinal arches have tilted the strata and thrown them into considerable relief, thus permitting the gas, oil, and salt water occurring in all porous sedimentary rocks to separate themselves in the order of their specific gravities, the water occupying the synclines and lower slopes of the strata, the oil coming next above the water and extending upward until it is in turn succeeded by natural gas higher

up the slope and across the crowns of the anticlinals, if the rocks are continuously porous. (See diagram.) Hence when



Ideal diagram of strata to illustrate the natural relations of brine, petroleum, and gas in a porous bed (Y) contained between impervious beds (X, Z). A well at A yields only brine. A well at B yields first petroleum and afterward brine. A well at C yields first gas and afterward petroleum and brine.

the rocks are nearly horizontal over a wide area, structure would condemn such a region as not likely to furnish large supplies of either gas or oil. Structure also teaches that it would be useless to bore for gas in a syncline, unless it should be a subordinate feature of an anticline.

Structure would also condemn all regions for gas or oil where the rocks are highly contorted and the folds of great height, since these fissure the strata deeply, bring the reservoirs themselves to the surface, and permit the escape of the oil and gas they may once have contained.

Reservoir.—When petroleum was first discovered in large quantity, many people imagined that it existed in underground lakes, filling large caverns in the strata, and it was so represented even in leading text-books on geology. Petroleum does not occur in caverns, as thus depicted, but in the rocks themselves, disseminated through the minute cavities and spaces between the sand-grains and pebbles of fragmental deposits, while in limestones it occurs in the crystalline cavities formed by the partial replacement of pure limestone by dolomite. In slates it probably exists mostly in fissures. All sedimentary beds are porous to some extent, but the finer elastic materials, like slate, shales, and ordinary limestone, are so slightly permeable to liquids that unless much fissured they make poor reservoirs for either oil or gas, and hence the geological structure may be favorable, but if porous rock reservoirs be absent from the underground strata we can not expect to find any large supplies of oil or gas. The rate of production of any oil-well appears to depend largely upon the porosity of its rock reservoir. When this is a mere bed of gravel, like the famous fifth sand at McDonald, Pa., we may have a well like the Matthews or Mevey, putting out 15,000 barrels daily, and when the pebbles are not consolidated, as in the Baku district of Russia, the wells may flow even 50,000 to 60,000 barrels daily, while if the reservoir is compact and close-grained, wells penetrating it are non-productive. If the reservoir rock changes its character suddenly a well practically dry may exist close beside one that is highly productive. A non-productive well was drilled within 300 feet of the Mevey well at McDonald, Pa., at the time the latter was yielding 15,000 barrels daily. The porosity or quantity of reservoir space in good oil or gas rock in the Pennsylvania fields varies between one-fifth and one-tenth of the volume of the rock.

Cover.—However coarse or open the rock reservoir may prove, it must be roofed over with an impermeable cover, else the oil and gas will escape to the air, and the drill will find the original reservoir practically empty, or filled with fresh water. Soft shales or slate make such an excellent cover that even where the rocks are bent at an angle of 30° to 60°, as along the Volcano, W. Va., anticlinal, they have still retained a considerable quantity of petroleum in its subterranean reservoirs, though from the sands which lie nearest the surface much of the oil and nearly all of the natural gas has escaped. In any region, then, where unaltered sedimentary rocks have been gently tilted, and contain coarse or porous beds overlain with a considerable thickness of shale, clay, or other impermeable rock, we may expect to find deposits of petroleum and natural gas.

Dr. Orton believes that the terrace, or monoclinical structure, which is really a suppressed or arrested anticlinal, is the most favorable for accumulation of petroleum, since this peculiar arrangement of the rocks, as first noted by Minshall, is so common in the oil-fields of Ohio. It is also prevalent in most of the oil-fields of Pennsylvania and West Virginia.

The pressure under which oil and gas are found in porous rocks is hydrostatic, and identical with that of artesian wells. In any field newly opened, or in a field the wells of which are kept closed until a condition of static equilibrium

is restored, it is approximately measured by the pressure of a column of water rising from the same reservoir at another point. If, in the case illustrated by the diagram, the brine in well A rises half way from the reservoir to the top, the oil in well B, being lighter than water, will rise to a higher level, and the gas in well C will sustain a pressure measured by that part of the column of oil in B which is above the surface of oil in the reservoir, or approximately by that part of the brine in A which is above the oil-surface in the reservoir. This law of pressures has been demonstrated by Dr. Orton for the Trenton limestone reservoirs in Ohio and Indiana, and the same rule holds true for the oil-sands of Pennsylvania and West Virginia. An important corollary is that in the same "oil-pool" the liquid must occupy about the same level in the rock, since it is subjected to practically the same pressure in every portion of the pool. Hence when one good well is found in any field, the proper direction to go in search of others is along the *strike* of the rocks, and as the strike of the oil-sands is nearly the same as that of the surface rocks, the latter may be used in tracing out the probable course of oil-belts in advance of the drill. In this is found the philosophy of the 45°, 35°, or 22½° lines which in different oil-fields have proved so popular with the practical oilmen. These are strike lines in the several regions where used.

Geological and Geographical Distribution.—Petroleum and natural gas are not confined to any particular geological horizon, but occur in rocks of all ages from the Lower Silurian up into the Quaternary, as will be seen by the following remarks on distribution in the U. S.

The Trenton limestone of the Lower Silurian is the lowest and oldest known horizon for productive oil and gas wells. This horizon was first discovered near Findlay, O., and has proved one of the most prolific sources of oil and gas that is yet known in the U. S. Very large areas in Ohio, Indiana, and also in Canada contain petroleum and natural gas. Dr. Orton has shown that the productive areas of the Trenton limestone are confined to domes and terraces in this rock, where it has been rendered porous by the presence of dolomite.

The Hudson river beds seem to have furnished the first flowing well on the continent in the salt-well of Cumberland co., Ky., bored in 1829. This formation is petroliferous at many points in Kentucky and Tennessee, but none of the wells are very productive, as the rocks are close-grained. The Clinton series has proved, according to Orton, a rich repository of gas in the vicinity of Lancaster and Newark, and in other parts of Ohio, having also some oil. It is also, according to the same authority, the probable oil and gas horizon in the Barren County oil-field of Kentucky, where a great many small producing wells have been found. The producing stratum is a sandstone in Ohio, and probably the same in Kentucky.

The Corniferous limestone, Devonian, appears to be the principal oil horizon in the Canada petroleum-fields, and it has also produced oil in several borings of Eastern Kentucky, though always in small amounts. The Marcellus shale is the source of considerable natural gas in New York, and doubtless at many points in Ohio, but the wells are always small. The Chemung series (including the Portage, Chemung, and Catskill formations) has so far proved the most prolific oil and gas horizon in the U. S. The Portage beds are always low in porosity and, so far as known, have yielded gas and oil only sparingly, the localities being at Erie, Pa., and elsewhere near the shore of Lake Erie. In the Chemung and Catskill rocks, however, we find coarse sandstones and conglomerates, which are very porous, and both of these series have proved great reservoirs of oil and gas along the western slope of the Appalachian Mountain system from the southern portion of New York across Pennsylvania, and down into Ohio and West Virginia. The great Bradford oil-field, as well as the Southern New York region, derives its oil and gas from the Chemung beds proper, and that from Kane, Sheffield, Warren, Cherry Grove, Speechly, and adjoining regions, comes from the same source. The Catskill rocks appear to be even more prolific in oil than the Chemung, since the Venango oil-sand group of Pennsylvania, with its first, second, third, fourth, and fifth sands, from Venango County down through Clarion, Butler, Armstrong, Mercer, Lawrence, Beaver, Allegheny, Westmoreland, Washington, and Greene, belongs wholly in the Catskill beds, with the possible exception of its basal members. This Venango group has furnished practically all of the oil and gas of Western Pennsylvania, and has proved

prolific at Macksburg, O., and at Eureka, Wellsburg, Mannington, Big Isaac, and many other points in West Virginia. Two of the largest gas-wells ever struck were found in a member of the Venango group at Big Isaac, in Doddridge co., and near Joetown, Marion co., W. Va.

The Cleveland shale, which, according to Orton, is the black shale of Southern Ohio and Eastern Kentucky, is also a member of the Venango or Catskill series, and contains some petroleum and gas wherever its outcrop extends. The gas-wells near Brandenburg, Meade co., Ky., occur in this stratum, and they have proved large enough to pipe to Louisville, 25 miles distant. Dr. Orton reports the shale as shattered and fissured at this locality, and its reservoir capacity has thus been increased to a large extent.

The next higher member of the geologic scale, the Pocono sandstone (Lower Carboniferous), No. X., or Vespertine of Rogers, is also one of the great petroliferous horizons. It is so far the principal oil and gas horizon of West Virginia, the Mt. Morris, Doll's Run, Peddler's Run, Jake's Run, Fairview, Mod's Run, and Mannington oil and gas fields being found at this horizon. The great Sistersville oil-field is found in the same rock, while it was the principal producing horizon at Volcano, White Oak, and Burning Springs. The gas-wells of the Great Kanawha, Guyandotte, and Big Sandy rivers are found in these beds. It is the Slippery Rock oil-sand in Pennsylvania, and the Mecca sand in Ohio, while through Kentucky, Tennessee, and Alabama it carries more or less oil, gas, or asphalt. The Mountain limestone series next above the Pocono is also petroliferous at many points in Kentucky, where the Keokuk and Chester divisions contain some massive sandstones. The tar-springs of Breckinridge and Grayson Counties come at this horizon. The Pottsville conglomerate also holds hydrocarbons, when covered sufficiently to prevent their escape. It holds large quantities of gas in Southwest Pennsylvania and Northern West Virginia, and also considerable oil along the Volcano anticline of the latter State. This series also carries oil in Southern Ohio, Eastern Kentucky, and at some localities in Illinois and Indiana.

The sandstones of the lower coal-measures, No. XIII., hold oil and gas in West Virginia, the Freeport sandstone being the one most generally petroliferous. This rock appears to hold gas over a wide area in Central West Virginia.

The Mahoning sandstone, at the base of No. XIV. in the Barren measures, is also widely petroliferous, and at one locality near Dunkard creek, Greene co., Pa., has produced a large quantity of oil. It is also the "Cow Run" sand of Southern Ohio and the Williamstown district of West Virginia, in both of which regions it has produced a considerable quantity of oil.

The highest stratum geologically that has ever produced oil in the Pennsylvania field is the Morgantown sandstone, 200 feet below the great Pittsburgh coal-bed. In the Dunkard region of Pennsylvania a large well was struck in this sandstone.

The natural gas at Paola, Kan., and the Kansas City region probably comes from the coal-measures. A small quantity of oil is found in the Triassic beds of North Carolina.

The oil and gas of the Western States and Territories are found in newer rocks than those of the Appalachian region. The Florence oil-field near Cañon City, Col., is in the Cretaceous beds, while the same rocks are petroliferous through Wyoming, Dakota, Montana, and New Mexico. The oil of California, Mexico, the West Indies, and much of that of South America, occurs in the Miocene. That of Trinidad and Peru is reported to occur in the Eocene. The natural gas near Salt Lake City, Utah, is derived from Pleistocene lake-beds; that of La Moille, Ill., from glacial gravels.

In England a small quantity of petroleum has been found in the coal-measures. In the valley of the Rhône and in Savoy it occurs in the Jurassic limestones. That of the Apennines, Dalmatia, Albania, Roumania, Galicia, the Caucasus, and Baku is mostly from rocks of Eocene age, as also that from the Punjab and Burma. Oil and gas are also found in Persia, Hindustan, China, Japan, Java, Australia, and Africa, and in all these cases the oil zones appear to lie parallel to the principal mountain systems of the several countries, as they do in America, thus indicating the connection of oil deposits with rock structure.

Available Store.—From this review it will be perceived that petroleum and natural gas, like coal, are distributed quite generally over the world and through rocks of all ages, from the Lower Silurian up to the Quaternary. The process of exhaustion is a slow one, many individual wells

in the Pennsylvania field having yielded oil in paying quantities continuously for a period of more than thirty years. New districts and new horizons are constantly being discovered, so that there is no immediate prospect of the exhaustion of petroleum. Not so with natural gas, however, which can be removed from the rocks so much more rapidly and completely than oil. In regions like Pittsburg, where several hundred wells have been drilled to the gas horizons, rapid exhaustion must certainly follow, but in other regions, where only a few wells are drilled, the supply may be counted upon for an indefinite time, since large gas-springs like those in the Caucasus have been burning for centuries. For other information, see the articles PETROLEUM and NATURAL GAS.

REFERENCES.—Orton, *The Origin and Accumulation of Petroleum and Natural Gas* (Geological Survey of Ohio, Economic Geol., vol. vi., Columbus, 1888), and *Origin of the Rock Pressure of Natural Gas* (Bulletin of the Geological Society of America, vol. i., 1890); White, *The Mannington Oil-field and the History of its Development* (Bulletin of the Geol. Soc. of America, vol. iii., 1892). I. C. WHITE.

Petrology [from Gr. *πέτρα*, rock + *λόγος*, discourse]: the science of the mineralogical composition of rocks. See PETROGRAPHY.

Petromyzon'idae [Mod. Lat., named from *Petromyzon*, the typical genus; Gr. *πέτρα*, rock, stone + *μύζω*, sucking in. The name is given in allusion to the manner in which these animals remove small stones from their breeding-grounds]: the single family of the order *Hyperoartii*, comprising the forms known as lampreys and lamprey eels. The form is eel-like; the skin naked; in the adult the head is elongated, with branchial and antibranchial regions nearly equal; eyes well developed, not far in front of the first branchial aperture; mouth with a subcircular suctorial disk armed with teeth which are horny, each resting on a soft papilla, and simple or multicuspid; the branchial apertures are always seven in number and lateral; dorsal, anal, and caudal fins represented to a greater or less extent by a continuous or interrupted membrane; pectorals and ventrals not developed; the intestine has a spiral valve. Such are the characters of the adults, but all the species undergo a metamorphosis, and a very different form is possessed by the young or larvæ. This stage was formerly regarded as representing a peculiar mature form, and described under the name *Ammocetes*; in this stage the front region of the head is little developed, the eyes are wanting, and the mouth is represented by a longitudinal slit, and is without teeth. The species are, to some extent, parasitic, and fasten themselves by their suckers to fish, whose flesh they consume by abrasion.

Revised by D. S. JORDAN.

Petro'nus Ar'biter: the author of a Latin romance, *Satiræ*, also called *Satiricon*, which in a half-comical manner gives a description of the vices and debauchery of Roman society under the first emperors, now in prose, now in verse, sometimes witty, occasionally obscene. Of the work, which seems to have been very large, only fragments are extant, from the fifteenth and sixteenth books. One of these, the *Supper of Trimalchio* (*Cena Trimalchionis*), was first discovered in the middle of the seventeenth century, and published at Paris in 1664. Several attempts have been made to deceive the public by spurious manuscripts of the lacking portions of the book; thus, in 1693, Francis Nodot published a complete *Satiricon* from a manuscript which he pretended to have found in Belgrade. The best editions of the true fragments are that by Burmann (Amsterdam, 1743) and that by Bücheler (Berlin, 1862, and in a third smaller edition 1882). A minute and thorough collation of the MSS. was made by Charles Beck (Cambridge, 1863). Of the author of this book nothing is known, but there are strong reasons for identifying him with the Petronius of whose character and life Tacitus (*Annales* 16, 18) gives an amusing sketch, the *maître de plaisir, élégant ar'biter*, at the court of Nero, the authority and model in matters of taste and fashion in dress, manners, and sensual enjoyment. The scene of the *Supper of Trimalchio* is laid in a town of Campania, probably Cumæ or Puteoli, and under Nero, although other scholars put it under Augustus or in the last years of Tiberius. There is an excellent edition of the *Cena* with German notes and translation by Friedlaender (Leipzig, 1891). See also C. Beck, *The Age of Petronius* (Cambridge, Mass., 1856); Haley, *Quæst. Petron* (Harvard Studies, ii.); A. Collignon, *Étude sur Petrone* (Paris, 1892).

Revised by M. WARREN.

Petropaulov'ski [Harbor of Peter and Paul]: a strong Russian naval station on the east coast of Kamchatka, commanding the Northern Pacific (see map of Asia, ref. 2-J). Pop. about 500, besides the garrison. It is the chief town of the peninsula.

Petrop'olis: capital of the state of Rio de Janeiro, Brazil; in a valley of the Organ Mountains, 2,300 feet above the sea; 35 miles N. of Rio de Janeiro and connected with it by a mixed railway and steamboat route (see map of South America, ref. 7-G). Originally a German colony, it became a favorite summer residence of wealthy residents of Rio, and the Emperor Pedro II. had a summer palace here. During the naval rebellion of 1893-94 the state government removed from Nictheroy to Petropolis, which was made the permanent capital in Oct., 1894. The climate is delightful and the scenery is magnificent. Pop. 8,500. H. H. S.

Petrosilex: See FELSITE.

Petrozavodsk': capital of the government of Olonets, European Russia; on the Onega Lake (see map of Russia, ref. 5-D). It was founded in 1703 by Peter the Great, who discovered the rich iron ore which the neighborhood contains. It is the see of an archbishop, and has many educational institutions, a good harbor, and a large cannon-foundry. Pop. 11,500.

Petrus de Apono: See ABANO, PIETRO, d'.

Petrus Lombardus: See LOMBARD, PETER.

Pettenkofen, AUGUST, von: genre and military painter; b. in Vienna, Austria, in 1821; member of the Vienna Academy 1866; member of Munich Academy 1867; knighted 1876. D. in Vienna, Mar. 20, 1889. His pictures, which are generally of small size and depict episodes in the soldier and peasant life of Hungary, are painted with marvelous exactness of detail, and at the same time are broad and complete in general effect. *A Rendezvous* is in the Vienna Museum, and *Hungarian Peasants' Halt in the Puszta* and *After the Duel* are in the Fedor Museum, Amsterdam. *The Ambulance Wagon* and *Hungarian Volunteers* are in the collection of Mrs. W. H. Vanderbilt, New York, and *Hungarian Artillery on the March* is owned by Henry G. Marquand, New York.

WILLIAM A. COFFIN.

Pettenkofer, MAX, von, M. D.: chemist and sanitarian; b. at Lichtenheim, Bavaria, Dec. 3, 1818; graduated from the University of Munich in 1843; became a professor of chemistry in Munich in 1847. In 1866 he initiated the first practical instruction in hygiene in Germany, and has been intimately associated with the advance in hygiene since that date. As a chemist his researches in the affinities of gold, the preparation of platinum and of hydraulic lime, the process of obtaining illuminating gases from wood, and of the characteristics of oil-colors, were of signal commercial advantage. His announcement made in 1855 that the ætiology of cholera was an equation with three unknown quantities—*x*, a specific germ disseminated by human intercourse; *y*, a factor dependent on place and time, that might be called local disposition; and *z*, the individual predisposition—has been substantiated by the facts discovered in later years. He was coeditor of the *Zeitschrift für Biologie* from 1865-82. Among his important works are *Untersuchungen und Beobachtungen über die Verbreitungsart der Cholera, nebst Betrachtungen über Massregeln, derselben Einhalt zu thun* (Munich, 1855); *Ueber die Verlegung der Gottesäcker in Basel* (Basel, 1864); *Ueber die Kanalisierung der Stadt Basel* (Basel, 1866); *Boden und Grundwasser in ihren Beziehungen zu Cholera und Typhus* (Munich, 1869); *Zum gegenwärtigen Stand der Cholerafrage* (Leipzig, 1877).

S. T. ARMSTRONG.

Pettigrew, CHARLES, D. D.: bishop; b. probably in Pennsylvania about 1750; removed with his family to North Carolina; became a teacher at Edenton 1773; was ordained in the Protestant Episcopal Church in London 1775; was chosen first Bishop of North Carolina 1794, but was prevented by accident from receiving consecration. He took a leading part in establishing the University of North Carolina. D. at Bonarva, near Lake Scuppernon, N. C., in 1807.

Revised by W. S. PERRY.

Petty, Sir WILLIAM: political economist; b. at Romsey, Hampshire, England, May 26, 1623; was the son of a clothier; educated in the school of his native town and at Caen in France; was for a time an officer in the English navy; afterward studied medicine at Paris; obtained from Parliament in 1647 a patent for his invention of a "penta-

graph" or copying-machine; practiced medicine at Oxford, where he became assistant to the professor of anatomy; obtained a fellowship at Brasenose College 1648; chosen Professor of Anatomy in the University of Oxford 1651; Professor of Music in Gresham College 1651; became physician to the army in Ireland and secretary to Henry Cromwell 1652; was made surveyor of forfeited lands in Ireland; entered Parliament 1658, and at the Restoration was knighted and made surveyor-general of Ireland. He was one of the founders of the Royal Society; made several curious inventions and discoveries in physics; lost much by the fire of London, but afterward acquired a large fortune by successful speculations, and was author, among other works, of *The Political Anatomy of Ireland* (1691), *Treatise on Taxes and Contributions* (1662), *Political Arithmetic* (1691), a treatise on money entitled *Quantulumcunque* (1682), which have procured him the reputation of being the principal founder in England of the science of political economy. D. at Westminster, Dec. 16, 1687.

Petunia [Mod. Lat., from Braz. *petun*, tobacco]: a genus of annual, biennial, or perennial plants of the family *Solanaceæ*, natives of the hot regions of America. The *Petunia nyctaginiflora* and *P. violacea* are cultivated in European and North American gardens, and have afforded numerous hybrid and other varieties, some of which are very beautiful.

Peutinger, poiting'er, KONRAD: antiquarian; b. at Augsburg, Oct. 14, 1465; d. Dec. 24, 1547; wrote several works on antiquities, and was the possessor of the so-called *Tabula Peutingeriana*, a map of the military roads of the West Roman empire from the fourth century. It was first discovered in a Benedictine monastery at Tegernsee, and remained there for nearly two centuries in the family of Peutinger, but in 1814 was bought by Prince Eugene, who presented it to the imperial library of Vienna, where it is now preserved. Published by Scheyb (Vienna, 1753); by Mannert (Leipzig, 1824), who also gives an interesting account of the vicissitudes which this unique monument of ancient literature has gone through from the fourth to the nineteenth century; and in *Recueil d'itinéraires anciens*, by Fortia d'Urban (Paris, 1845). Cf. Paulus, *Erklärung der Peutinger Tafel* (1867). Revised by A. GUDEMAN.

Pew [from O. Fr. *pui*, *poi*, rising ground, hill, high place < Lat. *po dium*, height, elevated place, emperor's gallery in the circus, appar. liter., foot-rest. Cf. Gr. *πόδιον*, dimin. of *πούς*, *ποδός*, foot]: an inclosed seat in a church. In England the exclusive and perpetual right to a particular pew in the parish church may be held as a kind of HEIRLOOM (*q. v.*) by a parishioner as an appurtenant to his messuage (dwelling-house), such ownership arising either from prescription—that is, long-continued use—or from a grant by the ordinary or bishop. All the other pews not so claimed, except that appropriated to the minister's family, are under the control of the churchwardens, acting on behalf of the ordinary—i. e. the bishop of the diocese. Every parishioner is entitled to a sitting, and may enforce his right by suit in the proper court. This is the law applicable to churches built before 1818; with regard to those built thereafter acts of Parliament provided for the existence of some free seats and the manner of letting the rest. Pews in the Established Church in Scotland are held under a similar system. In the U. S., where the Church and state are separate, the method of holding church seats is regulated by the rules of the various churches. Occasionally the trustees or vestry, or other officers of the corporation or society, retain the entire custody of the church edifice, and the seats are free to all comers during divine service. Sometimes the pews are leased for a year only at a specified rent; on the other hand, they are often conveyed by an instrument in the form of a perpetual lease, reserving an annual rent. In the latter case the right of the pewholder is peculiar; it is property, and may be transferred, but is generally exempt from sale on execution; in some States it descends to the heirs as real estate, and in others it passes to the administrator as personal estate. It is, however, limited, and subject to the ultimate control of the trustees or vestry, who may, under restrictions not affecting the pewholder, convey the church edifice, rebuild, repair, or remodel it at their discretion. Revised by F. S. ALLEN.

Pewee: See PHOEBEBIRD.

Peyer's Glands: small sacculi peculiar to the mucous membrane of the small intestine, termed *glandulæ solitariae* when scattered singly, and *glandulæ agminatae* when col-

lected in groups. Also called *Peyer's patches*, from Peyer (1653-1712), who first described them. See HISTOLOGY.

Peyron, pē'pōn, VITTORIO AMABEO: b. 1681; d. at Turin in 1785; d. 1870. He was a pupil of Tommaso Valperga di Caluso, and succeeded him in the chair of Oriental languages. He was a member of the Turin Academy of Sciences and foreign member of the French Institute. He rendered important services to the study of Greek and of Coptic; translated Thucydides anew into Italian; published a critical essay upon the Hellenic constitution, prefixed to the *Scene Elleniche* of Brofferio; some Greek texts, partly inedita, of Empedocles, Parmenides, Theodosianus; and fragments of the *Orations* of Cicero for Scaurus and Tullius and against Clodius. He has also the merit of having founded the study of Coptic by his *Lexicon Linguae Copticae* and his *Grammatica Linguae Copticae*.

Revised by A. GUDEMAN.

Peyronnet, pē'rō'nā', CHARLES IGNACE, Comte de; statesman; b. at Bordeaux, France, Oct. 9, 1778; studied law, and practiced as an advocate in his native city; became very conspicuous during the first and second Restorations as an ultraroyalist and staunch adherent of the Bourbons, and was Minister of Justice 1821-28. In 1822 he carried a law by which all press cases were deprived of trial by jury and referred immediately to the royal courts, which were empowered to suspend and suppress any publication which seemed hostile to the public peace, the established Church, and the royal authority. In 1825 he carried another law by which profanation of any object consecrated to the public worship was punished by forced labor for life. In 1822 he was created a count; on May 16, 1830, he again entered the Government as Minister of the Interior in the cabinet of Polignac, and as such he signed the notorious ordinances of July 25, 1830, which occasioned the Revolution of 1830 and the fall of the elder line of the house of Bourbon. Arraigned before the House of Peers for high treason, he was sentenced to imprisonment for life and confined in the fortress of Ham, but Oct. 17, 1836, he was pardoned. D. Jan. 2, 1854, on his estates in the Gironde. He wrote a *Histoire des Frances* (2d ed. 1846) and *Satires* (2d ed. 1854). F. M. COLBY.

Pfleiderer, OTTO: German Protestant theologian; b. at Stetten, near Cannstatt, Württemberg, Sept. 1, 1839; studied under Baur at Tübingen 1857-61; became pastor at Heilbronn 1868; superintendent and Ordinary Professor of Theology at Jena 1870; Professor of Theology in Berlin 1875. He belongs avowedly to the school of Baur, and defends his views with logical power and eloquence. He has twice appeared as a lecturer on English foundations—once as Hibbert lecturer in London (1885) and once as Gifford lecturer in Edinburgh (1894), and both courses were published in English—*Lectures on the Influence of the Apostle Paul on the Development of Christianity* (London, 1885) and *The Philosophy and Development of Religion* (2 vols., 1894). Besides these there are in English, *Paulinism: a Contribution to the History of Primitive Christian Theology* (2 vols., 1877); *The Philosophy of Religion on the Basis of its History* (4 vols., 1886-88); *The Development of Theology in Germany since Kant and its Progress in Great Britain since 1825* (1890). SAMUEL MACAULEY JACKSON.

Pflü'ger, EDUARD FRIEDRICH WILHELM, M. D.: physiologist; b. at Hanau-on-the-Main, June 7, 1829; studied medicine first in Marburg, then in Berlin, where he was a pupil of John Mueller and of Du Bois-Reymond; graduated M. D., University of Berlin, in 1855; elected Professor of Physiology at the Bonn University in 1859; established and edited the *Archiv für die gesammte Physiologie des Menschen und der Thiere* in 1868. Among his important works are *Die sensorischen Functionen des Rückenmarks der Wirbelthiere*, etc. (Berlin, 1853); *Untersuchungen über die Physiologie des Electrotonus* (Berlin, 1859); *Wesen und Aufgaben der Physiologie* (Bonn, 1878). S. T. ARMSTRONG.

Pforz'heim: town: in the grand duchy of Baden, Germany; at the confluence of the Nagold, Enz, and Würm: 20 miles by rail S. E. of Carlsruhe (see map of German Empire, ref. 6-D). It has large manufactures of jewelry, chemicals, and linens, iron-works, tanneries, and oil-mills, and an active trade in timber, which is cut in the neighboring Black Forest. Pop. (1890) 29,508.

Phacoc'h'ride [Mod. Lat., named from *Phaco*, the typical genus; *φακός*, lentil seed, wart + *χοῖρος*, pig]: a family of even-toed ungulates comprising the wart-hogs, and closely related to the true hogs, with which they are

combined by some zoölogists. The milk dentition is I. $\frac{1}{3}$, C. $\frac{1}{3}$, P. M. $\frac{2}{3}$, M. $\frac{3}{3}$; but many of the teeth are lost as growth proceeds, and in the adults frequently none are present but the canines and last molars. The structure of the molars is peculiar, as they consist of about twenty upright columns of dentine coated with enamel and united by cement, each column having its own pulp-cavity. See WART-HOG.

F. A. LUCAS.

Phædra (in Gr. *Φαίδρα*): in Greek legend, the wife of Theseus and the stepmother of Hippolytus, with whom she fell desperately in love. When he refused to comply with her wishes, she accused him to his father of an attempt upon her honor, but when she heard that he had perished in consequence of his father's wrath, she confessed her guilt and committed suicide. The tragedies on this subject by Sophocles and Euripides are lost, but there is a celebrated one by Racine.

Revised by J. R. S. STERRETT.

Phædrus: author; b. in Thracia; was taken to Rome as a slave, but was made free by Augustus, and was the first to raise the fable to the dignity of a special branch of Roman poetry. He wrote five books of fables, now extant but incomplete, containing ninety-three fables in all, many of which, however, are only versifications of the fables of Æsop. The style is easy and fluent, and the book often very pleasant to read. There are editions by Orelli (Zurich, 1831), L. Müller (Leipzig, 1868), and a larger critical edition, containing appendix of additional fables, 1877. See L. Hervey, *Les fabulistes latins* (Paris, 1884), and Hartman, *De Phædri fabulis* (Leyden, 1890). Revised by M. WARREN.

Phæthon [= Lat. = Gr. *Φαέθων*. Cf. *φάεθων*, shining]: in Grecian mythology, the son of Helios. He obtained one day permission of his father to drive the chariot of the sun across the heavens, but the horses ran off, and the chariot was just about setting heaven and earth on fire when Zeus struck down the unfortunate driver with a thunderbolt. He fell into the Eridanus, and his sisters, the Heliades, who stood mourning by his corpse, were transformed into poplars and their tears into amber.

Revised by J. R. S. STERRETT.

Phæton'idæ [Mod. Lat., named from *Phæthon*, the typical genus, from Gr. *Φαέθων* (see PHÆTHON), in allusion to their tropical habits]: a family of birds belonging to the order *Steganopodes*, and containing the TROPIC BIRD (*q. v.*).

Phagocyto'sis [Mod. Lat., from Gr. *φαγεῖν*, eat + *κύτος*, a hollow vessel]: a word first used by Metschnikoff to express the destruction of bacteria and other injurious substances by means of white blood-corpuscles. In accordance with this view of Metschnikoff, the leucocytes, which in inflammation leave the vessels and enter into the tissue, play an important and useful part, their function being to eat up and destroy bacteria and other injurious solid substances. Metschnikoff found on inoculating an animal with certain organisms that after inflammation was produced the bacteria became included in the leucocytes, and when this was the case they were apparently destroyed or rendered innocuous, and the inflammation subsided.

It was found from the experiments of Nuttall, Buchner, and others that the destruction of the bacteria is not due to this action of the leucocytes, but to destructive effects of substances contained in the blood serum, and the bacteria are already destroyed when they are taken into the cells. These substances in the blood serum, which are destructive to the bacteria, are either present naturally, in which case the animal has an immunity to the disease inoculated, or they arise during the course of the disease, and with their presence in the blood in sufficient amount the disease subsides. There is no doubt, however, that although the process has not the full bearing and importance which was ascribed to it by Metschnikoff, it plays an important rôle in disease. Not only are dead bacteria removed by the leucocytes, but foreign particles of all sorts, including necrotic cells and portions of tissue. These substances are taken into the body of the leucocytes, and there undergo a complete or partial digestion, and are rendered soluble and thus absorbed. In other cases they may be carried off while still in the body of the leucocytes. This is the case when particles of pigment are placed in the skin as in tattooing. The presence of the leucocytes in such places is always due to the presence of a chemical substance which has a powerful action in attracting the leucocytes. This substance is known to be of an albuminous character, and it is found in all cases where dead cells of whatever nature, whether bacteria or the tissue cells themselves, are present.

W. T. COUNCILMAN.

Phalan'ger: a common name for a marsupial of *Cuscus*, *Phalangista*, or a related genus of the family *Phalangistidæ*, popularly known in Australia as an opossum. The phalang-ers are about the size of a cat; have a rather small, somewhat pointed head; long, bushy, prehensile tail; and are clad in thick, woolly fur. They are arboreal and nocturnal in their habits, and live on fruit and leaves. They are found in Australia and Tasmania, and are eaten by the natives and to some extent by the settlers. The vulpine phalanger (*P. vulpecula*), which is of fox-like aspect, and gray above, whitish below, with white ears and a black tail, is a well-known species. The flying phalang-ers, of the genus *Petaurus*, have, like the flying squirrels, a fold of membrane running from the fore to the hind leg, which serves as a parachute and enables them to take long leaps. The genus ranges from New Ireland to New South Wales.

F. A. LUCAS.

Phalangida [from Gr. *φάλαγγιν*, spider + *εἶδος*, like]: a group of Arachnida, including those long-legged spider-like forms familiarly known as harvestmen or daddy-long-legs. They have small bodies consisting of an unsegmented anterior portion (cephalothorax) and a six- or eight-jointed abdomen. They have usually a single pair of eyes; they breathe by means of air-tubes (tracheæ), and so-called lungs are absent. The legs are usually extremely long and slender, the distal portion (foot or tarsus) being many-jointed. Some 250 to 300 species have been described, South America being especially rich in species. The harvestmen live in damp places, crawling over leaves, etc., by means of their long legs, and being protected from enemies by a pair of "stink glands," which open on either side of the cephalothorax. They are largely nocturnal, and feed upon small insects, etc. American species have been described by Wood (in *Proceedings Essex Institute*, vol. vi., 1870) and Weed (in *American Naturalist*, 1888-93).

J. S. KINGSLEY.

Phalangist'idæ, or **Phalangeridæ** [*Phalangistidæ* is Mod. Lat., named from *Phalangis'ta*, the typical genus, from Gr. *φάλαγξ*, phalanx, bone between joints of the fingers or toes. So called from the peculiar joining of the phalanges]: a family of herbivorous marsupials containing the members of the genera *Cuscus*, *Phalangista*, *Belideus*, and their allies. The dentition is somewhat variable, I. $\frac{2}{3}$, C. $\frac{1}{3}$ - $\frac{1}{2}$, P. M. $\frac{1}{3}$ - $\frac{2}{3}$, M. $\frac{1}{2}$ - $\frac{3}{3}$. The fore and hind limbs are of nearly equal size, all with five toes. The first toe of the hind foot is opposable to the others, the second and third are slender and united by skin as far as the claws. The stomach is simple; a cæcum present and usually large. See CUSCUS, KOALA, and PHALANGER.

F. A. LUCAS.

Phalanx [= Lat. = Gr. *φάλαγξ*]: in the military organization of ancient Greece, the tactical unit of the heavy-armed troops, a body of foot-soldiers armed with spears and shields. The number of men was various. They were arranged from four to sixteen men deep. In later times the great phalanx under the Macedonians comprised 16,384 men, and was composed of four minor phalanges, each of which had two *merarchies*, or halves. Each merarchy was composed of two *chiliarchies*, each of these of four *syntagmata*, and each syntagma of 256 men. The phalanx was, as compared with the Roman legion, a cumbrous arrangement of men.

Revised by J. R. S. STERRETT.

Phal'aris: proverbially the most cruel tyrant known to antiquity; the ruler of Agrigentum in Sicily for about sixteen years, in the middle of the sixth century B. C. Of his history hardly anything is known with certainty, most of it being enveloped in fables. A prominent feature in these fables is the brazen bull, invented by one Perillus, in which Phalaris roasted his enemies, inaugurating the ingenious instrument of torture by the roasting of its inventor. This story perhaps originated in the worship of the Phœnician Baal with human sacrifices, and after the abolishment of this cult its practice would seem to have been associated with the memory of the odious tyrant. The famous *Epistles of Phalaris*, 148 in number, first printed at Venice in 1498, and afterward often reprinted and translated, give quite another picture of the man's character, and were read through many centuries with great edification, until Bentley proved that they were spurious, a product of a much later time.

Revised by G. L. HENDRICKSON.

Phalarope, fāl'a-rōp: any one of three species of small wading birds resembling sandpipers, but having the toes lobed, or furnished with scallop-like margins, which enables these birds to swim and dive with great ease. They are found in the northern hemisphere and breed far north. On

their breeding-grounds they are usually found in couples about some body of fresh water, but during their migrations they often occur at sea in considerable flocks. They feed on seeds, insects, and minute crustacea. Wilson's phalarope (*Phalaropus tricolor*) is peculiar to North America. *P. lobatus* and *Crymophilus fularius* are found in Europe and Asia as well.

F. A. LUCAS.

Phalaropod'idæ [Mod. Lat., named from *Phala ropus*, the typical genus: Gr. φαλαρίς, foot + πους, ποδός, foot]: a family of aquatic birds of the order *Limicolæ*, containing the phalaropes. The bill is slender, straight, about as long as the head, and with the sides of the upper mandible grooved for nearly the whole length; nostrils near the base, linear, and in the lateral groove of the mandible; wings long and pointed; tail short and rounded; legs rather posterior, with the tarsi moderate, the anterior toes united at the base and with lobate sides, and the hind toe elevated and with a narrow membrane.

F. A. LUCAS.

Phallic Worship [*phallic* is from Gr. φαλλικός, deriv. of φαλλός, penis; probably cognate with Germ. (dial.) *bulle*]: originally the adoration of the reproductive and regenerative powers of nature, represented after a time by a figure of the phallus, or male generative organ, or in some instances by a straight column or by the pistil of a flower, as in India at the present day. This worship, whatever of symbolism it may have had at first, rapidly became a most corrupt practice. It prevailed in India (as at present), in Chaldea, Egypt, Syria, Phrygia, Greece, and Rome, as in later days among some of the American savages, notably the Seminoles of Florida. The forms which this abomination assumed were innumerable. Dionysus, Hermes, Venus, Priapus, Pan, Isis, and other gods were worshipped at Rome by phallic symbolism.

Phana'riots, or Fana'riots [from *Fanar*, one of the quarters of Constantinople where they dwell; from Gr. φανάριον, the "beacon" there situated]: a body of Constantinopolitan Greeks who claim a noble Byzantine descent. Spared by the Turkish conquerors, they artfully insinuated themselves into public affairs, and until 1822 held many important civil, military, and naval positions, in which they displayed, as a rule, selfish and ungenerous qualities. Their power as a class is now completely broken.

Phanerogamia, Phan'erogams [*phanerogamia* is Mod. Lat., from Gr. φανερός, apparent, visible (deriv. of φαίνειν, φανῆναι, show) + γάμος, marriage]: the highest branch of the vegetable kingdom, the flowering plants. The less objectionable terms ANTHOPHYTES (q. v.) and Spermatophyta are displacing the older ones in recent botanical works. See VEGETABLE KINGDOM.

CHARLES E. BESSEY.

Phanocles: Greek elegiac poet of the Alexandrian period who wrote a cycle of elegies on the boy-favorites of the gods and heroes (Ἔρωτες ἡ καλοί). The fragment preserved by Stobæus, *Floril.*, 64, tells of the love of Orpheus for Calaïs, son of Boreas, and the death of the singer at the hands of jealous women. Ed. by Schneidewin in his *Delectus* and Bergk in his *Anthologia Lyrica*. B. L. G.

Pha'raoh [Egypt. *Per-āa*, great house; Heb. *Phar'ōh*, Gr. *Φαραώ*]: the royal title of the Egyptian kings, used generally alone in the Bible, rendering it impossible to distinguish between successive sovereigns. Only in the later periods were other names added, as Pharaoh-Necho and Pharaoh-Hophra. The etymology given above is the one usually accepted, though several others have been proposed. It is often compared to the Turkish Sublime Porte. For contrary views, see Renouf, *Proceedings of the Society of Biblical Archaeology*, vol. xv., p. 421 f.

C. R. G.

Pharaoh's Hen: See EGYPTIAN VULTURE.

Pharisees [from Lat. *Pharise'us* = Gr. *Φαρισαῖος*, from Heb. *phrīshim* (plur.), deriv. of *pārash*, to separate]: a political and religious party among the Jews, originated during the time of the Maccabees in opposition to the invasion of Greek ideas and Greek customs which took place especially during the reign of Antiochus Epiphanes. While the Sadducees and the ruling aristocracy had yielded to the idea of a distinction between religion and politics, between Church and state, the Pharisees still maintained the old and genuinely Jewish view of a theocracy; and while the Sadducees adhered rigorously to the literal conception of the words of the sacred books, the Pharisees adopted the tradition as a means by which to interpret Scripture. Thus the Pharisees stood at the time of Christ at once as the national party in politics and as the progressive school in theology, and

their influence with the mass of the people seems to have been very great. The sources of our knowledge of them are the New Testament, Josephus, and the Mishna. Modern scholars seem inclined, however, to look at them under a milder view than that in which they appear in the New Testament, though it is only natural when the importance which they ascribed to the observation of all minutiae of the law led to hypocrisy and falsity.

Pharmacopœia [Mod. Lat., from Gr. φαρμακοποιία, preparation of medicines; φάρμακον, drug, medicine + ποιέιν, make]: a book containing formulas and directions for preparing and compounding drugs for use in the treatment of disease. Such a book may be the outcome of individual enterprise or the execution of an order of the government. In many European states the *Pharmacopœia* is issued by the authority of the Government, and penalties are attached to failure on the part of the pharmacist to observe its directions. In the U. S. the *Pharmacopœia* is not prepared under authority of the general Government, but observance of its provision is, in certain States, required by special law. The first pharmacopœia published in the U. S. was issued at Philadelphia in 1778 for the use of the hospital of the U. S. army, at Lititz, in Pennsylvania. This was published in Latin. In the second edition, Dr. William Brown was named as its author. In 1805 a pharmacopœia was issued for the use of New England. Another pharmacopœia was issued in 1815 for the use of the New York Hospital. In 1817 Dr. Lyman Spalding, of New York, proposed a plan for the formation of a *National Pharmacopœia*, and circulars being issued to a large number of medical societies, these sent delegates to Washington in 1820 to prepare the first *National Pharmacopœia*, which was issued Dec. 15, 1820, in Latin and English. Since that time at certain intervals conventions have been held by representatives of the medical profession and pharmacists, which have revised and altered the *Pharmacopœia*, so as to incorporate in it new drugs or new formulas which had come to be recognized as useful, and to exclude others which had fallen into disuse or been found unworthy of a place in such a work. The issue of the *Pharmacopœia of the United States of America* called the seventh decennial revision was prepared by a convention which met at Washington in 1890. It was printed at Philadelphia, and became official on Jan. 1, 1894. It contains descriptions of drugs and the mode of preparing them for use, and a great variety of information on subjects collateral with these. The following is an example of the description of a drug: "ACIDUM CARBOLICUM. CARBOLIC ACID. $C_6H_5OH-93.78$. (Phenol.) A constituent of coal-tar, obtained by fractional distillation, and subsequently purified. Carbolic acid should be kept in dark amber-colored, well-stoppered vials." After this follows a full description of the chemical and physical characteristics and properties of carbolic acid. In the preparation of compound remedies the *Pharmacopœia* gives the name in Latin, then in English, then a description of the preparation, then its constituents with their proportions, followed by a description of the method of compounding them. Works of this kind are of the greatest value in producing uniformity in the preparation of drugs, and in securing reliability as to strength and genuineness of their ingredients. In the U. S. there is no general law compelling physicians or pharmacists to follow the directions of the *Pharmacopœia*, but it is recognized as the best guide in regard to the preparation and compounding of drugs, and is the basis of all intelligent teaching on pharmacy.

CHARLES W. DULLES.

Pharmacy [from Gr. *φάρμακεία*, use of medicines, pharmacy, deriv. of *φάρμακένειν*, administer medicines, deriv. of φάρμακον, drug, medicine]: the art of preparing, preserving, compounding, and dispensing remedies for disease. The modern idea of pharmacy includes only the art of one who acts as an agent for the physician, and in so far differs from the theory and practice of the ancients. This definition corresponds fairly to the present actual relation of the dispensers of drugs to practitioners of medicine, although many who claim the name of pharmacists prepare remedies according to formulas which they make public or conceal, and sell these with indications for their use and directions how to employ them. This practice is not regarded as commendable by physicians, on the ground that, while sometimes useful, it may at times be damaging to those who avail themselves of it.

The origin of pharmacy is very ancient. In the earliest medical times it was carried on by physicians who prepared

their own remedies and directed their administration. The earliest history of medicine, which is that of the Egyptians, contains records in the Leipzig and Berlin papyri of the preparations of remedies by the priestly class, who were the physicians. The earliest Greek physicians (the Asclepiadæ) prepared their own remedies, and were in the original sense of the word pharmacists. About the time of the Christian era there was a class of persons called rhizotomes (root-cutters), who collected drugs and sold them to physicians. In a rude way these were the first pharmacists in the modern sense of the word. After this, with the increase of medical practice, there arose a class of persons who made it a business to collect drugs and prepare them for the use of physicians, and accordingly this work became more specialized. There were certainly drug-shops among the Romans, for one has been unearthed at Pompeii; but it was not until the end of the Middle Ages that pharmacy became much of an art, receiving a distinct recognition from the great Emperor Frederick II., who was the patron of the University of Salerno in the thirteenth century. At present it is made an object of study in institutions devoted to it alone, and is regulated by law in most civilized lands. Some of the most celebrated schools of pharmacy are found in the U. S., where men of great learning have contributed to elevate the standard of education of pharmacists, until the art is now sometimes erroneously spoken of as a profession. The intending pharmacist is instructed in chemistry, botany, physics, animal physiology, materia medica, toxicology, and pharmacology. The result of education and of cultivating the niceties of the art of pharmacy has been the preparation of many remedies, beautiful in appearance and pleasant to take, and at the same time of proper efficiency. The French pharmacists have unusual skill in the manufacture of what are known as elegant preparations. The U. S. is especially distinguished for what may be called neat pharmaceutical preparations.

The shop of the modern pharmacist is supplied with many things besides drugs, such as various surgical appliances, plasters, bandages, and even instruments, with many articles of convenience or of cosmetic usefulness. The enterprise of modern pharmacy secures, in the large cities, everything, no matter how rare, that is of approved value in the treatment of disease, and has led to the actual discovery of useful remedies. See APOTHECARY.

CHARLES W. DULLES.

Pha'ros (in Gr. *Φάρος*): an island off Alexandria, in Egypt, celebrated for its lighthouse. Alexander the Great connected the island with Alexandria (a distance of 7 stadia) by a dike.

Pharyngobran'chii [Mod. Lat.; Gr. *φάρυγξ*, throat + *βράγχια*, gills]: a group of fish-like vertebrates, so named from the perforation of the pharynx for the gill-slits. It is equivalent to the class *LEPTOCARDII* (*q. v.*), which is the generally used term.

Pharyngog'nathi [Mod. Lat.; Gr. *φάρυγξ*, throat + *γνάθος*, jaw]: name applied to an artificial combination of fishes originally established by Johannes Müller for the reception of those teleosts in which the two lower pharyngeal bones form a single solid piece. The group thus distinguished was recognized as an order by Müller, and to it were referred some of the spiny-rayed fishes (*Labridæ*, *Cichlidæ*, *Embiotocidæ*), as well as some with soft rays (*Scomberosocidæ*). These forms have, however, on the one side no close affinity with each other, and on the other side they are severally related to other types in which the lower pharyngeals are separated; again, there are fishes of other families, as the drumfishes (*Aplodinotus* and *Pogonias*) among the *Sciaenidæ*, which have the lower pharyngeals as much united as in the typical *Pharyngognathi* of Müller. On account of these inconsistencies the order, though formerly generally adopted, is now discarded by the best ichthyologists.

Revised by D. S. JORDAN.

Phar'ynx [Mod. Lat., from Gr. *φάρυγξ*, throat, pharynx]: a musculo-membranous sac situated at the base of the skull, immediately behind the mouth, nose, and larynx, and in front of the cervical vertebrae, extending as far down as the fifth, where it is continuous with the œsophagus. It has the following openings into it: Two from the nose, the posterior nares; two Eustachian tubes, which communicate with the middle ear; the mouth, larynx, and œsophagus. It is lined by mucous membrane, which is continuous with that lining the various cavities opening into it. Beneath this mucous coat is a fibrous layer known as the pharyngeal aponeurosis; and beneath this, again, is a muscular layer,

composed of the superior, middle, and inferior constrictor muscles; they diminish the capacity of the pharynx, and by their successive contraction from above downward the food is carried along into the œsophagus. The pharynx is freely supplied with glands, which are situated in the mucous membrane, and there is considerable lymphoid tissue in various parts. This is similar in structure to the tonsil gland. The function of the pharynx is to give passage to the food in deglutition and to the air in respiration. The pharynx is a common seat of catarrhal inflammations, occurring acutely as "colds" or as more chronic affections. Those who smoke tobacco or drink strong alcoholic beverages, as well as those whose occupation requires public speaking and especially that in the open air, are liable to a peculiarly obstinate form of inflammation of the pharynx.

Revised by W. PEPPER.

Phascology'idæ [Mod. Lat., named from *Phascolum*, the typical genus; Gr. *φάσκολος*, pouch + *μῦς*, mouse]: a family of marsupial mammals containing the wombats (see *WOMBAT*), and distinguished by their rodent-like dentition. The body is stout and large; the head large; nostrils widely separated behind, but converging forward; upper lip cleft; dentition, I. $\frac{1}{2}$, P. M. $\frac{1}{2}$, M. $\frac{1}{2}$, all of which are rootless, more or less incurved, and grow upward, like the incisors of the placental rodents; the limbs are nearly equal, short and stout, and with five toes to a foot; anterior toes, with broad and little-curved nails; the innermost toe of hind foot small, at nearly right angles with the rest, and destitute of a nail; the second, third, and fourth toes are connected, and they, as well as the fifth, have long curved nails; tail rudimentary; stomach simple, with a special gland situated to the left of the cardiac orifice; cæcum short and wide, with a vermiform appendage.

Revised by F. A. LUCAS.

Phasian'idæ [Mod. Lat., named from *Phasianus*, the typical genus, from Lat. *phasianus*, pheasant; cf. *Phasis*, name of a river in Colchis. See *PHASIS*]: a family of birds including most of the gallinaceous fowls. They all have the bill moderate, with the sides compressed, and with the culmen arched toward the tip, which is curved over the lower mandible; the wings are moderate and more or less rounded; the tail variable in development; the tarsi are robust, and covered with transverse scales in front, smaller ones behind, and still smaller ones on the sides, and in the cock generally armed with one or more spurs; the toes are moderate, three in front united at base by a slight membrane, and a hinder one short and elevated. The family has been made the subject of a beautiful monograph by D. G. Elliot.

Revised by F. A. LUCAS.

Pha'sis [= Lat. = Gr. *Φάσις*]: the ancient name of the *Rion* or *Faz* river; in the Russian province of Transcaucasia; considered by the classical geographers as the boundary between Europe and Asia. The Argonauts were fabled to have landed at its mouth.

Pheasant [from Lat. *Phasianus* (sc. *avis*), the Phasian bird]: a name said to have been given by the ancients to the best-known species of pheasant (*Phasianus colchicus*), from the fact that it was brought from the vicinity of the river Phasis, in Colchis. It is now used as a general name for the long-tailed gallinaceous birds related to the common pheasant, and forming the sub-family *Phasianinæ*, and is extended to a number of other game-birds. In the U. S. it is applied to the ruffed grouse (*Bonasa umbellus*), in those sections of country where the quail (*Colinus*) is termed partridge. *Phasianus colchicus* originally inhabited Western Asia about the Caspian Sea, and Southeastern Europe, but it has been introduced in other localities, especially in England, and in the U. S. is very commonly known as the *English* pheasant. It is nearly 3 feet long, half of this being due to the tail. The plumage is rich and variegated. The head and neck are glossy green, the lower neck, breast, and sides reddish brown with a purple luster, the feathers being edged with black. The rump is coppery red, wings striped with brown and red, tail gray with black bands and brown edges. The female is smaller, of a general grayish brown, and she is shorter and without the long central tail feathers. These long feathers, so characteristic of the males of the true pheasants, reach their maximum in Reeve's pheasant (*P. reevesii*), in which they attain a length of over 5 feet. Two species of pheasants closely related to the common pheasant, the Mongolian pheasant (*P. torquatus*) and the green pheasant (*P. versicolor*), have been introduced into Oregon, as has also the beautiful golden pheasant (*Chrysolophus pictus*). The fire-back pheasants (*Euplocamus*) are so called on ac-

count of the glowing red upon the rump of the males of some species. To this genus belongs the Macartney pheasant, *E. igneus*, of Siam. The impeyan pheasants (*Lophophorus*) are large birds of rich metallic colors, distinguished by their tails being flat and rounded instead of compressed and pointed. They inhabit the slopes of the Himalayas. The horned pheasants, or tragopans (*Cerionis*), are distinguished by a little pointed wattle on either side of the head. Their general color is dull red with white spots, and they too dwell on the slopes of the Himalayas. Pheasants are ground-frequenting birds, and feed on grubs, insects, seeds, and grain. They are mostly polygamous, and the numerous eggs are deposited in a very rude nest. With the exception of *Phasianus colchicus* they are confined to Asia and some of the large adjacent islands, and Japan. A beautiful monograph of the group has been issued by D. G. Elliot, under the title *A Monograph of the Phasianida, or Family of Pheasants*. A more accessible work is Tegetmeier's *Pheasants: their Natural History and Practical Management*.
F. A. LUCAS.

Phelps, Austin, D. D.: clergyman and author; b. at West Brookfield, Mass., Jan. 7, 1820; graduated at the University of Pennsylvania 1837; studied divinity at Andover and New Haven; was pastor of the Pine Street Congregational church, Boston, Mass., 1842-48, and was Bartlett Professor of Sacred Rhetoric in the Andover Theological Seminary 1848-79. He published *The Still Hour* (1859); *The New Birth* (1867); *The Theory of Preaching* (1881); *Men and Books* (1882); *My Portfolio* (1882); *English Style in Public Discourse* (1883); *My Study* (1885); *My Note-book* (1890); and numerous articles in the religious journals. With Prof. Park and Dr. Lowell Mason he edited the *Sabbath Hymn-book* (1858). D. at Bar Harbor, Me., Oct. 13, 1890. See his *Life* by his daughter, Mrs. Ward (1891).

Revised by G. P. FISHER.

Phelps, Edward J., LL. D.: lawyer; b. in Vermont, July 11, 1822; graduated at Middlebury College in 1840; was at Yale Law School 1842-43; a lawyer in Vermont from 1844; second comptroller of the treasury 1851-53; member of Vermont constitutional convention 1870; Democratic candidate for Governor of Vermont 1880; became Kent Professor of Law in Yale College in 1881, and lecturer on constitutional law in Boston University in 1882. He was a Webster Whig till that party broke up, and has since been an independent Democrat. He was U. S. minister to Great Britain 1885-89, and one of the counsel for the U. S. in the Bering Sea tribunal of arbitration in 1893.

Phelps, Elizabeth Stuart: See WARD, ELIZABETH STUART.

Phelps, William Walter, LL. D.: statesman; b. in New York city, Aug. 24, 1839; graduated at Yale College 1860 and at Columbia Law School 1863; member of Congress 1873-75; U. S. minister at Vienna 1881-82; again in Congress 1883-89; one of the U. S. commissioners to negotiate the Samoan treaty with Germany 1889; U. S. minister at Berlin 1889-93; appointed a judge of the New Jersey Court of Errors and Appeals 1893. D. at Teaneck, N. J., June 16, 1894.

Phenacetin: a drug which occurs in colorless needles, slightly soluble in water. Its general action on the system is almost identical with that of antipyrin and antifebrin, but it is thought by many physicians to be safer than those remedies. In nervous headaches and other nerve pains, in doses of 10 grains, it frequently affords great relief.

Phenakis'toscope: See STROBOSCOPE.

Phenic Acid: See PHENOL and CARBOLIC ACID.

Phenicin, or Phenyl Brown: a coloring-matter first prepared by Roth in 1865 by the action of nitrosulphuric acid on phenol (carbolic acid). It is a brown amorphous powder, slightly soluble in water, very soluble in alcohol, ether, and acetic acid. With alkalis it forms a fine violet-blue solution, which is changed to brown by the slightest excess of acid. It dissolves also in lime-water. It consists of two coloring-matters—one yellow dinitro-phenol, the other a black, humus-like body, both possessing the same tinctorial properties. Phenicin was at one time used for coloring leather, but it has given way to other dyes.

Revised by IRA REMSEN.

Phenol ($C_6H_6O = C_6H_5OH$). **Phenic Acid, Carbolic Acid, Phenyl Hydrate, Phenylic Alcohol, or Coal-tar Creosote** [*phenol* is from Gr. *phainein*, show, named from its

yielding derivative colors]: a substance discovered in coal-tar by Runge, produced by the dry distillation of salicylic acid and a number of other substances. The urine of the cow, horse, and man yields it in small quantities. Commercial creosote often consists entirely of phenol, but the true creosote from wood is a totally different substance.

Preparation.—Phenol is prepared from coal-tar. The tar is separated by fractional distillation into (1) light oil of coal-tar, crude coal-tar naphtha; (2) heavy oil of coal-tar, "dead oil"; (3) anthracene oil; (4) pitch which remains in the still. From the light oil the phenol is most easily prepared. The oil is rectified by distilling with a current of steam, and leaves behind a portion known as naphtha tailings, which contain about 15 per cent. of phenol. From dead oil it is more difficult to obtain pure phenol, owing to the presence of much cresol. But the mixture of the two, which is better than pure phenol for disinfecting purposes, is readily obtained. Dead oil contains from a trace to perhaps 12 per cent. of the tar acids, phenol, cresol, etc., according to the part of the distillate it represents, the entire product of dead oil averaging about 5 per cent.

Properties.—Phenol occurs in long colorless needles or in white crystalline masses, sp. gr. 1.065, melts at 93°-95° F., and boils at 368°-370° F. The crystals deliquesce on exposure to the air by absorbing a trace of water. Phenol smells like wood-tar creosote, and attacks the skin like that substance. It dissolves in about 20 parts of water, and mixes in all proportions with alcohol, ether, and strong acetic acid. The aqueous solution of phenol coagulates albumen and preserves animal substances from decomposition. It even removes the fetid odor from meat which is already in a state of decomposition. Fish and leeches die when immersed in the aqueous solution, and their bodies subsequently dry up on exposure to air, without putrefying. These properties have led to the extensive use of phenol as an antiseptic and disinfectant. It is used in all grades of purities—dead oil for privy vaults, sewers, cattle-yards, and cars, and purer forms for street-gutters, cellars, water-closets, dwellings, clothing, etc. All grades except dead oil should be mixed with 20 to 50 parts of water before they are applied, or they may be mixed with dry slaked lime, sawdust, clay, etc., and applied in powder; the first-mentioned mixture is sold under the name of carbolate of lime. Many mixtures of carbolic acid are advertised as disinfectants which are practically worthless. A mere odor of phenol is not sufficient to prevent putrefaction. (See DISINFECTION and FERMENTATION.) Phenol is highly poisonous, except in an extremely dilute solution. The best antidote is olive oil, administered in large quantities. Sulphuric acid converts phenol into phenylsulphuric acid. Strong nitric acid converts it into trinitrophenic acid, PICRIC ACID (*q. v.*), an important dye, $C_6H_3(NO_2)_3O$. On heating the soda compound of phenol in carbonic acid half the phenol distills off, leaving a sodic salicylate, which is now the source of the valuable salicylic acid. For phenol in its relations to medicine, see CARBOLIC ACID.

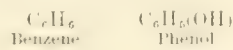
Revised by IRA REMSEN.

Phenol Colors: an important class of artificial dyes derived from coal-tar. The most important are (1) PICRIC ACID (*q. v.*); (2) *dinitro-cresol*, known as *Victoria yellow*, *aniline yellow*, etc.; (3) *aurin*; (4) *rosolic acid* (the last two are described in the article ROSOLIC ACID); (5) *azuline*; (6) *phenicin*; (7) *pæonine*. The phenols combine with phthalic acid to form another class of colors, known as the phthalic-acid colors; and they also combine with azo-compounds. See AZO-COLORS.

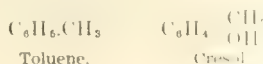
Revised by IRA REMSEN.

Phenology: See CLIMATE.

Phenols: a class of compounds of which ordinary phenol is the best-known example. They are closely related to the alcohols. The latter are derived from the paraffins by the substitution of hydroxyl (OH) for hydrogen, while the phenols are derived from the aromatic hydrocarbons (see HYDROCARBONS) in the same way. As benzene is the simplest of the aromatic hydrocarbons, so the substance called phenol is the simplest representative of the class to which it belongs. Its relation to benzene is shown by the formulas:



Cresol is derived from toluene in the same way that phenol is derived from benzene:



There are phenols derived from the hydrocarbons by the substitution of two hydroxyl groups for two atoms of hydrogen. These are called di-acid phenols. Of these, hydroquinone, resorcin, and orcin are examples. Tri-acid phenols are derived from the aromatic hydrocarbons by the substitution of three hydroxyl groups for hydrogen. Pyrogallie acid is the best-known example of the tri-acid phenols. The phenols have a somewhat more acid character than the alcohols. This is shown by the ease with which they form salts when treated with strong bases such as sodium hydroxide, NaOH, potassium hydroxide, KOH, calcium hydroxide, Ca(OH)₂, etc. They readily undergo decomposition when treated with oxidizing agents, and, unless pure, they are slowly decomposed by contact with the air, the change being shown by change in color.

IRA REMSEN.

Phenyl (C₆H₅): a univalent radical which exists in aniline, phenol, etc.

Phenylie Acid: See PHENOL.

Phœræ (in Gr. *Φεράι*): an ancient city of Thessaly; in a fertile plain near Mt. Pelion; 10 miles W. of its port; on the Pagasæan Gulf; on the site of the modern *Velestino*. Jason, son of Polyphron, succeeded to the throne of Phœræ in 378 B. C., and subdued the greater part of Thessaly up to Pharsalus. Phœræ now became a splendid and prosperous town, and under the government of the nephew of Jason, Alexander, who was notorious for his cruelty, it became the controlling power of the whole of Thessaly and played a conspicuous part in Greek politics. The treachery of Alexander induced the Thebans (see PELOPIDAS and EPAMINONDAS) to aid the oppressed Thessalians, and after the battle of Cynoscephalæ his dominion was again confined to the city and district of Phœræ. He was, nevertheless, still strong enough to land troops in Attica and plunder Piræus. In 358 B. C. Alexander was murdered, and in 352 B. C. Phœræ passed with the rest of Thessaly into the hands of Philip of Macedon.

Revised by J. R. S. STERRETT.

Pherecrates (in Gr. *Φερεκράτης*): poet of the Old Attic comedy, whose strength lay in his invention. A few fragments—one of considerable length—may be found in Meineke's and Koek's collections.

B. L. G.

Pherecydes (in Gr. *Φερεκύδης*) OF LEROS: a Greek logographer of the fifth century B. C. who lived in Athens. Of his great work on Greek mythology, often quoted by ancient writers, though under different titles, the existing fragments have been collected and edited by Müller, *Fragmenta Histor. Græcorum*, vol. i., 70-99, and vol. iv., 637-639.

B. L. G.

Pherecydes OF SYROS: Greek philosopher of the sixth century B. C. He was considered by some the earliest Greek prose writer; was a rival of Thales and the teacher of Pythagoras. Of his work, which bears the mystic title *Ἐρμῆωνος*, and seems to have been a product of poetical intuition rather than of philosophical reasoning, some fragments are extant, and have been edited by Sturz (2d ed. 1824). See Ueberweg-Heintze, *Grundriss der Geschichte der Philosophie des Alterthums*, p. 31.

B. L. G.

Phidias (in Gr. *Φειδίας*): the greatest sculptor of Greece; b. at Athens 500 B. C.; was taught by Hegias and Ageladas. His career as a sculptor (he gave but brief attention to painting) began under Cimon, but reached its glory under Pericles, with whose splendid epoch his name is indissolubly associated. He was a man of lofty soul, majestic intellect, consummate knowledge of the principles of his art, and wonderful skill in design. The buildings that crowned the Acropolis at Athens are believed to have been erected under his direction, and much of the work—how much can not be known—may be ascribed to his hand. The great statue of Athene in the Parthenon, of gold, ivory, and precious stones, was, there is little room for doubt, executed by him. It was finished 437 B. C. Later, he completed the colossal statue in gold and ivory of Zeus in the temple of Olympia at Elis. It sat enthroned in the temple for 800 years, and was finally destroyed by fire about 475 A. D. Of these works, which commanded the admiration of all Greece, and have given the master an immortal renown, nothing but the fame remains. The traditions concerning the life of Phidias are conflicting. That he met great changes of fortune from the fickleness of his countrymen, that he shared the popularity and the unpopularity of his patron, Pericles, was accused of crimes against the state, embezzlement, and even impiety, and imprisoned, may be believed. He is supposed to have had a long life, and to have died from poison about 432 B. C. See de Rouchand, *Phidias, sa vie et ses ouvrages* (Paris,

1861); Petersen, *Die Kunst des Phidias*, etc. (Berlin; 1873); Waldstein, *Essays on the Art of Phidias* (Cambridge, 1885); Collignon, *Phidias* (Paris, 1886); Brunn, *Geschichte der Griechischen Künstler* (Brunswick, 1853; 2d ed. 1889), i., pp. 157-210; Overbeck, *Geschichte der Griechischen Plastik* (Leipzig, 1893), i., pp. 344-385; Mitchell, *History of Ancient Sculpture* (New York, 1888), i., pp. 299-364; Collignon, *Histoire de la Sculpture Grecque* (Paris, 1892), i., p. 517 ff.—vol. ii., which has not appeared in 1894, will continue the subject.

Revised by J. R. S. STERRETT.

Phigali'a (in Gr. *Φιγαλία*): a city in the southwestern corner of Arcadia, near the frontier of Messenia, now Pavlitza. It was celebrated chiefly for the temple of Apollo Epicurius at Bassæ, on the top of Mt. Cotylium, some miles from Phigalia. The temple was built by Ictinus, one of the architects of the Parthenon, at Athens. Thirty-six columns and their architraves are still standing. The frieze, made up of sculptures now called the Phigalian marbles, is in the British Museum. One half of it represents a battle of the Greeks and Amazons, the other half the struggle of the Centaurs and Lapiths. The sculptures are of almost the best style of early Greek art. See Stackelberg, *Der Apollotempel zu Bassæ* (1826); Donaldson, *Antiquities of Athens and other Places in Greece* (London, 1830), vol. iv.; Cockerell, *The Temple of Jupiter Panhellenius and Apollo Epicurius at Bassæ* (London, 1860). See the histories of Greek art cited under PHIDIAS.

Revised by J. R. S. STERRETT.

Philadelphia: See ALA SHEHR and AMMAN.

Philadelphia [from Gr. *φιλᾶδελφία*, brotherly love, deriv. of *φιλᾶδελφος*, loving one's brother; *φίλος*, friendly, loving (but for meaning, cf. *φιλεῖν*, to love) + *ἀδελφός*, brother]: city; coextensive with Philadelphia co., Pa.; on the west bank of the Delaware river, 103 miles from its mouth, on both banks of the Schuylkill river, which joins the Delaware near the city's southern boundary, and on the Penn., the Phila. and Reading, the Lehigh Valley, and the Balto. and Ohio railway systems; area, 129½ sq. miles; extreme length, 20 miles; extreme width, 10 miles; water frontage, 38 miles (for location, see map of Pennsylvania, ref. 6-J). It is the most important city in Pennsylvania, and the third city in population in the U. S.

Plan of the City.—The streets running N. and S. are numbered (as First, Second, Third, etc.) from the Delaware westward; these are crossed at right angles by streets running E. and W. that are named from trees and the counties and Governors of Pennsylvania, and a few main thoroughfares cross diagonally the square blocks thus formed. The principal streets are from 50 to 120 feet wide. The houses are numbered N. and S. from Market Street, and W. from the Delaware, 100 to the block or square, though the block or square may not contain 100 buildings. Numerous streams formerly flowed through the comparatively level land on which the older parts of the city stand. Dock Street shows the winding course of Dock creek. Others have been converted into sewers. The Poquessing, Pennypack, Wissinoming, Frankford, Gunner's, Cobocksink, Hollanders, and Bow creek empty into the Delaware, the Wissahickon and Mill creek into the Schuylkill.

On Jan. 1, 1894, there were 1,297,000 miles of paved and unpaved streets; of these, 78.2 miles were laid with asphalt, 208.4 miles with Belgian block, and 49.6 miles with vitrified brick. The streets are lighted every night in the year by 4,368 are lights, 21,368 gas lamps, and 19,519 gasoline lamps. Between 1855 and 1893 102.5 miles of main sewers and 448.5 miles of branches were constructed. Most of the main streets are traversed by trolley cars. The Schuylkill is spanned by bridges at Penrose and Gray's ferries, at South, Walnut, Chestnut, Market, and Callowhill Streets, and at Girard Avenue and the Falls of Schuylkill, and by seven railway bridges. The most beautiful bridge in the city limits is the stone one of the Reading Railroad over Wissahickon creek. Ninety-four per cent. of the water-supply is drawn from the Schuylkill, the rest from the Delaware. There are 6 pumping-stations and supplementary high service at Roxborough, Mt. Airy, and East Park, and 10 reservoirs and 2 tanks, with a total capacity of 1,017,288,814 gal. The police force numbers over 2,100 men and 14 matrons. There are 30 station-houses, 11 sub-stations, 2 police tug-boats, and 18 patrol stations.

Public Buildings and Places of Interest.—Among the buildings of historic importance Independence Hall stands first. The Old Swedes' church, Christ Episcopal church, where Bishop White preached, Washington worshiped, and



- Depots**
- A. RAILROAD DEPOT
 - B. MARSHALL DEPOT
 - C. PENNSYLVANIA DEPOT
 - D. SEPTA DEPOT
 - E. PENNSYLVANIA DEPOT
 - F. PENNSYLVANIA DEPOT
 - G. PENNSYLVANIA DEPOT
 - H. PENNSYLVANIA DEPOT
 - I. PENNSYLVANIA DEPOT
 - J. PENNSYLVANIA DEPOT
 - K. PENNSYLVANIA DEPOT
 - L. PENNSYLVANIA DEPOT
 - M. PENNSYLVANIA DEPOT
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 - S. PENNSYLVANIA DEPOT
 - T. PENNSYLVANIA DEPOT
 - U. PENNSYLVANIA DEPOT
 - V. PENNSYLVANIA DEPOT
 - W. PENNSYLVANIA DEPOT
 - X. PENNSYLVANIA DEPOT
 - Y. PENNSYLVANIA DEPOT
 - Z. PENNSYLVANIA DEPOT
- Hôtels**
- A. HOTEL
 - B. HOTEL
 - C. HOTEL
 - D. HOTEL
 - E. HOTEL
 - F. HOTEL
 - G. HOTEL
 - H. HOTEL
 - I. HOTEL
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 - K. HOTEL
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 - M. HOTEL
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 - O. HOTEL
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 - Q. HOTEL
 - R. HOTEL
 - S. HOTEL
 - T. HOTEL
 - U. HOTEL
 - V. HOTEL
 - W. HOTEL
 - X. HOTEL
 - Y. HOTEL
 - Z. HOTEL
- Prominent Churches and Buildings**
- A. CHURCH
 - B. CHURCH
 - C. CHURCH
 - D. CHURCH
 - E. CHURCH
 - F. CHURCH
 - G. CHURCH
 - H. CHURCH
 - I. CHURCH
 - J. CHURCH
 - K. CHURCH
 - L. CHURCH
 - M. CHURCH
 - N. CHURCH
 - O. CHURCH
 - P. CHURCH
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 - S. CHURCH
 - T. CHURCH
 - U. CHURCH
 - V. CHURCH
 - W. CHURCH
 - X. CHURCH
 - Y. CHURCH
 - Z. CHURCH
- Prominent Churches**
- A. CHURCH
 - B. CHURCH
 - C. CHURCH
 - D. CHURCH
 - E. CHURCH
 - F. CHURCH
 - G. CHURCH
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 - I. CHURCH
 - J. CHURCH
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 - Y. CHURCH
 - Z. CHURCH

Franklin and Robert Morris are buried; Carpenters' Hall, in which the first continental congress met; the old building on South Street, which was the first American theater; William Penn's house, which stood in Latitia Street and has been removed to Fairmount Park; St. Joseph's, Willing's Alley below Fourth, the scene of the pathetic meeting of Evangeline and Gabriel; Mt. Pleasant, the home of Benedict Arnold, in East Fairmount Park; the modest house at No. 239 Arch Street, where Betsy Ross made the first American flag for Washington; and the site of the house at Seventh and Market, where Jefferson wrote the Declaration of Independence, are a few of the city's possessions rich in historical associations. The principal Government buildings are the U. S. mint, the post-office, and the custom-house, Naval Asylum and Hospital, and two arsenals. Among the parks are Stenton, once the property of James Logan, and Bartram's Garden, the first botanical garden in America. The Schuylkill and the romantic Wissahickon, along the latter of which dwelt Kelpius, the mystic, and Henry Bernhard Koster, the Chiliast of the seventeenth century, flow through Fairmount Park. Included in Fairmount Park are the residence of John Penn, the last colonial governor; the estate of the witty Judge Peters, the Revolutionary Secretary of War, and the country-seat of Robert Morris. The Zoological Garden, of 33 acres, is on the west bank. In the lower Schuylkill section of the park are 500,000 trees and shrubs, including 3,400 forest trees, some of them 27 feet in circumference. Of flowering shrubs and flowers there are 500 genera and 700 varieties. The park contains one-sixth of all the known minerals of the U. S. Fifteen species of fish inhabit its waters, and 77 species of birds its woods and valleys. There are 50 miles of carriage drives, and 100 miles of byways and bridge-paths. Steamboats ply for 6 miles through the park on the Schuylkill, and the course for row-boats on the Wissahickon is 2 miles in length.

Among the more notable works of art are the equestrian statue of Washington, made for the Pennsylvania Society of the Cincinnati by Rudolph Siemering, costing \$225,000; the Reynolds and McClellan statues in front of the city-hall; and the statues of Gen. Meade, Lincoln, and Jeanne d'Arc in Fairmount Park. The city-hall, at Broad and Market Streets, has cost \$16,000,000. The tower, completed in 1894, is surmounted with a bronze statue of William Penn, 37 feet in height and 547 feet above the pavement, the altitude exceeding that of any steeple in the world. The length of the north and south front of the city-hall is 470 feet, and of the east and west front 486½ feet. The Masonic Temple is on North Broad Street, opposite the city-hall. The permanent club-houses and grounds of the different cricket clubs are at Manheim, Haverford, and other suburbs.

There are some fifty prominent clubs, among them the Philadelphia, founded in 1834, the Manufacturers', the Rittenhouse, the Union League, the Penn, the Art, the Sketch, the Pen and Pencil (of newspaper-workers), the New Century (for women, whose drawing-room seats 600), and the United Service. The State in Schuylkill, founded in 1732, is said to be the oldest club in the world. There are over 50 hotels, and 18 theatres.

At the State penitentiary, on Fairmount Avenue, opened in 1829, the separate system of confinement was first introduced. Each prisoner works in his own room. The system has been adopted in several European countries. The Philadelphia Bourse, erected in 1894, at a cost of \$2,000,000, is primarily intended as a place for the display and sale of everything made in Philadelphia's widely scattered mills and factories. The great hall is 250 feet by 125 feet. There are 400 offices, and a room 130 feet square for the exhibition of machinery with or without power. It has also all the conveniences of a great club-house.

The site of the navy-yard at League island, including nearly 1,000 acres, was presented to the U. S. Government by the city in 1862. There are many cemeteries, of which the best known is Laurel Hill, where many famous men are buried, including Dr. Kane, the Arctic explorer, Gen. Meade, and Gen. John C. Pemberton.

Educational Institutions.—Penn's plan of government provided for the erection of public schools and the encouragement of useful sciences and laudable inventions. In 1689 the William Penn Charter School, still one of the most flourishing in the city, was formally opened. The Assembly charter, granted in 1711, provided for the instruction of poor children in "reading, work, languages, arts, and sciences." In 1740 subscriptions were raised for a charity

school, and the site was purchased in that year. On Feb. 1, 1749, the lot and buildings were conveyed to James Logan and twenty-three other trustees, the plan having been enlarged to include a college. This movement of 1740 was the beginning of the University of Pennsylvania. See PENNSYLVANIA, UNIVERSITY OF.

The medical colleges comprise the University, Jefferson, the Woman's, the Hahnemann, the Medico-Chirurgical, and the Philadelphia Polyclinic and College for Graduates. There are 3 colleges of dentistry, 1 of pharmacy, and 1 of veterinary surgery.

Philadelphia has over \$10,000,000 invested in public school property, and in 1893 the 428 public schools, taught by 2,988 teachers and maintained at an expense of \$3,461,183, were attended by 125,180 pupils. At the head of the public-school system are the Boys' High School, the Girls' High School, and Girls' Normal School. There are 3 manual-training schools, a school of pedagogy, a school of practice, an industrial art school, 3 cooking-schools, 5 combined grammar and primary schools, 29 combined grammar, secondary, and primary, 31 consolidated, 37 grammar, 52 combined secondary and primary, 77 kindergartens, 64 secondary, and 119 primary schools. The University of Pennsylvania offers sixty prize scholarships to the pupils of the public schools. The Pennsylvania Institution for the Deaf and Dumb at Mt. Airy, the Asylum for the Blind, and the Pennsylvania Working Home for Blind Men are prominent local charities. The Academy of the Fine Arts, founded in 1805, is the oldest art institution in the country. The School of Design for women was founded in 1853. The Drexel Institute, founded by A. J. Drexel, imparts industrial education to both men and women. It was opened in 1891. The Pennsylvania Museum and School of Industrial Arts was incorporated in 1876. Its valuable collection of fabrics, metals, curios, etc., has been maintained in Memorial Hall, the permanent building erected by Pennsylvania at the Centennial Exhibition of 1876. The Spring Garden Institute aims to cultivate the industrial side of art education. The Williamson Free School of Mechanical Trades, founded by I. V. Williamson, is near Media. Girard College, to found which Stephen Girard left about \$7,000,000, in 1893 contained 1,559 orphan pupils, 114 officers and pupils, and 268 employees. The Temple College, with a faculty of 40 members and 3,000 students, has an evening department for the instruction of working-people at a nominal charge, and a day and afternoon department for all grades of scholars. The Wagner Free Institute of Science, begun in 1847 by Prof. William Wagner, has a lecture-room seating 640 people, a library of 7,500 volumes, a natural history museum, and provides free lectures on scientific subjects. The Franklin Institute was founded in 1824 for the promotion of the mechanic arts and manufactures. Its library contains 40,000 volumes, 25,000 pamphlets, 20,000 maps and charts, and 1,000 classified and catalogued photographs. The library is strictly scientific and technical in character. The institute maintains a drawing-school, publishes a monthly journal, and awards each year medals for meritorious discoveries and inventions. The American Philosophical Society, which was made famous in the eighteenth century among scientists by the attainments of Rittenhouse, the great astronomer, and with the general public by the more popular experiments of Franklin, and which included among its members Godfrey, the inventor of the mariner's quadrant, Mason and Dixon, who ran the boundary-line between Pennsylvania and Maryland, and many other celebrated men, was founded in 1743. Its reference library contains 50,000 volumes. There are over 100 libraries open to the public, the chief being the Philadelphia Library, founded in 1731, and its Ridgway branch, which, under the will of Dr. James Rush, received a legacy of \$1,000,000. With the Philadelphia Library is the Loganian Library, begun in 1699, founded by James Logan, the secretary of Pennsylvania, who provided that the librarian should always be one of his male descendants, thus creating what is said to be the only hereditary office in the U. S. The Mercantile Library was founded in 1821. The library of the Carpenters Company was established in 1736, the Friends' Library in 1742. The city is rich in special and reference libraries, among the most important being those of the Pennsylvania Historical Society (30,000 volumes), the College of Physicians, the Law Library, the Hurst Free Law Library, and the library of the Academy of Natural Sciences. The Apprentices' Library and that of the City Institute, the latter being the first free library in the city, are

free. A free library of 7,000 volumes, under the Pepper bequest, has been opened in the city-hall, and by authority of city councils a number of free libraries have been established in different parts of the city. The Academy of Natural Sciences, founded in 1812, has the largest collection of shells in existence. Its ornithological cabinet holds 27,000 mounted specimens and 5,000 unmounted skins. Here are the Gould collection of Australian birds, the Bonaparte collection of European birds, and the Verreaux collection of African and Asiatic birds. In fossils, especially in invertebrates, the collections are particularly rich. The academy gives a scientific education to a number of young persons without charge. At the Historical Society are the most complete collection of colonial laws in the U. S., the Dreer collection of autograph letters, and a wealth of historical material.

The churches number 600; the Sunday-schools 616, with 16,937 teachers and 178,865 scholars. The first Sunday-school in the world, of which there is now a record, was conducted at Germantown. There are 25 general hospitals, 25 special hospitals, and 5 free dispensaries. The oldest hospital in America is the Pennsylvania, founded in 1751. The Philadelphia City Hospital is the largest in the U. S. in capacity. Each of the great medical schools maintains a hospital, and most of the hospitals have training-schools for nurses. The Nurses' School of the Lying-in Charity, founded in 1828, is the oldest in America and the second oldest in the world. The Wills Eye Hospital was founded in 1832 for the relief of the poor. The Young Men's Christian Association is the third in the world in size and equipment.

The Municipal Government.—The municipal life of Philadelphia begins with the charter to William Penn of Mar. 4, 1681, and the government of the provincial council, the county court, and the grand jury. Under the proprietary charter of 1691, Humphrey Morrey became the first mayor. Penn in 1701, before his departure to England, granted a second proprietary charter to Philadelphia, and this lasted until the Revolution. From 1776 to 1789 the government of the city rested in the justices of the peace and the legislative commissions. In 1789 an act of the Legislature incorporated the city, which remained under this charter until 1854. During the greater part of this period the government was administered practically by the different committees of the city council, although at first an effort was made to concentrate power and responsibility in the executive. In 1854 the many outlying districts which previously had their separate governments were consolidated with the city, which became coterminous with the county. The old city had extended from Vine to South Streets, and from the Delaware to the Schuylkill. The charter created by the Bullitt Act of 1885 concentrates executive power in the mayor, elected for four years. He appoints a director of public safety, whose department includes the police, fire, electrical, health, building inspection, city property, and boiler inspection bureaus; a director of public works, whose department includes the bureaus of gas, highways, street-cleaning, lighting, surveys, and water; and a president and four directors of the department of charities and correction. The receiver of taxes and city solicitor are city officers elected in the spring for terms of three years. The city treasurer and city comptroller are county officers elected for three years in November, the city and the county of Philadelphia being identical geographically, but having a separate political existence. There are a central board of education, consisting of a representative from each ward, and local boards in the different wards. The sinking fund commission is composed of the mayor, city comptroller, and one member elected by the city councils. The park commission is composed of the mayor, the presidents of select and common councils, commissioner of city property, chief engineer of water department, and ten citizens appointed for five years by the judges of the common pleas courts. The public buildings commission, created by the Legislature in 1870, has had charge of the erection of the new city-hall. The park commissioners have charge of Fairmount Park and Hunting Park. The other forty small parks of the city, of which fifteen, with a total area of 51 acres, are improved, while the rest are used as children's play-grounds, are under the control of the bureau of city property of the department of public safety. The legislative branch of the city government is composed of the select and common councils. Each of the thirty-seven wards is represented by one select councilman elected for three years, and by common councilmen, the number varying in the different wards, elected for two years. There is one common

councilman for every 2,000 names on the completed canvassers' list of the year in which the election is held. The judiciary consists of twelve judges of the court of common pleas, four judges of the orphans court, and, in 1894, twenty-eight magistrates. The Supreme Court of the State sits for the greater part of the year in the city-hall. The U. S. circuit and district courts sit in the post-office building. The city is represented in the Legislature by eight members of the State Senate and thirty-nine members of the House of Representatives. Philadelphia had in 1894 five representatives in Congress.

The assessed value of real estate, about two-thirds of the actual value, is \$766,446,387. The tax-rate is \$1.85 on every \$100 of assessed valuation. The total city debt on Jan. 1, 1894, was \$54,275,444, a decrease during the year of \$774,715; amount in the sinking fund, \$24,830,365; cash in the treasury, \$6,968,502; and taxes due and collectable, \$1,227,696. These cash assets amounted to \$33,026,561, leaving the total debt above cash assets \$21,248,883. The real estate owned by the city is appraised by the board of revision of taxes at \$45,705,699. The total receipts for the year ending Dec. 31, 1893, were \$30,199,515; expenditures, 27,977,232—excess of receipts, \$2,222,283.

Banking and Insurance.—In 1894 there were 42 trust companies with a combined capital of \$29,864,729 and deposits of \$66,396,409. These companies afford facilities that in most cities are furnished by banks, and, with a capital larger than that of the banks, control most of the market for collateral loans. There are 41 national and 3 State banks with an aggregate capital of \$23,915,000 and deposits of \$119,678,900. There are 4 savings-banks with deposits of \$52,450,828. The field for these institutions is limited on account of the great number of building and loan associations, 450 of which have offices in the city, have investments of \$40,000,000, and receive annually \$5,000,000.

There are 17 joint-stock fire and marine insurance companies, with a capital of \$8,452,875, a surplus of \$7,987,885, and total assets of \$36,420,710. There are 3 life-insurance companies of more than local standing.

Manufactures.—The census returns of 1890 showed that 18,166 manufacturing establishments (representing 330 industries) reported. These had a combined capital of \$375,249,715, employed 260,264 persons, paid \$135,917,021 for wages and \$311,645,804 for materials, and had products valued at \$577,234,446. The following are the principal industries reported:

CLASSIFICATION.	Establishments.	Capital.	Persons employed.	Value of products.
Foundry and machine-shop products.....	345	\$34,469,632	18,040	\$29,554,444
Printing and publishing....	668	32,765,323	10,590	25,172,053
Chemicals.....	36	11,264,183	2,072	9,674,910
Sugar and molasses.....	8	8,307,655	3,781	46,598,524
Iron and steel.....	79	7,850,128	4,691	9,387,512
Boots and shoes (factory product).....	93	4,185,794	5,140	6,851,834
Carpets and rugs.....	133	15,515,490	12,124	22,000,681
Cotton goods.....	123	9,683,697	7,080	11,514,601
Woolen goods.....	115	16,033,111	10,583	21,919,781
Hosiery and knit goods.....	178	8,923,866	12,637	14,932,181
Leather, morocco.....	3	5,432,443	3,012	10,840,198
Petroleum refining.....	4	9,351,798	2,035	8,646,982
Silk and silk goods.....	43	5,426,920	4,145	8,059,604

The minimum yearly products of all Philadelphia's manufactures have been estimated at \$763,820,400, the number of distinct establishments at 22,500, and the number of employees at 350,000.

Ship-building.—In ship-building from 1710 to 1894 Philadelphia led all American cities. From 1781 to 1790 162 vessels aggregating 18,000 tons register were constructed in Philadelphia. From 1790 to 1812 New Bedford and Nantucket wharfen frequently had their vessels built at the Philadelphia yards. In 1790 John Fitch made regular trips between Philadelphia and Trenton with the first American steamboat. In 1794 Joshua Humphreys, a Philadelphia ship-builder, designed the *Constellation*, President, *Constitution*, and the Congress, and himself superintended the building of the United States at Philadelphia. The purchase by the East India Company in 1830 of two Philadelphia ships built for the China trade resulted in the closing of the British market to American-built ships. Cramp's ship-yard was founded in 1830, and there were then fourteen ship-building firms along the Delaware front of the city. Two of these are still in existence. In sixty-three years the Cramps built 269 ships for the public service, and

in 1894 had 13 more in various stages of construction. The new Atlantic liners and the Newark, New York, Columbia, Indiana, and Philadelphia, among other vessels of the new navy, were built at this yard.

Commerce.—There are 7 steamship lines from Philadelphia to European ports, 5 to Jamaica and the West Indies, and 6 coastwise. The International Navigation Company, owner of the New York, the Paris, the Berlin, the Chester, the St. Louis, and the St. Paul, is capitalized and controlled in Philadelphia.

In 1753 Philadelphia exported 125,000 barrels of flour and 175,000 bush. of wheat. In 1793 its domestic exports were \$7,000,000; in 1796, \$17,500,000; in 1806, \$31,000,000. In 1843 the exports had fallen to \$2,300,000; in 1880 they reached \$56,500,000, their highest point. In 1893 the imports were \$66,122,147; exports, \$49,102,482. The immigrants arriving at the port were in the same year 28,906.

Railways.—The railway systems entering the city are the Pennsylvania, controlling 8,800 miles of road; the Philadelphia and Reading, 2,499.6 miles; the Lehigh Valley, 1,023 miles; and the Baltimore and Ohio, 2,053 miles—a total of 13,046 miles. Up to 1894 the terminals of the Pennsylvania and the Reading railways, in the heart of the city and reached by elevated viaducts of brick, stone, and iron extending to the outskirts, were the finest in the world. At the Broad Street and Camden stations of the Pennsylvania line an average of 585 trains and 75,450 passengers arrive and depart daily, and 203,780 trains and 27,683,764 passengers yearly. The terminal of the Pennsylvania Railroad extends on Broad Street from Market 306 feet to Filbert Street, and with the train-shed along Market and Filbert Streets westwardly for 812 feet. The train-shed has an arch of iron and glass with a clear span of 304 feet. The Reading terminal, at Market and Twelfth Streets, is of pink granite to the second floor, with pink-tinted brick and white terra-cotta above. It cost \$10,000,000. Here 348 trains and 30,000 passengers arrive and depart daily, and 17,100 at the other Reading stations of the city. The Pennsylvania Railroad has thirty stations in Philadelphia at which freight is received and distributed. The aggregate tonnage at all the stations in 1892 was 10,218,000. Two grain elevators at Girard Point have a total capacity of 1,750,000 bush. The Philadelphia and Reading Railroad has twenty-five freight-stations in the city. The Port Richmond grain elevator has a capacity of 960,000 bush.; another elevator at Washington Avenue has a capacity of 400,000 bush. At Port Richmond are the great coal-wharves of the Reading Company. The coal-wharves of the Pennsylvania Company are at Greenwich Point. A short distance above the mouth of the Schuylkill, at Point Breeze, is the terminus of the pipe-lines of the Standard Oil Company, where tank steamers receive about 35 per cent. of all the oil exported from the U. S. The Schuylkill Canal, 108 miles, is controlled by the Reading Railroad. In 1894 city councils appropriated \$10,000 for a preliminary survey of a ship-canal across New Jersey to the ocean.

Delaware River Improvements.—From 1836 to 1894 inclusive the Government appropriated \$2,409,000 for the improvement of the channel of the Delaware river, and \$1,791,000 for the harbor between Fisher's Point and Kaighn's Point, a distance of 5 miles. In 1894 Smith and Windmill islands were removed, as part of a plan to contract the Delaware river immediately in front of the city from a width of 2,400 feet to one of 1,900 feet by an extension of the wharves on the Philadelphia side to a length of from 500 to 600 feet, which would permit the widening of Delaware Avenue from 50 to 150 feet. To obtain the desired depth of 26 feet at mean low water and 32 feet at high water for a width of 1,000 feet from the harbor line, the excavation of 25,000,000 cubic yards of material and the expenditure of \$3,500,000 were required. By July 1, 1894, 5,000,000 cubic yards had been excavated. In the autumn of that year an ordinance was introduced in the city councils appropriating \$500,000 for improving the river-channel below the harbor, and \$1,500,000 for the widening of Delaware Avenue. The Girard estate also has a fund of about \$1,000,000 available for the latter purpose.

History.—Queen Christina of Sweden in 1636 sent a little band of Swedish colonists to the village of Wicaco, now a part of the city. An Indian town previously stood within the present city limits. In 1677 the Swedes erected a log church, which also served as a fort. In 1700 this was torn down and a brick structure erected on the site, known as the Old Swedes' church, which still stands in the southern part of the city on the banks of the Delaware. Services in the

Swedish language were continued until 1818. The Dutch vessel Onrust, Capt. Hendrickson, explored the Delaware in 1623, and near New Castle the Dutch in 1651 built Fort Casimir, which was captured by the Swedes in 1654, retaken by the Dutch the same year, captured by the English in 1664, surrendered to the Dutch in 1673, and given over to the English by the treaty of 1674. William Penn's deputy governor and cousin, Capt. William Markham, arrived at Philadelphia in Oct., 1681, and Penn's commissioners in the early summer of 1682. Penn himself, with a large company of Friends or Quakers, reached New Castle on the Delaware on Oct. 27, 1682. The city of Philadelphia had been named, surveyed, platted, and the lots occupied by some settlers in July, 1682. The Dutch and German pioneers, who had been invited by Penn to remove to Pennsylvania, arrived at Philadelphia Oct. 6, 1683, and settled Germantown, now a ward of the city. This immigration is notable because four of the immigrants, Gerhard Hendricks, Dirk Op den Graeff, Francis Daniel Pastorius, and Abraham Op den Graeff, on Apr. 18, 1688, sent to the Friends' meeting the first public protest ever made in America against the holding of slaves; because in 1690 the first paper-mill in America was erected by William Rittinghuysen, a Dutch immigrant, where was made the paper used by William Bradford, the earliest printer in the middle colonies; and because Sower, the German printer of Germantown, printed in German three quarto editions of the Bible before an edition in English had been printed in America.

The principal political events of the colonial period were the attempts, extending over many years, to wrest the political control of the colony from the Quakers and Germans, and the contests between the Assembly and the proprietary interests. Benjamin Franklin was active in the efforts to alienate the Germans from the Quakers, but was himself defeated when a candidate for the Assembly. These political struggles had an important influence upon the attitude of the colony in the contest with Great Britain. The religious and civil liberty encouraged by Penn's government caused the Quakers and the Germans to feel a strong attachment to the proprietors, whose rights they saw would be imperiled by revolution. The leaders of society in Philadelphia were not clergymen, as in Massachusetts, but lawyers, like John Dickinson, who had received a thorough legal training at the Inns of Court in London, who had great respect for law, and who thought that the legal methods for settling the difficulties should be exhausted before force was resorted to. Opposition to the Stamp Act took form in 1765. The act of Parliament imposing duties upon paper and tea was resisted in 1768, and when in 1773 the news reached Philadelphia that the tea-ships were on their way, the people met in the State-house on Oct. 17, and adopted resolutions which were unanimously readopted by the Boston meeting on Nov. 5. The tea-ship Polly, Capt. Ayres, from London, anchored near Philadelphia two days after Christmas, but was not allowed to discharge her cargo. Carpenters' Hall was the meeting-place of the first Continental Congress of 1774, and the State-house that of the second Congress, which met May 2, 1775, and which, on July 2, 1776, agreed to the resolution declaring that the united colonies "are, and of right ought to be, free and independent States." On July 8 the Declaration of Independence was first publicly read by John Nixon from the platform of the observatory, which then stood in the square back of the hall, and the bell, now called the Liberty bell, in the State-house steeple fulfilled the prophecy of its inscription—"Proclaim liberty throughout the land unto all the inhabitants thereof."

The city was soon to become the center of stirring events. The battle-fields of Trenton, Brandywine, where more troops were engaged than on any other battle-field of the war, the scene of the attack upon and escape of Warne at Paoli, where he occupied a perilous position by Washington's orders, and Valley Forge, are only an hour's ride from the city; while Germantown, where the losses were heavier than in any other battle of the war, is now a ward of Philadelphia. Lord Howe entered the city Sept. 26. The Congress had fled to York. Count Donop, with 2,500 men, was defeated at Red Bank by Col. Christopher Greene with one-sixth of that force Oct. 22, 1777. The British naval attack on the same day also ended in disaster. Fort Mifflin, on Mud island, after a gallant defense of six days, was abandoned on Oct. 16, by which time the earthworks had been leveled by the British fire. On Dec. 8 Howe declined a battle with Washington at Whitemarsh. The British evacuated Phila-

delphia in June, 1778, and Congress returned. The convention which framed the Constitution of the U. S. met at the State-house in May, 1787, and adjourned Sept. 18. Under the Constitution Philadelphia was the capital of the U. S. from 1790 to 1800, and in the building, still standing, at the southeast corner of Sixth and Chestnut Streets George Washington was inaugurated as President for a second term and John Adams and Thomas Jefferson as President and Vice-president.

On the invitation of the Pennsylvania Abolition Society a convention was held in Philadelphia Jan. 1, 1794, of delegates from the different abolition societies of the country. The nineteenth century was marked locally by the opening of the water-works Jan. 1, 1801; the completion of the Schuylkill Canal in 1825; the opening of the Germantown Railway in 1832; the lighting of the streets with gas Feb. 18, 1836; the abolition riots of 1834, 1835, and 1838; the burning of Pennsylvania Hall by a mob on May 17, 1838; the anti-Catholic riots of May and July, 1844; the civil war period; and the Centennial Exhibition from May 10 to Nov. 10, 1876, which was carried through entirely by Philadelphia capital, with the exception of a Government loan that was repaid in full.

Philadelphia's services to the Union cause during the civil war (1861-65) were important. One of her sons, Gen. George B. McClellan, organized the Army of the Potomac, and, with a brief interruption, commanded it from June 22, 1861, until Nov. 7, 1862. Another Philadelphian, Gen. George Gordon Meade, commanded it from June 28, 1863, a few days afterward winning the battle of Gettysburg, until the army was disbanded in 1865. Gen. Andrew A. Humphreys, a descendant of the designer of the famous vessels which won the brilliant naval victories on the sea in the war of 1812, was famous as chief of staff of the same army and as commander of the Second Corps at the time of Lee's surrender. Gen. David Bell Birney, another corps commander, was also a Philadelphian, and Admiral Porter, who at Fort Fisher commanded the largest armada the world had ever seen, was a native of a Philadelphia suburb. The city sent eighty regiments to the field. The Union Volunteer and Cooper Shop refreshment-saloons fed all the Union soldiers from the North and East, passing to the front and returning home, until the end of the war, the total number thus cared for being over 1,000,000. Philadelphia was the headquarters of the U. S. Christian Commission, which expended \$2,524,512 in caring for the soldiers, and distributed stores valued at \$2,953,767, besides Bibles, hymn-books, etc. The Sanitary Fair held in Logan Square in 1864 netted \$1,080,000 for the sick and wounded soldiers. During the war the house of Jay Cooke & Co. placed \$3,000,000,000 worth of Government securities without direct profit to the firm. In the Mexican war E. W. Clarke & Co. placed one-third of the war loan, Stephen Girard furnished the funds for the war of 1812, and Robert Morris was the financier of the Revolution. For a number of years the Bank of the United States, of which Nicholas Biddle was the head, was the center of the financial currents of the country, its position being destroyed when President Andrew Jackson vetoed the bill to recharter it, and ordered the removal of the Government deposits.

There are 20 daily newspapers, 118 weekly publications, 133 monthly, 8 fortnightly, 12 quarterly, and 5 bi-monthly periodicals. In the last quarter of the eighteenth century Robert Bell, one of whose clerks was Thomas Paine, introduced English literature to the people of the U. S., publishing *Rasselas*, Goldsmith's *Traveller* (1768), Robertson's *Charles V.* (3 vols., 1771), Blackstone's *Commentaries*; the poems of Milton and Thomson, and other standard works. For sixty years of the nineteenth century the Philadelphia magazines, from *The Portfolio* to *Graham's Magazine*, were the best in the U. S.

Population.—(1800) 65,787; (1820) 114,445; (1850) 360,305; (1870) 674,022; (1880) 847,170; (1890) 1,046,964; (1892) by city census, 1,142,653.

Authorities.—Westcott, *History of Philadelphia*; Alison and Penrose, *Philadelphia 1681-1887*; a *History of Municipal Development*. ISAAC R. PENNYPACKER.

Philæ [= Lat. = Gr. αἰ Φίλαι; Egypt. *Palek*, the island of the end; Copt. *Pilak*, or *Pelak*; mod. *Jeziret Anas-el-Wajond*]; a sacred island in the Nile, a little S. of the first cataract about 24 N. lat., devoted principally to Isis and Osiris, who were worshiped here for seventy years after the edict of Theodosius, in 381 A. D., prohibiting the native cult. It was regarded as one of the graves of OSIRIS (q. v.), and

was hence a resort of pious pilgrims. On its west side is located a large and irregular temple of Isis, built by Nectanebo II. and extended by the Ptolemies and the Roman emperors down to Diocletian. A small but exceedingly beautiful temple to Isis is also located on the east of the island. It was built by Nerva Trajanus, and is usually known as Pharaoh's Bed. CHARLES R. GILLET.

Philaret, BASIL DROSDOFF (*Vasily Drozdov*); Metropolitan of Moscow; b. at Kolomna, 63 miles S. S. E. of Moscow, Jan. 6, 1783; was educated in the theological seminary in Moscow; became tutor of the Greek and Latin languages; preacher in the Sergian monastery of Troizka 1806; entered the monastic life, and became archimandrite (1811), and later rector (1812) of the St. Petersburg Theological Academy; Bishop of Reval (1817), Archbishop of Tver and Yaroslavl (1891), Metropolitan of Moscow 1821. D. in Moscow, Dec. 1, 1867. He was renowned as an orator, a theologian, and a statesman. He was learned and remarkably broad-minded. To him is attributed the emancipation of the serfs. He was the constant adviser of his sovereign, and the most venerated and beloved man in the Russian empire. His writings enjoyed the highest reputation, and one of them, his *Longer Catechism of the Orthodox Catholic Eastern Church* (rep. by Schaff, *Creeeds*, ii., 445-542, in Blackmore's translation), was sent to all the Eastern patriarchs and unanimously approved by them, and since 1839 has been generally used in the Russian schools and churches. A selection of his sermons in English translation, with a short biography, appeared in London 1873. His greatest work was his history of the Russian Church (Moscow, 1850-59; German trans., 2 vols., Frankfurt, 1872).

SAMUEL MACAULEY JACKSON.

Philbrick, JOHN DUDLEY, LL. D., D. C. L.; educator; b. at Deerfield, N. H., May 27, 1818; graduated at Dartmouth 1842; taught the next ten years in Boston; was principal of the State Normal School, and State superintendent of schools in Connecticut four years; superintendent of public schools in Boston 1857-74 and 1876-78; for ten years member of Massachusetts board of education, and its agent in 1875; president of State educational associations of Connecticut and Massachusetts and American Institute of Instruction, and National Teachers' Association; was editor of Connecticut *Common-school Journal* and *Massachusetts Teacher*; educational commissioner of Massachusetts to Vienna Exposition 1873, serving as member of international jury; U. S. commissioner of education and member of international jury at Paris 1878, receiving the decorations of the cross of the Legion of Honor and the gold palm of the University of France. He was the author of nearly fifty public-school reports of great value, and of *City School Systems in the United States* (U. S. Bureau of Education 1885), a comprehensive and valuable study. D. at Danvers, Mass., Feb. 2, 1886. Revised by C. H. THURBER.

Philelpho, or **Filelfo**, FRANCESCO; humanist; b. at Tolentino, Italy, July 25, 1398. Having studied at Padua, he was appointed professor at the age of eighteen. The next year (1417) he was invited to Venice to teach eloquence and moral philosophy. Here he remained two years, becoming a citizen of Venice and being treated with great respect. In 1419 he was appointed secretary to the Venetian consul-general (bailo) at Constantinople, and in 1420 he arrived there. He at once took up the study of Greek under John Chrysoloras, brother of the more famous MANUEL (q. v.), and became a favorite at the imperial court. In 1427 he returned to accept the chair of Eloquence at Venice; but in 1428 we find him in Bologna, and in 1429 in Florence. In 1434, however, as a result of a bitter quarrel with the scholars of Florence and of rash participation in the intrigues against Cosimo de' Medici, he had to remove to Siena. After four years' residence here he was invited by Filippo Maria Visconti to Milan, where he was treated with great respect, and enabled to live in the luxurious and vain-glorious fashion he loved. After the death of Filippo Maria (1447), however, and the seizure of Milan by Francesco Sforza, he found his position an uneasy one. At last, in 1474, he was tempted to accept a professorial chair at Rome. Things went badly here, and in 1476 he posted back to Milan. In 1481 he was called to the chair of Greek Literature in Florence, and died two weeks after his arrival there, July 31, 1481. He was conceited, jealous, passionate, and absolutely without principle. Yet he extorted from his contemporaries almost unbounded respect and admiration. He was perhaps the first modern to know Greek and Latin

equally well, and this knowledge seemed at the time almost a miracle. The works he has left apart from his translations, have almost no interest beyond that attaching to the ingenuity of their security. See *Francesco Philippi Epistolæ Familiarum libri octavo* (Venice, 1592); *Satiparum Hecatastacha* (Venice, 1592); *Orationes Franc. Phil. cum quibusdam aliis eiusdem operibus* (Paris, 1515); E. Legrand, *Cent-dix lettres grecques de François Filelfe . . . d'après le Cod. Tricou. s.* (Paris, 1892); *Convicia Mediolanensia* (Spire, 1508); C. de Rosmini, *Vita di Franc. Filelfo* (3 vols., Milan, 1808); G. Voigt, *Die Wiederherstellung des klassischen Alterthums* (2d ed., 2 vols., Berlin, 1881).

A. R. MARSH.

Phile'mon (in Gr. Φιλήμων): Greek comic poet; b. at Syracuse, or at Soli, in Cilicia, about 361 B. C.; lived mostly in Athens, where he was a successful rival of Menander, but spent some time in Alexandria. D. at Athens in 262 B. C. The *Mercator* and *Triumviris* of Plautus are adapted from Philemon, and fragments of his plays are to be found in Meineke's and Kock's collections.

B. L. G.

Philemon, Epistle of St. Paul to: a letter written at the same time as the Epistles to the Ephesians and Colossians. It is a private letter, begging forgiveness and acceptance as a brother beloved for a runaway servant, Onesimus, who had been converted through the apostle's teachings. It is stated by tradition that the letter was written from Rome. Others suppose Caesarea was the place. One tradition makes St. Philemon a Bishop of Colossæ, and in the Roman missal he is commemorated on Nov. 22. See PAULINE EPISTLES.

Phile'tas (in Gr. Φιλάτας): Greek grammarian and poet of the island of Cos; tutor of Ptolemy Philadelphus; master of Theocritus, teacher of Zenodotus. A great light in his day, and much admired by his imitator, Propertius. Scant fragments are given in Schneidewin's *Delectus* and Bergk's *Anthologia Lyrica*. See COURT, *La Poésie Alexandrine*, pp. 68-80.

B. L. G.

Phil'idor, FRANÇOIS ANDRÉ DANIGAN: composer and chess-player; b. at Dreux, Eure-et-Loire, France, Sept. 7, 1726; received his musical education in the royal chapel, afterward in Holland and Germany, where he resided from 1745 to 1754; composed between 1754 and 1774 a number of operas, comic and serious, which were well received; but became most famous as an unrivaled master of chess-playing. His book, *L'Analyse du Jeu des Échecs* (London, 1775), was for many years considered the code of the game. D. in London, Aug. 24, 1795. See Allen's *Life of Philidor* (Philadelphia, 1864).

Philip: the fourth called to the apostleship by Christ; b. at Bethsaida. He is often mentioned in the Gospels, especially by John (vi.; xii. 20-22; xiv. 8), but must not be confounded with Philip the Evangelist, mentioned in Acts vi., who had four virgin daughters who prophesied (Acts xxi. 8, 9). By the Fathers they are so confounded that it is impossible to separate them. Thus Theodoret reports (*Com. on Ps. cxvi.*) that he preached in Phrygia, which is likely; Clement of Alexandria (*Stromata*, iii., 6 [*Ante-Nicene Fathers*, ii., 390]) that he was married and had married daughters, which again is likely, but the statement may come from the confusion noted above; Eusebius (*Ch. His.*, iii., 31; Eng. trans., pp. 162-163) states that he died at Hierapolis, in Syria, but, as the context shows, he confounds him with the evangelist. His festival is celebrated by the Latin Church on May 1, by the Greek on Nov. 14. The *Acta Philippi* are apocryphal.—PHILIP THE EVANGELIST was one of the seven deacons (Acts vi. 5); persecution drove him to Samaria, where he confounded Simon Magus (Acts viii. 5). He was instrumental in the conversion of the Ethiopian eunuch (viii. 2 seq.); afterward preached in Caesarea (viii. 40), where Paul met him (Acts xxi. 8), and Greek Church legends make him Bishop of Tralles, in Lydia. Revised by S. M. JACKSON.

Philip (in Gr. Φίλιππος): the name of five Macedonian kings, of whom two became very celebrated. PHILIP II. (359-336), b. at Pella in 382, a son of Amyntas II.; spent while a youth three years as a hostage at Thebes, in the house of Epaminondas, where he became familiar with Greek tactics and politics. When he ascended the throne Macedonia was attacked from two sides by external enemies, the Illyrians and the Athenians, and in the interior it was torn by four pretenders and their factions; but in less than two years the young king repelled the Illyrians, bought off the Athenians, defeated and killed the pretenders, and es-

tablished himself firmly in the kingdom. He immediately began to work at the realization of his much-cherished plan, the acquisition of the supremacy over all Greece, and by his energy and shrewdness, his talents and unscrupulousness, he succeeded at last. He conquered Pydna and Methone, two Athenian possessions on the coast of Macedonia, the peninsula of Chalcidica, with the prosperous cities of Olynthus, Potidæa, Amphipolis, etc., all Athenian colonies or allies; and a part of Thrace, with the rich gold mines, and the town of Crenides, which soon became a flourishing city under the name of Philippi. In spite of Demosthenes's thundering against him, he achieved these conquests without occasioning any serious breach with Athens, for he understood how to bribe and how to deceive. Meanwhile he had also defeated the tyrant of Phæra and reduced the whole of Thessaly, and during the two sacred wars in 346 and 339 he acquired a foothold in Greece proper, called in by the Greeks themselves—in the first case, by the Thebans against the Phocians; in the second, by the Amphictyonic Council against the Locrians. Alarmed at his successes, Athens made a coalition with Thebes and other Greek states against him, but he routed the allied army at Chæronea in 338, and after this victory became the master of Greece. By his admission as a member of the Amphictyonic Council shortly after the First Sacred war he and the Macedonians were recognized as belonging to the Greek nation, and by the congress at Corinth (in 337) he was chosen commander-in-chief of all the Greeks under a projected invasion of Persia; but the realization of this vast plan he had to leave to his son Alexander; during his preparations he was assassinated at Egæ by Pausanias.—Under PHILIP V. (220-179), b. in 237, Macedonia relapsed into insignificance. He dreamt, like his subjects, only of the re-establishment of the empire of Alexander. His whole attention was taken up by the East, by Pergamus, Bithynia, Syria, etc., and meanwhile the danger arose from the West, from Rome, which already held possessions in Illyria. The offers of alliance which Hannibal made he treated slightly, and the war with Rome, which began incidentally, the first Macedonian war (210-205), he carried on without energy, though generally successfully. In 200 the war began again, the second Macedonian war, in consequence of Philip's aggressive policy toward Pergamus and the Achæan association, now allies of Rome. The Macedonian army was completely routed by Titus Quintius Flamininus at Cynoscephalæ in 197, and the country reduced to a submissive ally of Rome, relinquishing all its conquests in Europe and Asia, surrendering its fleet, and paying a tribute. Revised by J. R. S. STERRETT.

Philip: the name of six kings of France. PHILIP I., b. 1052, son of Henry I. and a Russian princess, Anna, came to the throne in 1059, ruling at first jointly with his father, after whose death in 1060 Philip possessed the undivided sovereignty. In 1071 he married Bertha of Holland, by whom he had three children; but in 1091, having fallen in love with Bertrade of Montfort, the wife of the Count of Anjou, he repudiated the queen and married Bertrade, in spite of the vehement opposition of the Church. The Archbishop of Lyons, who was papal legate for France, excommunicated Philip and Bertrade at the Council of Autun, 1094, and in the following year, 1095, at the Council of Clermont, Pope Urban II. in person renewed the excommunication. Philip, however, continued to live with Bertrade, and after the death of Bertha the Church lost its principal argument against him. Nevertheless in 1100 the legates of Paschal II. compelled him to acknowledge his eldest son, Louis, as coregent, and from that time begins really the reign of Louis VI. D. July 29, 1108.—PHILIP II., AUGUSTUS, b. in Aug., 1165, son of Louis VII. and Alice of Champagne, ascended the throne Sept. 18, 1180, after the death of his father. His reign was eminently successful. In the controversies which took place between Henry II. of England and his sons Philip invariably took the part of the latter, and not without profit, though he afterward found among them his bitterest and most formidable enemy, Richard Cœur de Lion. Richard ascended the throne of England in 1189, and in the following year he and Philip joined in their famous crusade. They quarreled in the Holy Land, and Philip returned to France, stopping at Rome on his way to ask the pope to release him from the oath that he had taken not to attack Richard's possessions in his absence. The pope denied his request. Nevertheless, as soon as he heard of the imprisonment of Richard by the Emperor Henry VI., Philip made an alliance with John,

began the attack, and seized a portion of the English king's territories in France. After the liberation of Richard and his reconciliation with John, war broke out in which fortune decided now on this side and now on that; but at the death of Richard in 1199, Philip was the gainer, and, under John, England lost most of its remaining possessions in France. He was equally successful in his many controversies with Flanders, Brittany, etc., with the feudal lords of the realm, and with the clergy. He sent his ambassadors to the great Council of the Lateran in 1215, and he promised to give one-fourth of his revenues to a new crusade, but he absolutely refused to take any part in the war against the Albigenses. When Amaury of Montfort proposed to cede to him those domains in Languedoc which the Council of the Lateran had given to his father, he declined the offer, well knowing that by keeping aloof from this whole business, with its horrible crimes, the French crown could not fail finally to harvest the fruits. The general character of his government was decidedly aristocratic. The tribunal of the barons, which afterward played a conspicuous part in the history of France, was his creation, and, though he was very careful to make conspicuous distinctions between the king and the feudal lords, he sought and found his principal support among the latter. Nevertheless, few kings have done so much for the security and prosperity of the cities as he. A great number of places in France were provided with walls and other kinds of fortifications during his reign, and those works were generally executed at his expense. Paris especially owes much to his munificence. He gave its university—which already attracted not only the nobility of France, but also that of England and Germany—many privileges and a more independent position beside the Church. He continued the Cathedral of Notre Dame, which had been begun under Louis VII., and he built the churches of St. Sulpice, Ste. Geneviève, etc. He also laid the first foundation for the palace of the Louvre. D. July 14, 1223.—**PHILIP III.**, b. Apr. 3, 1245, was second son of Louis IX. and Margaret of Provence, and became heir-apparent to the crown after the death of his older brother, Louis. He embarked on a crusade with his father, and followed him to Tunis, but he was stricken by the plague. Upon the death of his father he was immediately recognized as king, and after some minor battles he made peace with Tunis and returned to France. An armistice of ten years was established, all Christian slaves were liberated without ransom, freedom of worship was granted to the Christians, and 210,000 gold pieces were paid to France. The rest of his reign was quiet and peaceful. D. Oct. 5, 1285.—**PHILIP IV.**, **THE FAIR** (1285-1314), b. in 1268, a son of Philip III., was an avaricious, haughty, and even cruel man, but courageous and eminently successful in extending the boundaries of France and consolidating the power of the crown. In order to procure money the king taxed the clergy. The pope, Boniface VIII., forbade the clergy to pay the tax, and the king answered by forbidding the exportation from France of money or other valuables, thereby cutting off one of the richest sources of the papal revenue. The pope sent a legate, who remonstrated in an insolent manner with the king, and the king threw the legate into prison. Philip now convoked the States-General, and having ascertained that the French people would stand by him even if he were excommunicated, he pursued his own course and confiscated the property of those prelates who sided with the pope. Meanwhile Boniface assembled a council at Rome and excommunicated the king, but a French army under William de Nogaret captured Rome and imprisoned the pope. In 1304, at the election of Clement V., the papal residence was transferred to Avignon, and for a long time the papal authority was merely a weapon in the hands of the French king. Clement V. also sold the Knights Templar to Philip IV., who treated them in a cruel and unjust manner, in order to get possession of their wealth. (See **TEMPLARS**).—**PHILIP V.** (1316-22), the second son of Philip IV., based his claims to the throne on the Salic law. His brief reign was uneventful.—**PHILIP VI.** (1328-50), the founder of the house of Valois, b. in 1293, a son of Charles of Valois, brother to Philip the Fair; was first proclaimed regent of France on the death of Charles IV. in 1328, but when the queen-dowager, who was pregnant at the death of her husband, shortly after gave birth to a daughter, who, according to the Salic law, was excluded from the French throne, Philip assumed the royal dignity and was crowned at Rheims. Edward III. of England, a grandson of Philip the Fair, laid claim to the French throne, and when Philip undertook to support David

Bruce of Scotland, the English king made an alliance with Flanders and declared war in 1337, thus opening that terrible contest between the French and English dynasties which lasted for 100 years, exhausted England, and devastated France. The two prominent events of the war during the reign of Philip VI. were the battle of Cressy (1346), in which the French army was totally routed, and the capture of Calais by the English (1347). In the following year the plague, the so-called Black Death, entered France and made fearful ravages; but in spite of all these calamities the king, who was bigoted and debauched, went on with his carousals, squandering the money which was extorted from the people by heavy taxes and ruinous government monopolies.

Revised by F. M. COLBY.

Philip: the name of five kings of Spain, of whom two deserve a special notice.—**PHILIP II.**, b. at Valladolid, May 21, 1527; succeeded his father, Charles V., in the Netherlands in 1555, and in the other possessions of the Spanish crown Jan. 16, 1556. Charles's attempts to procure for his son the imperial crown of Germany and the Austrian possessions had failed, and Philip's marriage with Queen Mary did not have the anticipated effect of making England the ally of Spain, but Philip II. was nevertheless, on his accession to the throne, the most powerful monarch of Europe. He ruled over Spain, its vast dominions in America, the East Indies and Africa, the two Sicilies, and Milan, Burgundy, and the Netherlands, to which in 1581 he added Portugal; and these countries were at that time the principal centers of European civilization and wealth. From his father's reign he inherited a war with France, the pope, and the Turkish sultan, who had made an alliance for the purpose of depriving the Spanish crown of its Italian possessions; but the Duke of Alva, Viceroy of Naples, drove the French out of Italy and compelled the pope to sue for peace under the walls of Rome, while the brilliant victories of St. Quentin and Gravelines, won by Egmont, enabled Philip to conclude an advantageous peace with France at Câteau-Cambrésis, Apr. 2, 1559. Nevertheless the forty years' reign which now followed was a period of decline. The countries under his scepter sank into degradation or rose in rebellion. On leaving the Netherlands he confirmed the political privileges of the provinces, but he refused to repeal his father's ordinances against heretics. On the contrary, he would enforce them, and immediately set to work to extirpate heresy in the Netherlands by means of the Inquisition. He met with energetic resistance, and the Duke of Alva was sent as governor to the country, with an army of Spanish veterans. Egmont, Horn, and other prominent men were executed and horrible cruelties perpetrated; but the result was just the opposite of that which had been expected. The resistance, instead of dying out, grew into a revolution, and under the organization and leadership of William of Orange the union of the seven provinces was formed at Utrecht in 1579, and a protracted war was carried on against Spain by land and sea. When Philip died Spain was exhausted, but the provinces were not reduced to obedience. In his wars against the Turks or the Mohammedans in general he gained a brilliant success by the battle of Lepanto, Oct. 7, 1571. After this victory it would have been possible to incorporate the northern coast of Africa into the political systems of the civilized world, and Don John of Austria entertained some such idea; but Philip felt a jealous distrust of his illustrious half-brother, and the situation of the Mediterranean pirates remained the same after the battle as it had been before. The destruction of the Invincible Armada was a mortification which he bore with dignity, but the unfortunate war against Henry IV. of France and the disadvantageous Peace of Vervins (May 2, 1598) he felt as a deep humiliation. After a lingering and painful disease he died in his palace of the Escorial in Sept., 1598, leaving Spain exhausted almost to prostration, with its industry, commerce, and other material resources greatly impaired and disturbed, and the proud, adventurous spirit of its people curbed by despotism and influenced by fanaticism. He was four times married—with Maria of Portugal, Mary of England, Elizabeth of France, and Anne of Austria. By his first wife he had a son, the unfortunate Don Carlos; by his fourth wife he had another, Philip, who succeeded him. (See Prescott, *History of Philip II.* (3 vols., 1856-59), and Motley, *Rise of the Dutch Republic* (3 vols., 1856).)—**PHILIP V.** (1701-46), the founder of the house of Bourbon in Spain, b. at Versailles, Dec. 19, 1683, the second son of the dauphin Louis, son of Louis XIV. by the Spanish princess

Maria Theresa; was declared heir to the Spanish throne by the will of Charles II., who died childless Nov. 1, 1700. There was, however, another claimant to the throne—Archduke Charles of Austria—and war began almost immediately. (See SUCCESSION WARS, Spanish.) By the Peace of Utrecht (1713) Philip retained the Spanish crown, but he was compelled to surrender his possessions in Italy and the Netherlands to Austria, and Gibraltar to England. He was indolent, weak-minded, and always controlled by his advisers. Under his first marriage, with Louisa Maria of Savoy, the Princess Orsini had the predominant influence; after his second marriage, in 1714, with Elizabeth Farnese of Parma, the queen, Cardinal Alberoni, the adventurer Ripperda, and others held the reins. The policy of the queen was concentrated on the acquisition of the former possessions of Spain in Italy for her sons, for which purpose Spain waged several wars. (See SUCCESSION WARS, Austrian.) Meanwhile the king became weaker and weaker. Jan. 10, 1724, he abdicated in favor of his eldest son, but as the young king died Sept. 6, 1724, Philip was persuaded to assume the government once more, though he had become almost idiotic. At last he would not leave his bed, and nothing would arouse him from his mental stupor but the songs of Farinelli. D. in Madrid, July 9, 1746.

Revised by F. M. COLBY.

Philip, or **Metacom**, usually called **King Philip**: young-son of Massasoit, sachem of the Pokanoket Indians of Massachusetts. He succeeded to the chieftainship on the death of his brother Alexander 1662, when he visited Plymouth and promised friendship to the colonists, but in 1675 headed the war known by his name, in which thirteen towns were destroyed and 600 colonists killed. Philip was killed at Mt. Hope Aug. 12, 1676, by a party under Capt. Benjamin Church, after his tribe had been nearly annihilated.

Philippeville: town (founded in 1838); in the province of Constantine, Algeria, on the Gulf of Stora (see map of Africa, ref. 1-D). It forms the port of Constantine, is well built, and has a fine harbor and large fishing, manufacturing, and trading interests. It is the seat of a bishopric. Pop. (1891) 21,962.

Philip'pi [Lat.; in Gr. *οἱ Φίλιπποι*; mod. *Filipi*]: an ancient town of Macedonia; built, or at least enlarged, by Philip, from whom it received its name. It became very famous as the place where the battle was fought in 42 B. C. between Brutus and Cassius on the one side, and Antony and Octavianus on the other. Brutus and Cassius were totally routed. The apostle Paul founded a Christian church here (Epistle to the Philippians). J. R. S. STERRETT.

Philippians: See PAULINE EPISTLES.

Philipp'ies [from Gr. *Φιλιππικός*, pertaining to Philip, deriv. of *Φίλιππος*, Philip]: a name properly belonging to three splendid and spirited orations of Demosthenes against King Philip of Macedon. The first was delivered in 351 B. C., the second in 344, the third in 341. There is a fourth philippic, which is assigned by some to the year 340, and which is generally pronounced either a forgery or a patch-work. The fourteen orations of Cicero against Mark Antony are also called philippics. They were delivered in 44 and 43 B. C., mostly in the senate, but the second and severest and most famous was written and not delivered. The name is applied to any severe personal attack in speech or print.

Revised by B. L. GILDERSLEEVE.

Philippine Islands: a group of over 400 islands, extending across sixteen degrees of latitude between Formosa and the Moluccas, and forming the northern part of the Malay Archipelago. The largest are Luzon, Mindanao, Samar, Mindoro, Panay, Leyte, Negros, Masbate, and Zebu. The total area is estimated at 114,326 sq. miles, all under Spanish rule and divided into forty-three provinces. Pop. about 7,000,000. The Philippine islands are of volcanic origin. Active volcanoes are found throughout the whole group, such as Mayon in Luzon and Buhayan in Mindanao, and earthquakes are frequent and often violent; in 1863 Manila, the capital of Luzon, was nearly destroyed, and in 1864 the whole province of Zamboanga, in Mindanao, was fearfully devastated. The soil is exceedingly fertile, and as water is abundant both in lakes and rivers, and the climate is hot and moist, vegetable life reaches here an almost gigantic development. The mountains, rising to a height of 7,000 feet, are covered to their very tops with forests of immense trees, yielding excellent timber and many of the most valuable sorts of wood. Teak, ebony, cedar, and gum

trees, iron and sapan wood, are interspersed with bread-fruit and cocoanut trees, oranges, citrons, mango, tamarinds, and other varieties of fruit-trees, the whole bound together with floating garlands of huge climbing plants and brilliant parasites. On the extensive slopes and in the valleys are cultivated abaca or hemp, of which about 65,000 tons are annually exported. In 1890 8,000 tons of tobacco and 110,000,000 cigars were exported. The other products are cotton, sugar, coffee, indigo, rice, wheat, maize, pepper, ginger, vanilla, cinnamon, cocoa, etc. Of dangerous wild beasts there are none; oxen, buffaloes, horses, goats, sheep, and swine of peculiar but excellent breeds are extensively reared; deer, wild boars, pheasants, ducks, and fine fish are abundant; the forests swarm with monkeys, squirrels, parrots, sun-birds (*Neotarniidae*), and bees—the jungles with lizards, snakes, tarantulas, and mosquitoes and other insects. Gold is found; also iron, copper, coal, vermilion, saltpeter, quicksilver, sulphur (in large quantities, both pure and mixed with copper or iron), mother-of-pearl, coral, amber, and tortoise-shell.

The Philippine islands were discovered in 1521 by Magellan, who died here in the same year, and a few years later the Spaniards, under Villalobos, took possession of the group and named it in honor of King Philip II. of Spain. The inhabitants consist partly of negritos, who have woolly hair and other characteristics of the Negro, and seem to have formed the aboriginal population. They live in the interior, are repulsive and savage in aspect, and roam in bands. There are only a few thousand pure blood negritos left, as they have long been in process of extermination by the Malay immigrants, or of absorption through cross-breeding with other peoples. The Malays are in large part Roman Catholics, settled in villages, and engaged in agriculture and fishing. They possess many fine branches of industry—as, for instance, their beautiful mats and their elegant linen fabrics—and they imitate European industry, ship-building, leather-dressing, carriage-building, etc., with great success. The Chinese and the mestizoes, descended from Chinese fathers and native mothers, are mostly engaged in commerce. Very few Spaniards reside in the islands, but the Chinese are very numerous. A formidable insurrection which broke out in 1896 is as yet (1897) unsuppressed.

Revised by C. C. ADAMS.

Phil'ippins [from Philip Pustowski, one of their former leaders], or **Staroverski** (old-faith men): name of a sect of Russian origin settled since 1700 in East Prussia and Lithuania. They reject oaths and the priesthood, refuse to do military service, rebaptize all converts from other sects, and have a celibate eldership. They are peaceable and industrious citizens, but have at times fallen into wild, fanatical excesses. They cling persistently to the ancient liturgy of the Russian Church, which has been officially discountenanced for more than 200 years. The Philippins are a branch of the RASKOLNIKS (*q. v.*).

Philippop'olis (Bulg. *Plovdiv*): chief city of Eastern Roumelia (South Bulgaria); picturesquely situated on five granite hills close to the Maritza in the middle of the great Roumelian plain (see map of Turkey, ref. 3-C). It is a center of trade in attar of roses, grain, tobacco, wool, and wine, and does an extensive banking business. The inhabitants are enterprising. Pop. (1890) 33,442. E. A. G.

Philippoteaux, 1765-1865, HENRI EMANUEL FÉLIX: painter; b. in Paris, France, in 1815. He was a pupil of Léon Cogniet, and worked with him on the painting of the *Battle of Mount Tabor* for the Museum of Versailles. He adopted the historical and descriptive manner of painting, and his work, though not of very high rank as fine art, is of great interest as illustration. Late in life he painted several remarkable panoramas. D. Nov. 9, 1884. Of his important pictures there are in the South Kensington Museum *Before the Battle of Fontenoy* and the *English Squares at Waterloo*; at Versailles, *The Chevalier Bayard defending the Bridge at Garigliano*, *The Siege of Antwerp in 1832*, and the *Battle of Montebello, 1859*; at the Luxembourg, *Louis XV. on the Field of Fontenoy*; and in the gallery of Versailles, *The Last Banquet of the Girondins*. R. S.

Philips, AMBROSE: poet; b. in Leicestershire, England, about 1671; educated at St. John's College, Cambridge, and graduated 1696; settled in London as a writer; was an associate of Steele, Addison, and their circle; wrote six *Pastorals*, which appeared in Tonson's *Poetical Miscellany* (1709) along with others by Pope—a circumstance which led to a bitter rivalry between the two poets; produced on the

stage three tragedies, *The Distressed Mother* (1712), *The Briton*, and *Humphrey, Duke of Gloucester* (1721); began in 1718 the publication of a serial paper, *The Free-thinker*, which attained great popularity; became secretary to the primate and to the chancellor of Ireland 1726; was chosen a member of the Irish Parliament; became registrar to the prerogative court 1734; returned to London, where he published a collection of his poems 1748. D. there June 8, 1749.

Revised by H. A. BEERS.

Philipsburg: borough; Centre co., Pa.; on the Moshannon river, and the Penn., the Beech Creek, and the Altoona and Philipsb. Connecting railways; 20 miles N. of Tyrone, 38 miles N. by E. of Altoona (for location, see map of Pennsylvania, ref. 4-E). It is the center of the bituminous coal region, has a large lumber-trade, and contains a national bank with capital of \$50,000, a private bank, and a daily, a semi-weekly, and two weekly newspapers. Pop. (1880) 1,779; (1890) 3,245.

Philip the Bold: Duke of Burgundy; b. Jan. 15, 1342, a son of John, King of France. He distinguished himself in the battle of Poitiers (1356), where he saved his father's life and received the surname of *Le Hardi*. Sept. 6, 1363, King John gave him, as a fief of the French crown, the duchy of Burgundy, which had become vacant by the extinction of the elder ducal line in 1361. Philip married Margaret of Flanders, heiress of Flanders, Artois, Rethel, and Nevers, and founded the younger ducal line, under which Burgundy became one of the most prominent powers of Western Europe. During the minority and subsequent insanity of Charles VI., Philip the Bold assumed the regency of France, which involved him in many feuds with his brother, the Duke of Anjou, and his nephew, the Duke of Orleans, but which he held to his death Apr. 27, 1404.

Philip the Good: Duke of Burgundy; b. at Dijon, June 13, 1396, a grandson of Philip the Bold. He succeeded his father, John the Fearless, after his assassination on the bridge of Montreaux in 1419, and married in 1424 Jacobæa of Holland, heiress of Holland, Brabant, Zealand, and the rest of the Low Countries. In order to avenge the murder of his father, which had been perpetrated at the instigation of the dauphin, afterward Charles VII., Philip allied himself closely with England, and acknowledged by the Treaty of Troyes (1420) the English king as the legitimate heir of the French crown after the death of Charles VI. The arrogance of the English, however, provoked him afterward to break the alliance, and in 1435 he concluded a separate peace with Charles VII. and aided him in expelling the English from France. He governed his extensive possessions with great wisdom, and, in spite of several risings in Ghent and Bruges, occasioned by heavy taxation, he was much loved by his subjects. D. at Bruges, June 15, 1467.

Philistines [from Lat. *Philisti'ni*, from Heb. *Pe'lishtim*, Philistines. See PALESTINE]: a people who occupied the southern seacoast of Palestine during most of the period of biblical history, and were almost constantly at war with the Israelites. The Old Testament speaks of them as immigrants into Palestine from the Egyptian region known later as Caphtor (Gen. x. 14; 1 Chron. i. 12; Amos ix. 7; Jer. xlvii. 4). Once, apparently, they are called Caphtorim (Deut. ii. 23). The immigration occurred early, as they were in or near the region in the time of Isaac (Gen. xxvi. 1, 8, 14, 15, 18), and probably earlier, in the time of Abraham (xxi. 32, 34). The accounts of the conquest under Joshua seem to imply that the region was then occupied partly by Philistine and partly by Canaanite communities (Josh. x. 29-34, 40-41; xi. 16; xii. 11-15; xv. 11, 38-47, etc., compared with xi. 22; xiii. 2-3).

In the phrase "whence the Philistines came out" (Gen. x. 14), the adverb denotes the region whence they came, not the race. The passage gives no indication as to whether the Philistines were Hamitic by race. Perhaps the evidence indicates that they were either Semites or Aryans who became thoroughly Semitized in language. Some have tried to connect the twelve to fifteen names and titles we know as Philistine with Sanskrit and Greek, but a Semitic derivation fits better in every case. The ending *ath*, which is found in many names (Goliath, Achish), is Egyptian, and indicates an emigration from Egypt. The land of the Philistines was the low plain called the *Shefelah*, and their superiority in the arts of war and in the possession of weapons several times enabled them to conquer the Israelites. The five chief cities of the Philistines, Gaza, Ashdod, Ashkelon, Gath, and Ekron, had their several princes, who were

united in a confederacy. The chief divinities of the Philistines noticed in the Bible are Dagon, Ashtaroth, and Baal-Zebub. The Philistines shared the fate of the Israelites in successive subjection to Assyria, Babylon, and Egypt, and disappeared altogether from history previous to the Christian era.

Revised by WILLIS J. BEECHER.

Philistus (in Gr. *Φίλιστος*): Greek historian; b. about 435 B.C.; was a general in the service of Dionysius the Elder and Dionysius the Younger, and wrote a history of Sicily from the beginning to 362 B.C., in which he showed practical sense and insight as well as groveling servility toward his masters. Thucydides was his model, and he imitated him in condensation of style, in the strictly chronological order of his narrative, and in the use of speeches; hence he was called by Cicero *pusillus Thucydides*. The fragments are to be found in Müller's *Fragmenta Historicorum Græcorum*, vol. i., pp. 185-192, iv., p. 639 foll.

B. L. GILDERSLEEVE.

Phillimore, JOHN GEORGE, LL.D.: b. in Oxfordshire, England, in 1809; educated at Westminster School and at Christ Church College, Oxford; called to the bar at Lincoln's Inn 1832; became an eminent jurist and (1851) queen's counsel and professor at the Middle Temple; M. P. 1852. Besides a number of pamphlets on legal topics, he wrote an *Introduction to the Study and History of the Roman Law* (London, 1848); *Private Law among the Romans; Principles and Maxims of Jurisprudence*; and began the publication of a history of England during the reign of George III. (vol. i., 1863). D. at Shiplake House, Oxfordshire, Apr. 27, 1865.—His brother, Sir ROBERT JOSEPH PHILLIMORE, D. C. L., b. in London, Nov. 5, 1810, graduated at Oxford in 1831. He also was a distinguished lawyer and writer; sat in Parliament 1853-57; and held the offices of judge-advocate general (1871), judge of the arches court 1867-75, judge of the high court of admiralty 1867-83. He was made a baron in 1881. D. Feb. 4, 1885. His most important works are *Commentaries on International Law* (3d ed. 1879-89); *The Ecclesiastical Law of the Church of England* (1873; largely taken from Burn's *Ecclesiastical Law*); also, besides other works, the *Memoirs and Correspondence of George Lord Lyttelton from 1734-73* (1845). Most of his works were published under the name of Robert, or Sir Robert, Phillimore.

Revised by F. STURGES ALLEN.

Phillips, GEORGE: historian; b. at Königsberg, Germany, in 1804, of English Protestant parents; studied law at Berlin and Göttingen under Savigny and Eichhorn; was successively professor at Berlin, Innsbruck, and Vienna; became a Roman Catholic with his wife in 1828, and retired from teaching to live at Salzburg. The great epochs of the Middle Ages, the times of Charlemagne, Innocent III., and St. Louis, exercised a powerful charm over the mind of Phillips, who saw in them the highest flowering of Catholicism. He wrote much on the imperial and constitutional history of Germany, but he will be best remembered by his monumental work on canon law entitled *Das Kirchenrecht*, of which seven volumes (Manz, Regensburg) appeared from 1845 to 1872, in which year he died. The work has been taken up by Prof. Vering, of Prague, who printed in 1889 the first part of the eighth volume; a compendium of it exists in German and Latin for the use of seminaries. He was a man of very great erudition in mediæval matters, possessed a sure and sober judgment, and rigorously adhered to the historico-critical method in his great canonical work. See Adolphe Tardif's *Histoire des sources du droit canonique* (Paris, 1887), p. 370. He co-operated with Görres and others in founding the *Historisch-politische Blätter*, a Roman Catholic monthly review of history and politics.

J. J. KEANE.

Phillips, JOHN, LL.D.: benefactor; b. at Andover, Mass., Dec. 6, 1719; graduated at Harvard 1735; was for a time a preacher, but became a successful merchant of Exeter, N. H., where in 1781 he founded Phillips Exeter Academy at a cost of \$134,000; gave \$31,000 to Phillips Academy, Andover, besides liberal sums to Dartmouth College and Nassau Hall, New Jersey. D. at Exeter, N. H., Apr. 21, 1795.

Phillips, JOHN: geologist; b. at Marden, Wiltshire, England, Dec. 25, 1800; was a nephew and pupil of William Smith, called "the father of English geology"; became Professor of Geology in King's College, London, in the University of Dublin, and finally in the University of Oxford; and made important researches in geology, electricity, mag-

netism, astronomy, and meteorology; author of *Illustrations of the Geology of Yorkshire* (1829-36); *A Treatise on Geology* (2 vols., 1837-38); *Palaæozoic Fossils of Cornwall, Devon, etc.* (1841), and other writings on geology. D. at Oxford, Apr. 24, 1874.

Revised by G. K. GILBERT.

Phillips, WENDELL: orator and anti-slavery leader; b. in Boston, Mass., Nov. 29, 1811; the son of John Phillips, the first mayor of Boston; graduated at Harvard College in 1831 and at the Cambridge Law School in 1833, and was admitted to the Suffolk bar in 1834. When he entered upon his professional career the anti-slavery movement was attracting serious attention. In 1835 occurred the attack on William Lloyd Garrison by a Boston mob, and two years later the murder of Lovejoy, the editor of an anti-slavery newspaper in Alton, Ill. His sympathy with the Abolitionists was strengthened by these acts of violence, and at a meeting held in Boston to condemn Lovejoy's murder he delivered a speech of great fire and eloquence, condemning what he characterized as the cowardly spirit of those who would submit without protest to so gross a violation of the liberty of the press. From this time he was the foremost orator of the Abolitionists. He gave up his commission as a lawyer on the ground that he could no longer hold himself bound to obey the Constitution, which recognized the existence of slavery and protected the slaveholder in his rights. Refusing to accept money for his services, he devoted himself with unflinching energy to the advocacy of the anti-slavery cause, for which he maintained that even the disruption of the Union was not too high a price to pay. Believing that the war would lead to emancipation, he supported the North throughout the contest, and when that side triumphed he still continued as president of the Anti-Slavery Society his work on behalf of the Negroes, contending for their possession of equal civil rights with the whites. With the passage of the Fifteenth Amendment the Anti-Slavery Society found its objects attained, and it accordingly dissolved, but by this time Phillips's fame as an orator had won wide recognition, and he made frequent and much-applauded speeches on other topics. In addition to his anti-slavery championship he was an advocate of women's rights and a supporter of the temperance movement, and he occasionally lectured on subjects that had no relation to his aims as a reformer. A well-known lecture of this sort was that *On the Lost Arts*, which was very frequently repeated by him. He also lectured and wrote on financial subjects, and on the relations between capital and labor. He advocated prohibitory legislation in regard to the sale of liquors, maintaining that the attempt to govern great cities on the basis of universal suffrage had been a failure owing to the influence of the dram-shop. He urged that the national banks be deprived of the right to issue bills, and that the Government furnish all the national currency, separating it wholly from any coin basis, and let the currency rest solely on the credit of the Government. D. in Boston, Feb. 2, 1884.

Revised by F. M. COLBY.

Phillipsburg: city; Warren co., N. J.; on the Delaware river, and the Cent. of N. J., the Del., Lack. and West., the Lehigh Valley, and the Penn. railways; opposite Easton, Pa., 50 miles N. N. W. of Trenton (for location, see map of New Jersey, ref. 2-C). It is in an agricultural, iron-ore, and limestone region, and is noted for its extensive iron-works and their productions. There are six public-school buildings, public-school property (over \$60,000), a national bank with capital of \$200,000, and a daily and a weekly newspaper. Pop. (1880) 7,181; (1890) 8,644; (1895) 9,081.

Philoch'orus (in Gr. Φιλόχορος): the most important of the writers of special histories of Attica (Ἀττικῆς): flourished in the first half of the third century B. C. Fragments are in Müller's *Fragmenta Historicorum Græcorum*, vol. i., pp. 384-412, and iv., pp. 646-648.

B. L. G.

Philocte'tes (in Gr. Φιλοκτήτης): in Grecian mythology, son of Peas and Demonassa. He was educated in archery by Heracles, whose bow and arrows he inherited from his father, Peas, who received them from Heracles, because he had set fire to the pyre of that hero. Philoctetes started to Troy with seven ships, but having been bitten on the island of Chryse by a snake sent by Hera because of the service rendered to Heracles, he was abandoned on the island of Lemnos by his fellows, who could not endure the stench of his wound and his agonized wailings. He lay on Lemnos for more than nine years, when he was brought to Troy by Odysseus and Diomedes, or Neoptolemus, because an oracle had declared that Troy could not be taken without the ar-

rows of Heracles. He was healed by Machaon, killed Paris, and Troy was taken. See the tragedy of Sophocles entitled *Philoctetes*.

J. R. S. STERRETT.

Philode'mus (in Gr. Φιλόδημος) OF GADARA: Greek philosopher of the first century B. C., fragments of whose writings have been discovered at Herculaneum, some of them of great importance for our knowledge of the Epicurean school, to which Philodemus belonged. See Ritter and Preller, *Historia Philosophiæ* (1888), p. 447 foll.; Gomperz, *Philodem* (1891), and Sudhaus, *Philodemi volumina rhetorica*. A number of amatory epigrams by Philodemus are contained in the *Anthologia Palatina*.

Phi'lo Judæ'us [= Lat., liter., Philo the Jew]: theologian; b. at Alexandria about 20 B. C.; spent his whole life there, with the exception of two journeys he made—one to Jerusalem and one to Rome. Of his life very little is known. He was of a wealthy family, and occupied a conspicuous position in his native place. In the year 40 A. D. he was chosen a member of the embassy which the Jews sent to Rome to Caius Caligula. The embassy stayed in Rome over half a year without being admitted to the presence of the emperor; but during the reign of Claudius a learned defense of the Jews, written by Philo, was read in the Roman senate. The embassy he has described in his *Legatio ad Cæsum*. In Alexandria he devoted all his time to study, and although as a philosopher he is without original genius, the peculiarity of his situation as mediator between Greek and Oriental wisdom, between Platonism and Judaism, between polytheism and monotheism, gave his writings a great influence in his own time, and makes them interesting to ours. He was a very religious man, and believed himself to be an orthodox Jew; but yet is the first representative of those of his countrymen who accommodated the faith of their ancestors to the new circumstances. His writings, which are in the Greek language, may be divided into three classes—those defending his countrymen, *Contra Flaccum*, *Legatio ad Cæsum*, *De Nobilitate*; those interpreting and explaining the sacred books of the Jews, *De Opificio Mundi* (ed. L. Cohn, Breslau, 1889), *Legis Allegoriarum Libri III.*, *De Monarchia*, *De Praeceptis Sacrorum*, *De Posterioribus Caini*, *De Cherubim*, *De Penitentia*; and those treating metaphysical subjects, *De Alternitate Mundi* (ed. F. Cumont, Berlin, 1891), *Quod Omnis Probus Liber*, *De Vita Contemplativa*. Of these three classes, the second and third are the most interesting with respect to his standpoint. His method of interpretation is the allegorical. The texts of the sacred books are not made subjects of positive criticism, but employed as opportunities for the development of theories. With him matter is an eternal principle. His idea of God is thoroughly monotheistic, but between God and matter he finds a convenient place for the ideas of Plato transformed into the angels of the Old Testament. These ideas, or powers, or angels form the medium through which God reveals himself to the world, and they are all gathered together in a divine world-spirit, a divine intellect, the *Logos*, which, however, in the speculation of Philo, remained a cosmic, naturalistic power without any real personality. D. about 50 A. D. The latest complete collection (8 vols.) was published at Leipzig in 1893. There is an English translation by C. D. Yonge in Bohn's Ecclesiastical Library (4 vols.). Cf. J. Drummond, *Philo Judæus, or the Alexandrian Philosophy in its Development and Completion* (2 vols., London, 1888).

Revised by S. M. JACKSON.

Philola'us (in Gr. Φιλόλαος): Pythagorean philosopher; contemporary of Socrates. The genuineness of the extensive fragments written in Doric dialect was maintained by Boeckh in his *Philolaus* (Berlin, 1829). See Ritter and Preller, *Historia Philosophiæ* (1888), p. 57 foll. B. L. G.

Philology: See LANGUAGE and COMPARATIVE PHILOLOGY.

Philome'le (in Gr. Φειλομήλη): in Grecian mythology, daughter of Pandion, King of Athens, and sister of Procne, the wife of the Thracian king Tereus, who lived at Daulis, in Phocis. Tereus loved Philomele, and having concealed Procne in the country that he might lie with Philomele when she came to visit her sister, he accomplished his purpose, and having cut out the tongue of Philomele, that she might not inform against him, he announced to Procne that her sister was dead; but Philomele, having discovered the truth, wove the story of her wrongs into a mantle and sent it to Procne. The two sisters then killed Itys, the son of Tereus by Procne, and served him up to Tereus for dinner. The sisters fled, Tereus pursued, and when he had

overtaken and was about to slay them, the gods, at the prayer of the sisters, turned all three into birds; Proene into the swallow, Philomele into the nightingale, and Tereus into the hoopoe.

J. R. S. STERRETT.

Philopomen [—Lat. = Gr. *Φιλοποίμην*]: soldier and statesman; b. at Megalopolis, Arcadia, in 252 B. C., of a noble family; was carefully educated; distinguished himself greatly in the battle of Sellasia (221 B. C.) as leader of the horse; lived subsequently for several years in Crete, and was chosen commander-in-chief (*strategos*) of the Achaean League in 208 B. C., a position which he held eight times. It was his policy to put down rigorously all internal dissensions and feuds in order to deprive the Romans of any opportunity of interfering in Greek affairs; and although his plan was finally baffled by the fickleness of his countrymen and the meddlesomeness of the Roman senate, in details he achieved many brilliant successes; thus he compelled the Spartans to join the league, which was an important step toward the establishment of a united Greece. He was in Greek history the last character of an heroic cast. When the Messenians revolted against the league, he was seventy years old and sick in bed, but he rose immediately and put himself at the head of the army of the league. In the ensuing battle he was captured, and the hostile commander sent to him a cup of poisoned wine, which he drank (183 B. C.).

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Philosophy [via O. Fr. from Lat. *philosophia* = Gr. *φιλοσοφία*, liter., love of wisdom; *φίλος*, loving + *σοφία*, wisdom]: a term the introduction of which is currently attributed to Pythagoras on the authority of Cicero (*Tusc.*, v., 3) and Diogenes Laertius (i., 12; viii., 8), but the oldest writer known to use it is Herodotus (i., 30). The Seven Wise Men of Greece were called *σοφισταί*, to denote their practical sagacity rather than their knowledge of science as such. Socrates, however, who left behind him no writings of his own, is said to have called himself a philosopher in order to reprove the Sophists of his time, he being only a seeker of wisdom—they, self-styled possessors of wisdom.

Definition.—Many noteworthy definitions of this science may be culled from its writers. While the Stoics made it include "a striving after virtue in the sciences—physics, ethics, and logic"—Epicurus declared it to be the rational pursuit of happiness. Plato had already designated philosophy as the acquisition of true knowledge (*ἐπιστήμη* = scientific knowledge), and Aristotle had defined it as the science of being as being (*τὸ ὄν ᾗ ὄν*). The relation of cause and effect furnishes the basis of the definitions of the earlier among modern philosophers (Descartes, Bacon, Hobbes, Leibnitz). Wolf returns substantially to the Aristotelian basis by defining it to be the science of possible existence in so far as possible, thus referring to the logical conditions of existence. Fichte makes it the science of sciences (*Wissenschaftslehre*); and this conception is very generally adopted, with slight modifications, by later thinkers. Whenever man attempts to refer all of his cognitions to one he begins to philosophize. Each nation's philosophy is an endeavor to solve the problems of the world, as they appear to it from the standpoint of its national life, by some one principle. This principle may be any cognition selected from the realm of nature or from that of mind. The systems of philosophy of a given nation or time may differ as to the one principle chosen as the explanatory one, but they are certain to agree in the elements of the problem to be solved. For the philosophy of a given epoch endeavors to state in ultimate terms the elements of the problems of its epoch. A philosophic solution of a problem consists in the reduction of the immediate and contradictory elements, as they are given in life, to the ultimate terms or expressions which indicate the universal and necessary conditions out of which those elements have arisen. Hence every philosophy has two factors: (1) The temporal and finite one, which includes the empirical elements to be explained—that is, the then present world of man and nature, which involves problems to be solved; (2) an eternal and infinite element, or the permanent and unchangeable ultimate idea through which the solution is wrought out and by which the temporal and finite is explained: this element is the conception of the absolute as it finds expression in the solution. Thus the different systems of philosophy start from different phases of life (because its phases, from one age to another, are perpetually changing), and yet they arrive at substantially the same result if they are complete systems. The difference, therefore, between the systems of philosophy of different

peoples appertains rather to the empirical factor than to the character of the general terms in which the solution is expressed and contained. It has been pointed out (see GENERALIZATION) that in the most rudimentary form of knowing—i. e. in sense-perception—there is a synthesis of the two extremes of cognition: (1) The immediately conditioned content, which is the particular object as here and now perceived; (2) the accompanying perception of the self or Ego which perceives—that is, the activity of self-consciousness, the knowledge that it is I who am subject in this particular act of perception. Thus in sense-perception two objects are necessarily combined: (a) The particular object here and now presented; (b) the universal subject of all activity of perceiving. This universal subject, which is thus its own object in all forms of knowing, appears in two characters if we reflect upon it: (1) It is absolutely particular—i. e. present in this special moment now and here, and in this special act of perception; and (2) it is absolutely universal, retaining its self-identity under the constant change or flux which essentially belongs to the process of the immediate now and here, or present moment. The present now is a point in time, and thus has no duration except through the synthetical addition of past and future time, which are not, but either *were* or else *will be*. Thus such a thing as the perception of a permanent or a relation of any sort (for example, the one of identity or of difference, the most elementary and fundamental ones) can not take place without attention on the part of the subject who perceives to the perception of self or to the universal factor which is present in perception. This act of attention to self is reflection, self-perception entering all perceptions. The degree of the power of reflection or of attention to self-consciousness measures the ability to generalize or the ability to think; or, in other words, the strength of thought. For the minimum of this power of reflection admits barely the possibility of combining the perceptions of time-moments that are slightly separated, and hence its results are bare perceptions of identity or difference, without their quantity and quality. Sense-perception increases in richness of knowledge in proportion as the power of synthesis or of combining the successive elements of perception increases. And this power of combining such separate elements is contingent on the power of reflection or of attention to the self-activity in perception. Such reflection has been called "second intention," and is the condition of all generalization. Self-consciousness is therefore the basis of all knowledge; for all predication—from the emptiest assertion, "This is now," up to the richest statement involving the ultimate relation of the world to God as the highest principle—is possible only through a withdrawal of the mind out of the limiting conditions of the particular here and now by means of attention to its own activity, which, as already pointed out, comprehends the two phases of absolute particularity and absolute universal potentiality in one. This is the psychological basis of the general principle laid down regarding the identity of systems of philosophy and their phases of difference. The naïve state of mind of the uncultured human being, alike with the acute philosophical intellect or the intuition of the religious mystic, involves in all its activities and at every moment thereof this phase of attention to the self-activity or to the subject which knows. The naïve or non-philosophical stage of consciousness differs from the philosophical stage in the fact that the latter sets up some one of its cognitions as the highest principle, through which it attempts to explain the totality of said cognitions, while the former makes no such attempt. The philosophical activity of the mind is therefore a *third intention*, or act of attention which has for its object the reference of individual cognitions, whether particular or general, to an assumed supreme principle. This philosophical act, it is evident therefore, is a species of reflection different from that reflection which is implicit in all cognition. It is an act of withdrawal of the mind from immediate cognition, which arises through the first and second intention (or perception and reflection), and a concentration of the attention upon the relation of that immediate cognition (as existing in its separate details) to all cognition as totality. It is therefore systematic knowing. Moreover, as already suggested, it may posit as its supreme principle any one of its cognitions, taking, for example, an empty one lying close to the sensuous pole of cognition, or a concrete one lying close to the pure Ego. Thus it may make matter, or some form of matter, as water, air, fire, or ether, the philosophical principle which is to explain all things, being universal and

particular at the same time; or it may take for this purpose Reason (*νοῦς*), the Will, the Idea, the Good, *Causa sui*, the self-representing monad, or some form nearly approaching the pure Ego, for its principle; but the psychological presupposition underlying all philosophy, whether materialistic or spiritualistic, is the fact of withdrawal or abstraction of the mind from its first stage of cognition, and the contemplation of the same under the form of relation to a single principle—i. e. to an absolute totality. This contains the remarkable result that in this species of knowing the mind views its first principle, or the primitive existences by which it explains things as self-activities; which means that mind sees under its knowledge its own form as the ultimate truth of all. Take the standpoint of materialistic philosophy, for example: Matter is the ultimate principle, the whence and whither of all. Matter is thus posited as a universal which is the sole origin of all particular existences, and also the final goal of the same. Hence matter is active, giving rise to special existences, and also changing them into others with all the method and arrangement which we can see in natural laws. For matter must contain in it potentially all that comes from it. Hence matter is creative, causing to arise in its own general substance those particular limitations which constitute the differences and individuality of things. It is negative or destroyer in that it annuls the individuality of particular things, causing to vanish those limitations which separate or distinguish this thing from that other. Such a principle as this "matter" is assumed to be, which causes existences to arise from itself by its own activity upon itself and within itself, entirely unconditioned by any other existence or energy, is self-determination, and therefore analogous to that factor in sensuous knowing which was called the Ego or self-consciousness—an activity which is universal and devoid of form, and yet incessantly productive of forms, and destructive of the same. All this is implied in the theory of materialism, and exists there as separate ideas, only needing to be united by inferences; but "matter" as such idea is a cognition which arises only through reflection; it is perceived by "second intention," for first intention only refers or relates to immediate particular objects, and not to general objects like "matter," which is only a term for the persistent activity which recurs in the perception of whatever object it apprehends in time and space. As cognition of the mind, therefore, "matter" is a product of "second intention," but as philosophic principle it is more than this: it is this special cognition of matter posited as the absolute or as the totality and entirety of cognition, and hence not as limited through other particular cognitions, but as containing within itself a limiting power necessary for the particularization of other cognitions. Hence it is a pure Ego in so far as the possibility of all special ideas are concerned, and an active process so far as actual particular existence arises from it. Thus the position even of materialistic philosophy implies the thought of a totality which is purely universal, and a pure activity originating particular existences at the same time. Here we meet the most important distinction which belongs to the definition of philosophy. The degrees of consciousness are various, and differ through the completeness with which they grasp the determinations of the self-activity of the Ego. On the stage of philosophy consciousness grasps determination as a totality, and hence as self-determination; but this may happen in all shapes, from the emptiest up to the fullest and concrete. Even in materialism the attempt to explain the world through an ultimate principle indicates the certitude of the mind of the objectivity of its principle of self-determination, and it therefore implicitly asserts and presupposes that the truth of things is self-determination. Yet it may under this form so far contradict itself as to represent its content, "matter," to be a mere spatial existence, thinking under the term a vague abstraction as the origin of all immediate particularity and as the final cause thereof, without distinctly defining to itself these attributes as belonging to matter as highest principle. There are, then, various forms of philosophy, differing in the degree of completeness in which they consciously define their highest principle as the concrete Universal which originates the particular by its self-activity, and thus realizes itself in its own externality.

The distinction of philosophy from religion (which would be thought at first to be a reduction of all special beings to an absolute principle, God, in the same manner as defined for the province of philosophy) lies in the fact that while philosophy attempts to comprehend the totality of things

through its absolute principle, religion represents its absolute in the historical relation of Creator of the world, and thus while it does subordinate all knowledge to one of its own principles, the mind in religion is not active in its third intention, but only in its first and second intentions. Religion offers its teaching to the lower and lowest stages, as well as to the highest stages of theoretical consciousness; for its revelation, although of the highest essence, is not immediately addressed to the theoretical reason, but rather to the Will. Hence it presents its absolute, not for assimilation, but for practical reconciliation with the individual. The relation of theosophy or mysticism to philosophy is here to be defined. Setting out from the standpoint of religion, and positing the absolute of religion as not only the principle of human action, but also of theoretical cognition, the religious mystic explains the world of nature and of history through it. This constitutes theosophy. It purports to arise through special illumination of the mind through the Absolute, and may be very profound and complete in its theory of things, but will of necessity use categories borrowed from religion, and consequently tinged with pictured representations, while philosophy uses its thoughts abstractly, and derives them from the activity of reflection.

The province of literature is to be distinguished from philosophy through the fact that its works seek an æsthetic unity of form, rather than a unity in the principle portrayed. It may happen, as in the poem of Lucretius, *De Rerum Natura*, that a philosophical treatise assumes an æsthetic form, but such form does harm to the requirements of scientific method. The essay and the literary criticism may offer profound reflections, but they are necessarily hampered through their form when it is literary rather than scientific.

The sciences, finally, are more difficult to distinguish from philosophy, especially the mental sciences. Indeed, philosophy is sometimes made synonymous with mental science, or with psychology. While religion agrees with philosophy in content (the relation of the Absolute to the world), it differs from it in form (employing the principle of faith or authority instead of logical necessity); the sciences, on the contrary, agree in form, but disagree in content. They treat of the systematic arrangement of materials within special provinces, rather than the reduction of the same to the first principle of all. The province of philosophy may include those of all special sciences, and even those of art and religion, jurisprudence and ethics, psychology and ethnology, in so far as those provinces are made elements of the problem of the universe to be solved by a first principle.

Method.—Philosophy alone can cognize methods, whether of other provinces of mental activity or of its own procedure. First and most obvious is the analytic method, which proceeds by resolution of a whole into its parts, and is a method of invention or discovery, inasmuch as it concentrates indefinitely the power of the mind upon a subject by attacking its details singly. This method is in philosophy what the microscope is in anatomy and kindred physical investigations. It proceeds from the vague to the distinct and clear. Then there is the synthetic method, which proceeds by combination or composition, and is a method of generalization or of principles—a method of explanation rather than of discovery. Besides these species of method, their union gives rise to higher species of method: (1) Deductive method, proceeding from the necessity of the whole to the necessity of the parts; (2) inductive method, proceeding from particulars contingently given to their necessary unity; (3) dialectic or genetic method, which by the analysis of its object discovers its essential dependence upon other objects and its unity with them; again, considering the new object, which has arisen synthetically through the discovery of dependence in the first object upon other objects, it discovers by analysis a new form of dependence, which leads to a new synthesis, etc. It is a method of ascent toward a first principle by the discovery of presuppositions, and by their addition to the object considered. It is contrasted by Plato (*Repub.*, bk. vi., ch. xiii.) with the mathematical method (that of simple deduction), as the method which removes its hypothesis (i. e. its first object) and ascends toward a first principle (*ἐπ' αὐτὴν τὴν ἀρχήν*), while geometry and the kindred sciences use fixed hypotheses (i. e. assumed first principles), and are unable to show their necessity as the dialectic method does by the discovery of presuppositions. The method of Aristotle is dialectic in the same sense as that of Plato, differing only in this, that he makes it more exhaust-

ive by laboriously collecting and discussing all the inadequate phrases that fall under each subject, exhibiting at last the true archetype or adequate realization of the species, as though he had empirically discovered it by careful investigation. The dialectic method contains the process of analysis in union with that of synthesis. Its analysis proves to be a synthesis because it reveals dependence, and hence the relation of the part to a whole. It must be present under all forms of necessary thinking, even when the thinker is unconscious of his method; as, in fact, he may be even of all method, and still think philosophically. The inductive and deductive methods, so called, unite analysis and synthesis also, but in the former the side of analysis is partly suppressed, in the latter that of synthesis. Again, the dialectic method is skeptical when it lays chief stress on its negative side, on that of the destruction of its hypothesis through the discovery of dependence, and speculative when it subordinates the negative phase to the total result, which is constructive of a more comprehensive and deeper thought—hence of a truer thought.

Classification.—(A) From the foregoing definition of philosophy it is evident (a) that there is one province of thought which belongs partly in the domain of philosophy and partly in that of religion—to wit, theosophy or mysticism. In it the dogma is partially rationalized, and therefore belongs to the realm of cognition instead of faith. Theosophy is the first form of philosophy, therefore, inasmuch as it makes its appearance as an outgrowth from religion, the effort being made to realize the content of religion as truth. (b) Thought perfectly independent from religion, and intent on constructing a rational view of the world and on reducing its common notions to consistency, may originate systems of materialism. This happens when it is not yet sufficiently disciplined to seize consciously its higher cognitions (those of the soul, for example) as first principles with which to explain the world; it therefore posits a cognition lying close to its ordinary experience and most familiar to it, as the explanation of all. (c) By continued reflection it gradually discovers what it has implied by endowing a principle with the power of originating all things, and comes to adopt, step by step, more spiritual principles until it reaches pure idealism and recognizes the world of sense-perception as phenomenal manifestation of absolute mind. This first series is founded on the "third intention of the mind" and constitutes dogmatic philosophy. (B) Above this standpoint begins the series of systems founded on perception of method (the fourth intention of the mind, making for its object the operations of the mind in its third intention, or ordinary philosophizing). (a) The first system founded on perception of method is skepticism, which breaks the link between subject and object, between the mind and the truth, by calling attention to the process or method of the mind in philosophizing, and exhibiting the modifying effect of mind upon truth. It shows that the activity of the mind enters and constitutes an element of truth, and therefore invalidates it. (b) The second system founded on the perception of method is the system of critical philosophy, giving to it the name which Kant gave his own system. On it is founded the third phase of philosophy which we may call Absolute Idealism, giving it the name given to its best type, the system of Hegel. (C) As the second phase of philosophy is skeptical when it perceives philosophic method only in glimpses, so when it comes to make an exhaustive study of method and to learn all of its possibilities, as in the critical philosophy of Kant and Fichte, then it arrives at the insight that the object of the third intention—namely, mind as the first principle or absolute, is also the presupposition of all psychological method. After this skepticism becomes impossible. This third phase of philosophy is founded on the fifth intention of the mind and perceives the positive side of method, and its necessary universality as principle of existence or as logical condition of the world. This last system is sometimes called pure science, science of ideas in and for themselves, ontological logic, science of knowledge, absolute idealism, etc. Examples of each of these five systems may be found in the subdivision *History of Philosophy*.

Departments.—The old division of Wolf makes four departments in philosophy: (a) Ontology, (b) rational psychology, (c) cosmology, (d) theology. This may be modified to meet the present development of philosophy thus: (a) Pure science or logic or methodology—dialectical discussion of general ideas; (b) science of nature, corresponding to rational cosmology; (c) science of spirit, including numerous subordinate spheres, such as (1) psychology, (2) ethics, (3)

politics and history, (4) æsthetics, (5) theology (natural). This corresponds nearly to the division of the ancients into (a) dialectics, (b) physics, (c) ethics.

History of Philosophy.—The history of philosophy, according to the definition discussed in this article, will contain the record of all thinking which refers the manifold of experience to an ultimate principle; this explanatory principle being materialistic on the one hand in the elementary stages of thought, and idealistic in the more advanced stages, while it becomes a principle of method (or a principle at once ontological and psychological) in the highest thinking.

The Orient has generally been excluded from the domain of the history of philosophy, on the ground that its thinking is not emancipated from religious authority. Religion and philosophy are mingled in a species of theosophy in Asia, but are worthy of study as a phase of transition containing the embryonic shapes and metamorphoses that become fully developed and distinct in the literature, religion, and philosophy of the Western peoples. The Chinese systems of Lao Tsū (604 B.C.) and Confucius (550 B.C.) posit a first principle (called *Tao* by the former, and *Tai-ki* by the latter), an abstract indeterminate substance, whence arise masculine and feminine principles that beget all things.—The Indian caste system gives rise to limitations so irksome and galling that the great problem in Indian thought is emancipation; it seeks relief from the rigid particularity of the distinctions (tedious ceremonial observances) which it encounters in life, by flight to the indefinite, vague, and empty ground of substance of all things, and finds solid satisfaction in contemplating Brahm—i. e. the pure identity wherein neither caste-differences, nor the bewildering luxuriance of tropical nature, nor even the prolific creations of its own active fancy and teeming intellect, any longer find subsistence to vex and weary it. Besides the Sankhya or rational system, there are reckoned the Nyaya, or logical system of Gautama, and its modification in the atomic system of Kanada, called the Vaiseshika Philosophy; the Vedic system, full of mysticism, including the elder school of commentary called *Purva Mimansa*, founded by Jaimini, and a later one, called *Uttara Mimansa*, founded by Krishna Dwaipayana; but the philosophic principle is the same in all these, namely, the doctrine that the absolute is Pure Being devoid of all attributes, and that all phases of mind and matter are only illusion (Maya).—The philosophic standpoint of the Persian consciousness is considered to be an advance upon those just considered, in that it gives greater validity to the negative element—that of limitation or finitude, the principle of individuality or particularity. It posits a process, the conflict of light and darkness or of good and evil, the positive and negative, as the explanatory principle of the universe.—The worship of Hercules and of Adonis in Syria and of Osiris in Egypt indicates a progress over the standpoint of Zoroaster, in that the principle of particularity is still more highly prized. Purification through pain reconciles the finite and infinite, and it is not necessary to annihilate the former. Immortality of the individual becomes explicable, and the Egyptian mind is mostly occupied with this thought.—Western Asia (including Egypt) occupies itself with the problem of individuality and its essential inherence in the absolute. Its influence appears in the Ionic philosophy, particularly in the teachings of Anaximander and Heraclitus; in the Pythagorean philosophy; in Neoplatonism; in gnosticism; in the mysticism founded on the *Cabbala*; in the early Christological speculations of the Church; in Arabian mysticism.—The history of philosophy in the Occident, beginning with Greece, has to do with independent thinking, and is no longer obliged to seek its material in systems that are partly religious, partly ethical, and partly speculative. Greek philosophy begins with the Ionic school in Asia Minor, Thales, Anaximander, Anaximenes, and Heraclitus being its chief names. They set up material principles—(a) water, (b) the indefinite (matter), (c) air, and (d) fire—as the origin of things. Pythagoras, born in Ionia and taught in its school of philosophy, founded a society in Lower Italy, and proclaimed numerical harmony as his principle. The Eleatic school (also of Lower Italy) set up the principle of pure being, thus arriving for the first time at a principle entirely above and beyond experience, a principle seen only by pure thought acting *a priori*; it included Xenophanes, Parmenides, and Zeno. Empedocles of Sicily taught that love and hate are the ultimate principles, while Anaxagoras at Athens announced the important doctrine that Reason

(*νοῦς*) arranges and orders all things. Leucippus and Democritus of Thrace founded the atomic philosophy. The Sophists, of whom the most important were Protagoras, Gorgias, and Prodicus, discovered and applied the principles of ratiocination, or the dependence of conviction upon grounds or reasons. Socrates investigated universals, seeking ultimate grounds for conviction in order to establish moral principles on a firm basis. The *νοῦς* of Anaxagoras becomes with the Sophists individual reasoning—with Socrates, universal reason as conscience. Plato, continuing the investigation, finds the theoretical universals, the ideas or archetypes, antecedent to and dominant over the world of experience. Aristotle, finally, takes an empirical inventory of the world, and completes the demonstration that *νοῦς* is the principle of things in detail, being their final cause. He finds that all universals are phases of one universal Reason (*νοῦς ποιητικός*), which is the highest principle. His doctrine of first and second entelechies defines the relation of individuals to this absolute Reason and the grounds of the immortality of man. He maps out the paths of the several particular sciences, and makes important investigations in many of them. His pupils, Eudemus and Theophrastus, and his commentators, Alexander of Aphrodisias, Porphyry, Themistius, Simplicius, and, later, Avicenna and Averroës, deserve mention in any notice of Greek philosophy, however brief. The Stoic school of Zeno of Citium, whose system is ethical in its tendency, the school of Epicurus, whose system is an atomic materialism, belong to the decline of Greek philosophy. (This brief summary of the first phase of Greek philosophy may be supplemented by reference to special articles in this cyclopaedia, such as THALES, PARMENIDES, ZENO OF ELEA, HERACLITUS, PYTHAGORAS, SOPHISTS, SOCRATES, PLATO, ARISTOTLE, STOICS, ZENO THE STOIC, TELEOLOGY, FORM, MATTER, SUBSTANCE, IDEA, SIMPLICIUS, SEXTUS EMPIRICUS, and LUCRETIUS.) The revival of Greek philosophy at Alexandria after the Christian era was occasioned by the contact of Greek thought with Orientalism. Alexandria was the focus or center for the East and the West. Neoplatonism, accordingly, is the struggle to define the relation of Greek thought to spiritual religion. Its distinguished names are Ammonius Saccas, Plotinus, the two Origenes, Porphyry, Iamblichus, and Proclus. Its principle is the transcendence of the Deity, and it labors to explain how the world emanates from a primal One which is in no wise related to it, and is devoid of all antithesis, and therefore unthinkable. Boëthius, through his *Consolatio* and his translation of a portion of the *Organon*, and by his commentary on the *Isagoge* of Porphyry, transmitted almost all that was known of Greek philosophy by the Christians in the West for several centuries. (See articles on PLOTINUS, PORPHYRY, IAMBELIUS, PROCLUS, GNOSTICS, MYSTICISM, and PHILO JUDÆUS.)—Within Christianity, Gnosticism arose in the second century as an attempt to construct a philosophy on a Christian basis. Philo had already speculated on the Logos. Valentinus made the *νοῦς* the “only-begotten” and the source of the Logos. Origen and Clement endeavored to assimilate some of the Gnostic doctrines. After the Council of Nice had given definition to the orthodox faith, more attention was given to the philosophic justification of its dogmas. Athanasius, Gregory of Nyssa, St. Augustine, Synesius, Aeneas of Gaza, Philoponus, and the pseudo-Dionysius the Areopagite contributed to this work. In the ninth century it was the translation of the writings of the pseudo-Dionysius, evidently a Neoplatonist, by Scotus Erigena that gave rise to scholasticism. The controversy of nominalism and realism, in which Roscellinus, Anselm, Abelard, and William of Champeaux were the chief disputants, occupied the first period of scholasticism. The mastery of Aristotle and the refutation of the pantheistic commentary of Averroës were the chief business of the second period, in which appeared the great theologians Alexander of Hales, Bonaventura, Albertus Magnus, Thomas Aquinas, and Duns Scotus. Aristotle became the “precursor Christ in naturalibus,” as John the Baptist “in gratiis.” Besides Averroës should be named Avicenna, Alfarabi, Alkendi, and Algazel among the Arabians, and Avicembron, Ben David, and Moses Maimonides among the Jewish philosophers. Roger Bacon and William of Ocam did not follow the prevailing tendencies, the former being an experimenting physicist born before his time, and the latter an invincible opponent of the logical realism current. Nominalism under Ocam destroyed the tendency to rationalize the dogma, and scholasticism went down altogether. (See articles on SCHOLASTICISM, NOMI-

NALISTS, REALISM, IDEALISM, IMMORTALITY, NECESSITY, OCAM, DUNS SCOTUS, and AQUINAS.) The fall of the Eastern empire brought many learned Greeks into the West, and kindled at Florence and elsewhere the direct study of Plato and Aristotle in the original Greek, whereas hitherto the interpretation of commentators had been generally accepted. Distinguished translators and new commentators, such as Ficino, Pomponatius, Scaliger, appeared. (See FICINO.) The naturalistic opponents of the traditional philosophy of the schools at this period, Nicolaus Cusanus, Jerome Cardan, Telesius, Patritius, and Ramus, prepared the way for an epoch of emancipation from authority, in which the leading spirits were Giordano Bruno, Francis Bacon, and René Descartes. The first of these attacked the ecclesiastical authority in matters of science; the second founded the empirical method of philosophizing; the third completed the emancipation from scholasticism by bringing the principles of philosophy to the test of consciousness and by discarding the authority of tradition. Thomas Hobbes applied Bacon's principle to politics; Geulinx and Malebranche explained the relation of mind and matter in the Cartesian dualism; Spinoza avoided the Cartesian dualism altogether by adopting the principle of One Substance with the two attributes, thought and extension. Locke attempted a critical survey of the powers of the mind to cognize truth, and found sense-perception and reflection to be the sources of all ideas. Berkeley drew from Locke's doctrine the inference that we know only ideas and not the external world. Cudworth, author of the *Intellectual System*, and Henry More the Platonist, Gassendi the atomist, Grotius and Puffendorf, writers on international law, Bayle the pantheist, are among the foremost thinkers of that time. Meister Eckhart, probably a pupil of Albertus Magnus, founded in the fourteenth century along the Rhine the most noteworthy school of theosophy yet known, and with his followers, Tauler, Heinrich Suso, John Ruysbroeck, and the author of *Theologia Germanica*, and Thomas à Kempis, exercised a most potent influence on the growth of thought in Germany and the rise of the spirit that produced the Protestant Reformation. Jacob Böhme, contemporary of Descartes and Lord Bacon, developed another system of theosophy nearly as remarkable as that of Eckhart, and in substantial agreement with it. With Leibnitz, theosophy becomes philosophy. His doctrines were systematized by Wolf, and held sway down to the time of Kant. In his *Monadology* he sets up in opposition to the mechanical system of Descartes the doctrine of monads, which have no mechanical relation to each other, but only the ideal or psychological one of representing each other. David Hume is the point of departure for the chief systems of philosophy which have appeared during the past hundred years. His criticism on the idea of causality, reducing it to the mere “habit of surveying things constantly conjoined with each other,” sapped the foundations of all dogmatic philosophy current at his time. La Mettrie, Voltaire, Rousseau, Condillac, Diderot, d'Alembert, Robinet (who anticipated Darwinism and the Spencerian “evolution”), and Von Holbach are noted thinkers in the same movement in France. Lessing began the struggle for literary independence in Germany, and Kant completed the reaction in philosophy and freed his country from its subservience to French ideas. The *Critique of Pure Reason* established on the ground of their universality and necessity the *a priori* character of causality and other categories, and demonstrated the self-activity of the mind in sense-perception. The *Critique of Practical Reason* showed that God, free will, and immortality are necessarily postulated by all acts of the individual as “regulative ideas”; hence these are the logical conditions of human action. These two *Critiques* rescued religion and morality, and the institutions founded on them, from the attacks of skepticism, but they denied the possibility of theoretical cognition in the realm of objective existence. This inability the later schools of German philosophy labored to remove. Fichte's *Science of Knowledge* showed in a systematic form the origin of the categories in the self-activity of the mind, and proved that the will is therefore presupposed everywhere as a conditioning factor in cognition. The sensuous factor of knowledge is accordingly subordinated, and the moral world is almost the only world that exists for Fichte. Schelling, however, reacts to the opposite extreme, and lays great stress on the evolution of unconscious organism in nature and human history. The central object of his system is therefore aesthetic art, wherein the unconscious reason reaches its completest expression. Schelling's school in-

cludes the distinguished theosophist Baader and the naturalists Oken, Carus, Oersted, Esenbeck, Steffens; the theologians Schleiermacher, Eschenmayer, Blasche, Görres; Schubert the cosmologist, Stahl the jurist, Solger and Ast, aesthetic writers; besides Krause, Troxler, Jacob Wagner, and others. Hegel, in opposition to Schelling's tendency to emphasize unconscious evolution, endeavored to grasp the content of nature and mind with self-conscious method. His "unity of thought and being" means that universal and necessary ideas, being the logical conditions of the world of experience, are as objective as they are subjective, any denial of this principle being self-contradictory, inasmuch as it assumes to pronounce *a priori* upon the objective possibility of existence—the very thing it repudiates. Hegel's philosophy, like that of Aristotle, takes an encyclopedic inventory of the world of nature and man, reconciling and interpreting all phases. The most eminent of the direct expounders of Hegel are Marheineke, J. Schulze, Gans, Von Henning, Hotho, Förster, Michelet, Rosenkranz, Weisse, Göschel, Erdmann, M. Carrière, K. Ph. Fischer, R. Eucken, and Kuno Fischer. All these expound with originality, and sometimes with important deviations.

According to the popular distinction of Strauss, there is a left wing which expounds the Hegelian system as a logical pantheism (panlogism); a right wing which expounds it in conformity with orthodoxy; a center which agrees substantially with the right wing, but introduces many modifications in technique and interpretation. The study of Hegel and of the Kantian movement in his direction has made its way into Great Britain through the original writings and translations of J. H. Stirling (*The Secret of Hegel*), J. Caird, of Glasgow, T. H. Green, E. Caird, and W. Wallace, of Oxford; and further by A. Seth, D. G. Ritchie, B. Bosanquet, E. S. Haldane, E. Wallace, R. Adamson, F. H. Bradley; into France especially through A. Vera, Ch. Benard; into Italy through A. Vera, B. Spaventa, R. Mariano; into the U. S. through the *Journal of Speculative Philosophy*, and the expositions and translations of J. Watson, C. C. Everett, E. Mulford, G. S. Morris, G. H. Howison, H. C. Brockmeyer, D. J. Snider, J. Royce, J. S. Kedney, J. Dewey, W. S. Hough, W. M. Bryant, J. M. Sterrett, R. A. Holland, N. M. Butler, J. G. Schurman, A. T. Ormond. A school has arisen in Germany which, starting from Hegel or Kant, approximates somewhat in methods the English and Scotch schools of empirical psychology. Its most eminent names are J. H. Fichte, Wirth, Zeller, Ulrici, Fr. Harms, Bona Meyer, Liebmman, Volkelt, J. Bergmann, J. Rehmke, W. Schuppe. A materialistic tendency appears in the writings of the "left" Hegelian wing, and becomes pronounced in Strauss, Feuerbach, and some others. Experimental psychology has recently taken new life from researches in anthropology, ethnology, folklore, child-study, hypnotism, spiritism, mind-reading, and other phases of "psychic research," and more especially through the discoveries in the physiology of the brain and nerves made since the success of Broca in fixing the location of the lesion producing aphasia in 1868. In England the names of Carpenter, Maudsley, D. Ferrier, Galton, Lubbock, Romanes, Sully, Spencer, Tylor, J. Ward, G. C. Robertson, A. Bain, are connected with one or another phase of this movement; in America the names of G. T. Ladd, W. James, G. S. Hall, J. M. Baldwin, J. B. Powell, L. F. Ward, G. Mallory, D. G. Brinton, J. Fiske, G. S. Fullerton, J. M. Cattell, E. B. Titchener, E. Barnes, C. L. Franklin, are most distinguished in the several departments of this study; in Italy the criminologist C. Lombroso is eminent; and in Germany, where the movement borrowed its methods, its literature is due to W. Wundt, Helmholz, A. Horwies, G. T. Fechner, E. Dubois-Reymond, A. Schleicher, E. Haeckel, F. Brentano, H. Münsterberg, H. Ebbinghaus, C. Stumpf, H. Witte, T. Lipps, G. K. Uphues, M. Dessoir, and their collaborators; in France the hypnotic phenomena have received more attention than elsewhere, and the location of psychical activities in the brain has been investigated with much thoroughness. The writings of Th. Ribot, A. Binet, G. Tarde, Ch. Féré, are studied in both hemispheres. Herbert reproduced Leibnitz modified by ideas derived from Kant and Fichte. His school is prolific in distinguished writers, especially in the department of psychology as applied to philology and education. Prominent are the names of Drobisch, Beneke, Exner, Hartenstein, Lazarus, Steinthal, Waitz, Bonitz, Wittstein, A. Fouillée (in France). II. Lotze's system is almost eclectic, being founded on a criticism of the Herbartian system and the later Kantian systems. It has exercised much influence in the U. S. through the

writings of B. P. Bowne, G. T. Ladd, and J. Cook. Trendelenburg's system is based chiefly on Aristotle and Kant, and represents a reaction against the logic of Hegel. Schopenhauer revived the Buddhistic system with great penetration and power of exposition, and with caustic criticism of his contemporaries. E. von Hartmann has added to its popularity by his writings, and Frauenstaedt has connected it with the "left-wing" interpretation of Hegel. Other disciples of Schopenhauer are Julius Bahnsen, K. Peters, P. Deussen, P. Mainländer, the novelist Spielhagen, and the musician Richard Wagner. Italian philosophy counts Galuppi, Gioberti, Rosmini, Mamiani, and the Hegelians (at Naples), Vera, Spaventa, Mariano, Ragnisco. The writings of Rosmini have been translated into English by his disciples, W. Lockhart and T. Davidson, and expositions made of his ideas in psychology and metaphysics. Besides these, there is an active school of positivists in Italy represented by R. Ardigò, A. Angiulli, G. Cesca, G. Sergi, E. Lombroso, Morelli, and Caporali. In France, Laromiguière, Royer Collard, Maine de Biran, B. Constant, Victor Cousin, T. Jouffroy, P. Janet, C. de Rémusat, Saint-Hilaire, Emil Saisset, J. Simon, Ravaisson, represent the spiritual tendency, partly stimulated by the Scotch philosophy, partly by the scholastic traditions of the universities, and partly by the Kantian movement. Saint-Simon, Fourier, P. Leroux, represent the socialistic direction, and Comte and his disciples positivism. Comte has gained followers in all countries. In France, Blignières, Littré (lexicographer), P. Lafitte, many of the physiological psychologists, Taine, are eminent names in this school. In Great Britain Frederick Harrison is the leader of positivism. A reaction against the materialistic followers of Locke begun with V. de Bonald, Jos. de Maistre, and F. de Lamennais. Writers that should not be omitted in a list of French philosophers are J. Reynard, E. Vacherot, E. Carot, Claude Bernard (physiologist), J. M. Guyau, and especially C. Renouvier, whose writings show the influence of Kant. The Scotch school of Reid, Stewart, Brown, and Sir W. Hamilton begins with a reaction against Hume, and tends toward a modified Kantianism (in the system of Hamilton). Dr. McCosh (see MCCOSH, JAMES) is a later representative. It has exerted a powerful influence in France and the U. S. The writings of Mansell furnished the foundations of Herbert Spencer's doctrine of the unknowable. The school of Locke and Hume has been represented in the nineteenth century by Stuart Mill, Lewes, and Spencer. All these, and especially Herbert Spencer, have exerted a powerful influence upon thinking minds engaged in natural science. German philosophy was introduced to the English-speaking world by Coleridge and Carlyle and later by J. H. Stirling, Jowett, Flint, T. H. Green, J. F. Ferrier, J. Caird and E. Caird. Shadworth Hodgson has criticised the Kantian doctrines of time and space. Whewell, De Morgan, Boole, Jevons, Venn, Bradley, and Whateley have written on logic, and H. Sidgwick, Leslie Stephen, and James Martineau have written on ethics. In the latest period there has arisen in Germany a movement which takes as its watchword "back to Kant." It counts among its leaders Fr. Paulsen, F. A. Lange, O. Liebmann, A. Krause, A. Classen, J. Folkelt, B. Erdmann, H. Vaihinger, H. Cohen, A. Stadler, P. Natorp, K. Lasswitz, and E. König. The following German writers on philosophy in various departments should be added to those already named: Laas, Riehl, and Avenarius as German positivists; A. Zeising, and K. Groos, writers on aesthetics; C. Sigwart, W. Schuppe, and J. Bergmann as writers on logic. American philosophy counts (a) in its theological school the names of Edwards, Dwight, Taylor, Tappan, Finney, W. E. Channing, D. D. Whedon; (b) in its transcendentalist school, chiefly founded at first on Platonism and the Coleridge version of Kantianism, and later on influenced by French eclecticism, Fichte, and other Germans, Marsh, Emerson, Margaret Fuller, A. B. Alcott, Theodore Parker, J. F. Clarke, George Ripley, O. A. Brownson (who afterward became a Thomist), F. H. Hedge, and H. D. Thoreau; (c) in its psychological school (following the Scotch school or the French eclectics), N. Porter, F. Bowen, A. Mahan; (d) in its school based on the study of Kant or his successors, L. P. Hickok, C. C. Everett, J. B. Stallo, and nearly all the present teachers of philosophy in the colleges of the U. S. Most of those who have contributed to philosophy by their writings have been mentioned in other connections. (See articles on IDEALISM, IDENTITY, KNOWLEDGE, REASON, SENSATIONALISM, TRANSCENDENTALISM, UNDERSTANDING, DESCARTES, SPINOZA, MALEBRANCHE, BACON (FRANCIS), LOCKE, LEIBNITZ, HOBBS, HUME, KANT, FICHTE, SCHELLING,

HEGEL, SCHLEIERMACHER, SCHOPENHAUER, HERBART, MILL, J. S., and SPENCER, HERBERT. Consult also, on the general problems recurring in the history of philosophy, GENERALIZATION, INFINITE, MIND, MORAL PHILOSOPHY, PSYCHOLOGY, SCIENTISM, SOUL, THOUGHT, and WILL. The chief historians of philosophy are Stanley, Bayle, Brucker, Tiedemann, Buhle, Tennemann, Reinhold, Ritter, Hegel, Schweigger, Erdmann, Ueberweg, Cousin, Lewes, Zeller, K. Fischer, L. Ferri, E. Zeller, R. Falcenberg, W. Windelband, Ludwig Noach (*Philosophisches-Geschichtliches Lexikon*). Recent periodicals devoted to speculative philosophy are *Zeitschrift für Phil. und philosophisch. Kritik* (at Halle); *Phil. Monatshefte* (at Berlin); *Die Neue Zeit* (at Prague); *La Filosofia della Scuola Italiana* (now *Rivista Italiana di filosofia*) (at Rome); *Mind, a Quarterly Review of Psychology and Philosophy* (at London); *Revue philosophique de la France et de l'Etranger* (at Paris); *Journal of Speculative Philosophy* (New York); *The Monist* (Chicago); *International Journal of Ethics* (Philadelphia); *The Philosophical Review* (Ithaca, N. Y.); *American Journal of Psychology* (Worcester); *The American Anthropologist* (Washington); *Journal of American Folk-lore* (Boston); *Philosophisches Jahrbuch* (Fulda); *Vierteljahrsschrift für Wissenschaftliche Philosophie* (Leipzig); *Psychological Review* (New York); *The Platonicist* (Osceola, Mo.); *The Journal of the American Akademie* (Jacksonville, Ill.); *Rivista Filosofica Scientifica* and *La Nuova Scienza* (organs respectively of Signor Morelli and Signor Caporali, Italian positivists); *Revue de Hypnotisme* (Paris). W. T. HARRIS.

Philosophy, Moral: See MORAL PHILOSOPHY.

Philosophy of the Conditioned: See CONDITIONED, PHILOSOPHY OF THE.

Philostatus (in Gr. *Φιλόστρατος*): a name borne by four Greek sophists of the same family of Lemnos: 1. The eldest Philostratus, son of Verus, lived under Nero and wrote the dialogue of that name (*Νέρων*), preserved among the writings of Lucian. 2. The next, Flavius Philostratus the elder, a descendant of Verus, flourished under Alexander Severus (222-235 A. D.), and composed, among other things, the *Lives of the Sophists* (*Βίοι Σοφιστῶν*) and a remarkable romance, *The Life of Apollonius of Tyana* (see APOLLONIUS OF TYANA), much used as an offset to the life of our Saviour. 3. The third Philostratus, son-in-law of Philostratus II., wrote a series of descriptions of paintings; and 4. A fourth Philostratus wrote a second series in imitation of the first. Whether and how far these descriptions deal with real works of art is disputed. The works of these various Philostrati are of great importance for an appreciation of the periods to which they belong. There is a text edition of all the works by Kayser, in the Teubner Library (2 vols., 1849), and a separate edition of the *Vite Sophistarum*, with a copious commentary by the same scholar (Heidelberg, 1838). A new edition of the *Imagines* of the elder Philostratus was published by the members of the Vienna Seminary in 1893.

B. L. GILDERSLEEVE.

Philostratus (in Gr. *Φιλόστρατος*): Greek dithyrambic poet (435-380 B. C.) of Cythera; lived long at the court of Dionysius the Elder, about whose poetical performances he used great plainness of speech. One of his dithyrambs suggested the *Cyclops* of Theocritus. Fragments of another, *The Banquet*, are interesting for their rhythmical form and for the account they give of the luxury of the Sicilian table, and are to be found in Bergk's *Poete Lyrici Græci*. B. L. G.

Philter [from Lat. *philtreum* = Gr. *φίλτρον*, love potion, deriv. of *φιλέω*, love]: an aphrodisiac preparation. Philters were much used in ancient Greece and Rome, and the Thessalians had special eminence in their preparation. From the accounts which have come down to us, many of their ingredients were harmless, or at most disgusting, and used on account of some purely fanciful efficacy; while others, it would seem, were violent poisons. Thus a doubtful tradition says that the poet Lucretius died in consequence of a strong philter given by his wife; and some hold that Caligula's madness was caused and maintained by his wife's philters. The use of these potions is prevalent in almost all barbarous and half-civilized lands. As of old, magic arts are employed to add force to the supposed natural powers of the drugs.

Phintias: See DAMON AND PYTHIAS.

Phips, or Phipps, Sir WILLIAM: Governor of Massachusetts; b. in Pemaquid, now Bristol, Me., Feb. 2, 1651; was a shepherd, but when eighteen was apprenticed to a ship-

builder; removed to Boston, where he worked as a ship-carpenter, and subsequently engaged in commerce; went in 1684 to England, and obtained means to fit out a vessel to recover the silver of one of the Spanish Plate fleet wrecked off the Bahamas, but was not successful until 1687, when he obtained treasure worth \$1,500,000 (some accounts say \$3,000,000), for which he got about \$80,000, besides receiving knighthood and the office of high sheriff of New England; headed, in 1690, an expedition which captured Port Royal, Nova Scotia, and in the same year had command of a fleet which unsuccessfully besieged Quebec; was the first royal Governor of Massachusetts 1692-94; built the fort of Pemaquid, Me., 1692; put an end to the prosecutions for witchcraft by organizing a special court of magistrates for the consideration of the cases; was suddenly called to England 1694 to answer charges against him. D. suddenly, of a malignant fever, in London, Feb. 18, 1695. His enterprise and patriotism were remarkable, and his native abilities fair, but he was ignorant, ill-tempered, credulous, and the tool of abler men. He did not learn to read until he was twenty-two years of age. Cotton Mather wrote an eulogistic *Life of Phips*, who was a member of his church. A trustworthy one by Francis Bowen is given in Sparks's *American Biography* (Boston, 1834-37).

Phlebitis [Mod. Lat.; Gr. *φλέψ, φλεβός*, vein + suff. *-itis*, denoting a disease of]: inflammation of the coats of a vein or veins. Phlebitis may occur in any part of the body from direct injury and accidental or surgical wounds. Idiopathic or primary phlebitis occurs chiefly in the lower extremities, especially in the tortuous expansions and dilated pouches of varicose veins. When a vein is inflamed its contained blood coagulates, adheres to the walls of the vessel; a local fibrinous mass or clot (thrombus) obstructs or wholly suspends the circulation. Exceptionally, this thrombus organizes, connecting with the nutritive capillaries of the venous coats. More often it partly or wholly breaks down, disseminating pus when attached by pyogenic (pus-producing) or putrefactive bacteria, and contaminating the blood, or giving off particles which are carried by the blood to the different parts of the body, and may lodge in the small vessels of large organs, occluding them. Such plugs or emboli deprive a tract of tissue of its nutritive blood-supply, and lead to the condition of fatty degeneration or abscess. Phlebitis, if acute, may be announced by chills and febrile disturbance preceding the local inflammation. The affected vessels are hard, tortuous, prominent, visibly elevated if the surface be viewed in profile. There is a dusky redness over and in the immediate vicinity of the vein, with slight tumefaction and redness of an erysipelatous character, shading off into adjacent tissues. Nodular prominences exist at the site of the valves in the veins. The vein is sensitive to touch, and the entire part tender and painful if moved. Edema or dropsical swelling, evidenced by pitting upon pressure, may result from the obstructed circulation; in the extremities this swelling may be considerable, with sense of great weight, due to accumulated venous blood and serous transudation. Following childbirth, phlebitis occasionally occurs, usually in the lower extremities, due to local thrombi following the perverted blood of the puerperal state, and probably resulting from absorption of septic matter by the open uterine sinuses. This painful condition is known as *phlegmasia alba dolens* (i. e., painful white swelling), and popularly termed "milk leg." Indeed, at present, the infection of the blood by septic matter and local thrombosis are the causes producing phlebitis are generally conceded. Phlebitis and venous thrombosis are chiefly interesting as engendering embolism and similar putrefactive disturbances in other parts of the body, metastatic abscesses. The "multiple abscesses" of the liver follow inflammation of the *venæ portæ*. Coexisting abscesses in the brain, lung, liver, spleen, and kidneys may develop from a general poison of the blood. When a vein is enlarged and rigid, as in the sinuses of the cranium, the veins of old hemorrhoids or stricture of the rectum, or the varicose veins of the leg, its inflammation is very liable to infect the system. The treatment of phlebitis is by local antiphlogistics and internal administration of antiseptics and tonics with absolute rest of the part attacked, and prompt evacuation of collections of pus. Revised by R. PARK.

Phlebotomy: See BLEEDING.

Phlegma'sia [Mod. Lat., from Gr. *φλεγμασία*, heat, inflammation, deriv. of *φλέγω*, burn]: a term synonymous with *phlegmon*, *phlegmous inflammation*, *pseudo-erysip-*

elas, diffuse abscess, and now usually replaced by *cellulitis* or *phlegmonous cellulitis*, denoting an acute inflammation of the subcutaneous cellular tissue, tending to suppuration, in which the pus formed has a tendency to become infiltrated through the tissues, instead of collecting into one place as in ordinary acute abscess. The causes of this variety of inflammation are sometimes very obscure. It is always an expression of an infection by pyogenic or pus-forming bacteria, patients being made more liable thereto by exposure, alcoholic excess, wasting disease, etc. It sometimes results from mortifying shreds of tissue in wounds, and complicating injuries, but in by far the greater number of cases it arises spontaneously in debilitated individuals—persons suffering from mal-assimilation, and consequently having a thin and impoverished blood, i. e. which is incapable of producing a healthy inflammatory action. In such individuals it generally occurs in the extremities, especially in the fingers and hands. The symptoms of phlegmasia are those of ordinary inflammation somewhat aggravated—viz., pain, heat, redness, and swelling; there is always some oedema of the affected part, and, as a consequence of it and the swelling, a tense, shining skin; a throbbing, synchronous with the pulse-beats, is one of the chief symptoms of the disease, and generally immediately precedes the suppurative process. In a few days the skin becomes red at one or more points, and fluctuation appears. Sometimes the oedema and swelling exist to such a marked extent that the skin is deprived of blood, and consequently becomes gangrenous; and as a complication immense sloughs of integument often come away, exposing the uncovered muscles and fasciæ beneath. Accompanying these local symptoms there is always a high fever. In the treatment the first indication should be to remedy as far as possible the condition of the system which has acted as a predisposing cause of the trouble; for this purpose aperients and such tonics as quinine and iron should be given. Locally, suppuration should be hastened by warm applications, and as soon as fluctuation appears at any point an exit should be made for the pus by the lancet; should two or more outlets be found to communicate subcutaneously, the sinus or sinuses should be laid open the entire length, and be allowed to heal from the bottom. Sometimes local depletion, if practiced at the outset of the disease, will cut it short. For *phlegmasia alba dolens*, see PHLEBITIS.

Revised by ROSWELL PARK.

Phlegon (in Gr. Φλέγων) of TRALLES in Caria: Greek historian; freedman of the Emperor Hadrian, and author of a much-read historical compend in sixteen books called *Olympiads*, of which several chapters have been preserved. These and fragments of other works of his are to be found in Müller's *Fragmenta Historicorum Græcorum*, vol. iii., pp. 602–624. B. L. G.

Phlogis'ton: See CHEMISTRY and HYDROGEN.

Phlox [Mod. Lat., from Lat. *phlox* = Gr. φλόξ, a flower, so named from its bright color, special use of φλόξ, φλογός, flame]: a genus of a few annual and nearly thirty perennial herbs of the family *Polemoniaceæ*, all but one Siberian species North American. The phloxes cultivated in flower-gardens are mostly artificial varieties of *Phlox paniculata*, *maculata*, *drummondii*, and *subulata*, all natives of the Atlantic U. S. and Texas.

Revised by L. H. BAILEY.

Phlox Family: the *Polemoniaceæ* (from *Polemonium*, one of the genera), a family of gamopetalous dicotyledonous plants, mostly herbs, distinguished from allied families by having regular and symmetrical flowers with the parts five each, except the superior pistil, which is of three carpels, forming a three-celled capsule. The seed-coat when wet usually develops mucilage and spiral threads, especially in the large genus *Gilia*. *Polemonium* (the Greek valerian or Jacob's ladder) is the only European genus, but the single European species is also North American, as are the few others and nearly all the rest of the family, except a few peculiar to South America, and one or two extending into Northeastern Asia. The family is rich in plants for ornamental cultivation, but is otherwise of no economic importance, the plants and their watery juice being bland and inert. PHLOX (*q. v.*) furnishes the gardens with numerous handsome perennials and one or two annuals, running into many varieties; *Gilia* supplies many annuals, chiefly Californian, and one or two showy biennials, such as the "standing cypress." A common cultivated climber, *Cobæa scandens*, with compound leaves and tendrils, is an anomalous member of the family from Mexico and South America.

Revised by CHARLES E. BESSEY.

Phocæ'a: the most northern of the twelve ancient Ionian cities of Asia Minor; founded by the Athenians on the Erythrean Cape, 200 stadia N. W. of Smyrna. Remarkable for maritime enterprise, its inhabitants were first of the Greeks to build fifty-oared galleys and to undertake distant voyages, traversing the Adriatic, Tuscan, and Black Seas. Attacked by Harpagus, general of Darius, the Phocæans abandoned their city rather than submit, and after long wanderings reached Gaul and founded Marseilles. Their abandoned city attracted colonists, again became rich and powerful, and desperately resisted the Romans. In the Middle Ages the Genoese founded a city, Phocæa Nuova, on the same spot, and with their ships aided the Ottomans against the Greeks. The present insignificant village of Phokia occupies the ancient site.

E. A. GROSVENOR.

Phocas I.: Byzantine emperor (602–610); originally a groom in Cappadocia, then a common soldier, and finally general; was made emperor by the rebellion which deposed Mauritius. Brave before accession though always sanguinary, on the throne he became tyrannical and timid as if demented; was unsuccessful in war against Persia, whose armies marched to Chrysopolis (Scutari). Abhorred as a monster, he was deposed by the people, and put to death with frightful mutilations.—**PHOCAS II.**, or **NICEPHORUS II.**: Byzantine emperor (963–969); before his accession conquered Crete from the Saracens (962), and was decreed a triumph; was proclaimed emperor by the people shortly after the death of Romanus II.; was successful against the Mussulmans in Asia Minor, captured Aleppo and Antioch, made intimate alliance with Sviatoslav, Prince of Kiev, and in subsequent wars was victorious throughout Armenia and Mesopotamia. At the height of his successes he was betrayed by his wife Theophania, and assassinated by John Zimisces, her paramour.

E. A. GROSVENOR.

Phocidæ, fos'i-dēe [Mod. Lat., named from *Phoca*, the typical genus, from Lat. *phoca* = Gr. φώκη, seal]: a family of pinniped mammals belonging to the order *Carnivora*, and containing the earless or hair seals. The nose is blunt, there are no external ears, the flippers are developed as swimming-paddles, the hind limbs, which alone are used in swimming, can not be directed forward, and, as a rule, all the digits bear claws, and are always without the cartilaginous prolongations peculiar to the eared seals (*Otariidæ*). With the exception of one genus (*Monachus*) all are inhabitants of the frigid and colder portions of the temperate zones. See SEAL.

F. A. LUCAS.

Pho'c-ion (in Gr. Φωκίων): an Athenian general; b. about 402 B. C., of humble descent, but excellently educated; commanded with great success against Philip II. of Macedon in Eubœa, Megara, Byzantium, and other places. In politics, however, he sided with the Macedonian party, and was an unrelenting adversary of Demosthenes. After the death of Antipater he became implicated in the intrigues between Cassander and Polysperchon, fled to Phocis, was delivered up to the Athenians, and by them condemned to take poison (317 B. C.), and his corpse was hurled unburied across the frontier. One year later the Athenians raised his statue and erected a fine monument in his honor.

Revised by J. R. S. STERRETT.

Pho'cis [= Lat. = Gr. Φωκίς]: an ancient division of Greece in Hellas proper; was bounded S. by the Corinthian Gulf, E. by Bœotia, N. by Doris, and W. by Locris. It was very mountainous, being almost entirely covered with the famous mountain range of Parnassus. Its northeastern part was traversed by the river Cephissus, which formed a beautiful and fertile valley. Delphi, Elatea, and Cirrha were its principal towns. It derived its chief historical interest from the circumstance that the famous oracle of Delphi was situated in its territory; but this circumstance became at last the cause of its ruin. A verdict of the Amphictyonic Council ordered the Phocians to pay a fine for having used a tract of land which belonged to the oracle. When the Phocians refused to pay, a ten years' war (generally called the Sacred war), from 355 to 346 B. C., broke out, in which they fought bravely, maintaining themselves by the treasures of the temple; but at last they were conquered, chiefly by the strategy of Philip of Macedon, and then their cities, twenty-two in number, were destroyed, and they were scattered in villages, of which none was allowed to contain more than fifty houses.

Phocylides (in Gr. Φωκυλίδης) of MILETUS: Greek elegiac poet; flourished about the middle of the sixth century B. C.

His poems were of brief compass and conveyed moral lessons in more or less humorous forms. A few of these have been preserved. A transparent forgery called *Phœnolidea*, in 230 hexameters, once diligently conined as an authoritative code of morals, is, according to Bernays, the fabrication of an Alexandrian Jew; the time is uncertain, but not later than Nero. Both real Phœcyllides and false in Bergk's *Pœtia Lyrica Græci* (4th ed. vol. ii., pp. 68-109). On the pseudo-Phœcyllides see the admirable treatise of Bernays in *Gesammelte Abhandlungen* (vol. i., pp. 192-261). B. L. GILDERSLEEVE.

Phœbe: See DIANA.

Phœ'be-bird, or Pewee: a well-known fly-catcher of the U. S., the *Sayornis fuscus*, which often builds under old bridges, mills, and at other points near the water. It is easily recognized by its well-known note, whence its name is derived.

Phœ'bus: See HELIOS.

Phœnicia [Gr. *Φοινίκη*. Etymology uncertain, but plausibly connected with *φωινός*, blood-red, a name applied to the people because of their complexion, analogous to the name *Edom*, which also signifies red; the name given by the Greeks to the narrow strip of coast-land between the Lebanon Mountains and the Mediterranean. Its northern and southern limits were never accurately fixed, but in a general way Phœnicia may be said to extend from the mouth of the Nahr el-Kebir to Mt. Carmel. The breadth varies from 10 to 12 miles. Its excellent harbors gave it a most favorable situation for commerce, and as early as the fifteenth century B. C. the towns that afterward rose to such importance, as Sidon, Tyre, Byblos, Beirut, Acre, are already in existence. How much earlier the settlement of these places began it is impossible to say. The language of the country known among the natives as Canaan was at the time already Semitic (see PHœNICIAN LANGUAGE), and the Phœnicians whenever they came either adopted or brought with them this speech. The lack of historical monuments makes it impossible to follow the history of the Phœnicians in unbroken sequence. Inscriptions in large numbers have been found both in Phœnicia itself and in the various settlements made by the Phœnicians, but they are generally of a religious or mortuary character, while the historical annals that appear to have been drawn up by native historiographers are lost, beyond a few fragments preserved in Greek writers. Upon the latter, in combination with the important notices found in the Old Testament and in the annals of Egyptian and Assyrian kings, the history of Phœnicia must largely depend for its reconstruction. The earliest notices that we have show the country to be in a state of dependence upon Egypt. Following the campaigns of Thothmes III. in the seventeenth century B. C., governors were stationed at various points along the coast under Egyptian control, whose duty it was to furnish the tribute imposed upon the country. This control, varying in firmness, continued until the fourteenth century, when the Hittites of Northern Syria appeared as formidable rivals to Egypt, and the latter, agitated by internal disturbances, was unable to retain her hold upon her foreign possessions. The centuries following marked the development of the commercial prosperity of Phœnicia, which gave her such an important place among the nations of antiquity. The native industries of dyes and the manufacture of glass were two of the chief factors that furnished the stimulus to her commercial activity, and about the year 1000 B. C. we find the position of the Phœnicians as the mediators between nations assured. At this time the extension of the Phœnicians beyond the mainland begins. The outlying island of Cyprus may have been settled by them even earlier. After Cyprus, the southern coast of Asia Minor and the islands of the Ægean became additional centers of commercial colonies, and about the ninth century the settlement of Carthage on the African coast took place. Other places followed with the growth of commercial interchange. Sicily, Sardinia, the southern coast of Spain, and, farther to the north, Marseilles, were founded by the Phœnicians. There seems to be no reason to question the tradition that Phœnician ships passed through the Strait of Gibraltar into the open sea and reached the English coast, though whether they actually brought back tin from the mines of Cornwall and amber from the Baltic ocean has not been definitely ascertained. Of the internal history of Phœnicia during all this period few details comparatively are known. The commercial spirit was not conducive to the unfolding of either military force or the creation of a strong national feeling. The cities appear to have been independ-

ent of one another for the greater part of their duration and only occasionally did the one or the other endeavor to extend her jurisdiction beyond her limits. In consequence of this lack of unity the Assyrian conquerors, when, in the ninth century, they began the serious conquests of the lands lying to the west of the Euphrates, met with comparatively little resistance; but the tribute imposed upon the cities did not seriously affect the commercial activity, which steadily assumed larger proportions, and it was not until the advent of the Greeks after Alexander's conquests that Phœnicia began to lose her importance. The independent existence of Phœnicia ended with the absorption of all of Syria and Palestine into the Roman empire.

The share taken by the Phœnicians in the propagation of the alphabet, which was probably not their invention (see PHœNICIAN LANGUAGE), entitles them to an honorable place as potent factors of civilization. Their religion shows an eclectic character, such as we should expect in a nation commingling so largely with others. To the substratum of the primitive Semitic cult, elements taken from the Egyptian and Assyrian religions were added, and at a later period Greek ideas also made themselves felt. The chief god Baal was worshiped in many different manifestations, and the combination of the male and female elements was a distinguishing feature of the religious symbolism that led by a natural degeneration to rites, obscene when viewed from the surface, but redeemed by the mystic sense attached to them.

LITERATURE.—Pieteschmann, *Geschichte der Phœnizier* (Berlin, 1889); Maspero, *Histoire ancienne de l'Orient*, chap. xi. (Paris); George Rawlinson, *History of Phœnicia* (not reliable; London, 1889); Meltzer, *Geschichte der Karthager* (Berlin, 1879); Duncker, *History of Antiquity* (Eng. trans. London, 1877, book iii.); Sayce, *Ancient Empires of the East* (chap. iii., London, 1884). Among older works Mover's *Die Phœnizier* (3 vols., Bonn, 1841-50) still retains its value, though antiquated in parts. MORRIS JASTROW, Jr.

Phœnician Language: a language belonging to the Semitic group (see SEMITIC LANGUAGES), spoken by the inhabitants of the ancient district of Phœnicia (native name *Canaan*), on the Mediterranean coast, but with the founding of colonies by the Phœnicians diffused through the islands of the Mediterranean and Ægean—notably Cyprus, Rhodes, Malta, Sicily, and Sardinia—along the southern and in part western coast of Asia Minor, the northern coast of Africa, and the southern coast of France. It is natural that in a language spread over so large a district dialectical variations should arise and become more pronounced with the lapse of time. Phœnician, as spoken and written on the African and Spanish coast and adjacent islands, is thus sufficiently marked off from that current in the mother-land and parts nearer to it to perhaps merit the distinct name of Punic—the term itself being only another form of Phœnician. This distinction extends also to a variation in the script, and it is possible even to differentiate within the Punic dialect between old and new Punic, but the differences touch only minor points, pronunciation and orthography rather than morphology proper and syntactical construction, so that the relation between eastern and western Phœnician may be appropriately compared to the divergences existing between the English of Great Britain and that heard in the U. S. As in the latter instance, the constant communication between Phœnicia and her colonies acted as a check to the accentuation of these differences sufficiently to preserve the unity of Phœnician speech. Our knowledge of the Phœnician language is derived (1) from the large number of inscriptions, mostly of a mortuary or votive character, found in Phœnicia itself, but more copiously in the various settlements, notably Carthage and Citiun; also the names and phrases found on coins and seals; (2) the Phœnician phrases transliterated into Latin characters occurring in Plautus's comedy of *Pœnulus*; (3) the proper names and occasional words in the Old Testament, in the Egyptian and Assyrian inscriptions, and in classical writers. Of native Phœnician literature proper, which does not seem to have been very extensive, and so far as we know consisted largely of annals, nothing has been preserved beyond some fragments in Greek translation of Sanchuniathon and Hanno.

The inscriptions form naturally the most important source, but covering as they do the period (roughly speaking) from 600 B. C. to 200 A. D., they are not coextensive with Phœnician history, which approached its climax some centuries earlier, while a corrupt Punic dialect survived in Africa as

late as the fifth century of our era. On the other hand, the Phœnician phrases in Plautus, as well as the transliterated names and words revealed through the other sources mentioned, are of great value in determining the more precise form of the language as well as the pronunciation; for the Phœnician script, like all Semitic alphabets (except the Babylono-Assyrian cuneiform and the Ethiopic), expresses only the consonantal framework of the words, without any vowel signs and only a very sparing use of vowel letters. Even with this help, many features in the morphology of the language remain to be determined, even where the meaning of a text is perfectly clear.

It has been definitely ascertained that Phœnician belongs to the northern division of the Semitic group, and bears the closest resemblance to Hebrew (see HEBREW) and Moabitic. Indeed, the variations are so slight that it is regarded by some scholars as a Hebrew dialect. Hebrew and Phœnician may more appropriately be looked upon as two independent branches of some older form of Semitic speech once current in Palestine, and the peculiarities presented by each are due to the different course taken by the two peoples in their political, social, and religious development, just as the still slighter variations between Hebrew and Moabitic are to be accounted for. The more important points of divergence between the Hebrew and Phœnician are (1) the use of *Kân* for the predicate verb in the latter (as in Arabic) instead of *hâyâ*; (2) the more restricted use of the article; (3) the more frequent recurrence of certain suffixes, as *em*; and (4) lexicographical variations involving the common use of certain stems in Phœnician, as *pa'al*, to do, for which in Hebrew quite different ones are brought into requisition. In general, Phœnician betrays a more archaic stage of language than Hebrew, less indicative of phonetic decay, and simpler in its syntactical constructions. The scantiness of the vocabulary is due to the monotonous character of the epigraphical material, which also is disappointing in affording but little light for the history of Phœnicia and her colonies. See SEMITIC LANGUAGES.

The Phœnician script is an interesting and important study because of its position as the direct prototype of the Greek, Roman, and modern European alphabets on the one hand, and of the square character Hebrew, Palmyrene, Arabic, Nabatean, Syriac on the other, while less directly the Sanskrit and derivatives and the Ethiopic are to be traced to the same source. The variations in the form of the characters are considerable as we pass from one century to another, while upon approaching the Neo-Punic period, the tendency to cursive script results in distortions which give the writing a confused appearance. The oldest specimen of "Phœnician" script being the Moabite Stone (about 850 B. C.), the origin of the alphabet must be placed at 1000 B. C. at the least. The question, however, as to the time and circumstances of its invention is still involved in obscurity. Recent epigraphical discoveries seem to show that in Southern Arabia and along the Abyssinian coast a more archaic form of the alphabet than even that of the Moabite Stone is to be found, and it is more than doubtful whether the Phœnicians, whose entire culture shows little traces of originality, are to be regarded as the inventors of the alphabet. De Rouge's theory, that the alphabet is a derivative of the hieroglyphic writing of Egypt, requires new investigation in the light of the advanced culture that has been shown to have flourished in Southern Arabia and Abyssinia as early at least as 1000 B. C. The contingency of these districts to Egypt and the commercial intercourse between them makes it probable that we must, after all, look to Egypt as the source of the alphabet, if future investigations should bear out the proposition that it originated among the Semites of Southern Arabia, and was by them transmitted to the Phœnicians. See ALPHABET.

LITERATURE. — Schroeder, *Die Phœnizische Sprache* (Halle, 1869); Boeckh, *Phœnizisches Glossar* (Berlin, 1891); Stade, *Erneute Prüfung des zwischen dem Phœnizischen und Hebräischen bestehenden Verwandtschaftsgrades, in Morgenländische Forschungen* (Leipzig, 1875); M. A. Levy, *Phœnizische Studien* (Breslau, 1857-64); Renan, *Histoire générale des Langues Sémitiques* (5th ed. Paris, 1878), pp. 181-211. The most complete collection of Phœnician inscriptions is to be found in the *Corpus Inscriptionum Semiticarum* (Paris, 1881-87), published under the auspices of the Académie des Inscriptions et Belles-Lettres. Previous to this the standard work was Gesenius's *Scriptura lingue Phœnicie monumenta quotquot supersunt edita et inedita* (3 vols., Leipzig, 1887).

MORRIS JASTROW, JR.

Phœnicopter'idæ [Mod. Lat., named from *Phœnicopterus*, the typical genus; Gr. *φοῖνιξ*, purple red, red + *πτερόν*, feather, wing]: a family of birds of peculiar organization, whose species are known under the English name flamingoes. In their osseous structure, as in their external characters, they are almost intermediate between the duck-like birds (*Anatidæ* and *Palamedeidæ*) and the stork-like birds (*Ciconiidæ*); there has, therefore, been considerable doubt as to their systematic position, some authors having associated them with the wading birds, and others with swimming birds: on the whole, however, they appear to be most closely related to the swimming birds, although forming a peculiar type or "super-family" by themselves, named by Huxley *Amphimorphæ*. See FLAMINGO.

Phœnix [= Lat. = Gr. *φοῖνιξ*; cf. Egypt. *bennu*]: a fabled bird, whose prototype is found in the Egyptian *Bennu*; sacred to Osiris, and also, particularly, as a form of the rising sun, to Ra, the sun-god. In the hieroglyphs the *bennu* is represented as a heron, but in classical myth, following Herodotus (ii., 73), the phœnix was given the form of an eagle. It was reputed to have its origin amid flame in the top of a sacred tree at Heliopolis. Herodotus represents it as an Arabian bird which arises from its own ashes in Heliopolis once in 500 years, but the myth assumed a variety of other forms.

CHARLES R. GILLET.

Phœnix: city; capital of Arizona and of Maricopa County; on the Salt river, and the Maricopa and Phœnix Railroad; 226 miles N. E. of Yuma (for location, see map of Arizona, ref. 13-L). It is in an agricultural, stock-raising, and mining region, and contains 2 national banks with combined capital of \$200,000, 3 incorporated banks with capital of \$215,200, a State bank with capital of \$50,000, and 3 daily and 5 weekly newspapers. Pop. (1880) 1,708; (1890) 3,152.

Phœnix: village; Oswego co., N. Y.; on the Oswego river, the Oswego Canal, and the Rome, Watertown, and Ogdensburg Railroad; 16 miles N. of Syracuse (for location, see map of New York, ref. 3-G). It is in an agricultural region, and has large interests in stock-raising, tobacco-growing, and dairying. The river and canal afford good water-power, which is utilized by saw and flour mills, and other manufactories. There are a State bank with a capital of \$35,000, and a weekly newspaper. Pop. (1880) 1,312; (1890) 1,466.

Phœnixville: borough (founded as a forge in 1792, incorporated as a borough in 1848); Chester co., Pa.; at the junction of the Schuylkill river and French creek; on the Penn. and the Phila. and Reading railways; 28 miles N. W. of Philadelphia, 30 miles E. S. E. of Reading (for location, see map of Pennsylvania, ref. 6-I). It is widely known for its rolling-mills, blast furnaces, and iron-works, and their products, such as iron bridges, girders, columns, and other heavy work, and for its hosiery-factories. There are gas, electric-light, and water plants, a denominational and 4 public schools, public park, library, 2 national banks with combined capital of \$300,000, and a daily and 2 weekly newspapers. Pop. (1880) 6,682; (1890) 8,514; (1894) estimated, 9,000.

EDITOR OF "REPUBLICAN."

Phonautograph: See ACOUSTICS.

Phonetic Laws: the laws governing the changes of sound in the historical development of a language. When a sound-change like that of Old English *ā* (pron. *aa*) to English *o* is observed to have taken place in a great number of words widely separated from each other in meaning and use, the possibility of anything like collusion or a conscious regulation of one word according to the sound of another is entirely excluded, and it is evident that the change is a matter of individual sounds and not of complete words as such; cf. O. Eng. *hām* > Eng. *home*; *dæg* > *dough* (*dō*); *hlāf* > *loaf* (*lōf*); *strād* > *strōde*; *cnihtan* > *knōw*; *þas* > *thōse*; *nā* > *nō*, etc. If a matter of individual sounds, this change can not have been subject to conscious direction, because in the natural and unstudied pronunciation of words the individual articulations from which the sounds result are made unconsciously. Except after careful acoustic and physiological analysis the speaker is not aware, for instance, that in the word *judge* he employs the compound consonant *dʒ* twice (i. e. *dʒʒdʒ*). He is not aware that the *g* in *give* differs from that in *got*, or that the *m* in *lamp* is different from that in *lamb*, or that the *th* in *thin* differs from that in *then*; or, if he is, he does not without analysis and reflection know wherein the difference lies. The production of speech, moreover, does not consist in the juxtaposition of a

certain number of definite and complete articulations, but in a current of sound checked, deflected, and guided by organs which are in continuous and generally complicated simultaneous movement. As the organs pass from one point of articulation to another speech goes on, and the number of different sounds produced is really infinite. An absolutely correct analysis of speech has not yet been attained, even by scientific observation and reflection.

In view of such considerations as these, it is evident that the production of sounds is not governed by consciousness. Consequently the assumption of sporadic, in the sense of willful, sound-changes, subject to the speaker's choice or caprice, is untenable. The power of an individual willfully to mispronounce a word is undeniable, but an occurrence like this does not constitute a fact of language history. Language is a social institution. If a case could actually be found where the willful and capricious mispronunciation of an individual had by imitation been adopted by a whole speech community and become the unconscious possession of their language, then it would be a case of a loan-word in just the same sense as *rouge* is a loan-word from the French.

Phonetic change is in its inception due to minute and unconscious deviations in the speech of individuals. As speech is a social institution in which intelligibility is of even higher importance than expression, these deviations are continually subject to correction, (1) by the necessity of intelligibility, (2) by the impressions received from the speech of others, as well as the impressions received from the speaker's own more accurate articulations. Before, therefore, any deviation can establish itself in the language of the community, it must do so as the resultant of a practically infinite number of modifying forces. The language of a community is therefore in reality an ideal to which the speech of the individual is always being drawn back, but to which in each single case of speaking it may not absolutely conform.

As the conditions which produce the changes of sounds are not dependent on the particular words in which the sounds occur, it is evident that there can be no reason to expect like-conditioned sounds to be differently treated in different words. On the contrary, we should expect a phonetic change to reach throughout the whole like-conditioned material of the language. This expectation finds more and more confirmation as language comes to be more accurately observed in its natural developments. The principle that the laws of sound suffer no exception was first stated by August Leskien in the introduction to his *Declination im Slavisch-Litauischen und Germanischen* (1876), and has since that time been vigorously attacked, vigorously defended, and widely applied in investigation. Though only a scientific dogma, it constitutes the only safe guide in etymological research, and is theoretically defensible within the limits of the perfectly natural developments of folk-speech in a compact and homogeneous speech-community. When a sound-change is in the act of extending itself from the narrow speech-community where it is native to a wider speech area it undoubtedly seems to progress from word to word—i. e. it manifests itself in some words before others; thus in the case discussed by W. D. Whitney, *Indogermanische Forschungen*, iv., 32 ff. Such cases do not, however, contravene in the least the theory of uniformity in phonetic change. They fall under the head of processes for the unification and solidification of language. Phonetic laws are not laws in the sense of physical laws, but, as may be inferred from the foregoing, are socio-historical in character. As Paul has expressed it (*Principien*, chap. iii.): "Sound-law does not pretend to state what must always under certain general conditions regularly recur, but merely expresses the reign of uniformity within a group of definite historical phenomena."

LITERATURE.—H. Paul, *Principles of the History of Language* (*Principien der Sprachgeschichte*), chap. iii.; Strong-Legeman-Wheeler, *History of Language*, chap. iii.; B. Debrück, *Die neueste Sprachforschung* (1885); K. Brugmann, *Zum heutigen Stand der Sprachwissenschaft* (1885). Opposed to the view here maintained are, e. g., G. Curtius, *Zur Kritik der neuesten Sprachforschung* (1885); H. Schuchardt, *Ueber das Lautgesetz* (1885); F. B. Tarbell, *Phonetic Law* (*in Transactions of the American Philological Association*, vol. xvii., 1886).

BENJ. IDE WHEELER.

Phonetics [noun use of plur. of *phonetic*, pertaining to sounds, from Gr. *φωνητικός*, pertaining to sounds or to the

voice, deriv. of *φωνή*, sound, voice]; the science of speech-sounds, and, in the usage of some, also the art of representing their combinations by writing. Speech-sounds are such of the phenomena of the resonance of inclosed masses of air variously excited by the organs of speech as are used for communication of thought. The resonance cavities are the larynx, pharynx, nasal passages, and mouth, with various smaller parts. Each cavity has a separate resonance, and each resonance acts more or less in combination with all the others. The action of the resonance for vowels was first (though incompletely) explained by Helmholtz (*Sensations of Tone*; see Ellis's translation, 2d ed., 1885, pp. 103-119, 123, 538-543). It is necessary to distinguish the mode of exciting resonance and the fixed or variable forms of the resonance-cavities.

I. *Mode of Exciting Resonance*.—(1) "Irrespirates," sounds independent of respiration, which may or may not be carried on at the same time through the nose. The air in the resonance-cavities is excited by smacks, clicks, smokers' mouth-puffs, blow-piper's cheek-puffs, or implosion (due to sudden condensation). All these are recognized elements of language. (2) "Inspirates," sounds arising from drawing in air—(a) through the mouth only, as in chirps, whistles, sobs, gasps; (b) through the nose only, as in snuffing; or (c) through both nose and mouth, as in snoring. Common elements of expression, even in English. (3) "Expires," sounds arising from expelling air from the lungs. These are the commonest and most important elements of speech. (a) "Physem" (a name not in general use), or bellows-actions of the lungs, with constant pressure (force, loudness, and much of modern accent), with discontinuous pressure (jerks, the main element of aspiration), or with condensation suddenly relieved (explosions, one element of post-aspiration). (b) "Glottids," or actions of the elastic glottis, which, when the vocal chords forming it are wide apart, give either inaudible breath (physem weak) or "flatus"—that is, audible breath (physem strong). When the glottis is narrowed, but not closed, they give "whisper." When the glottis is closed elastically, they give "voice." When the glottis is closed inelastically, they give the Arabic *hamza*, or "check." These actions also, chiefly by various tensions of the vocal chords, produce variety of pitch (musical accent, singing), and by different arrangements regulate the size and distinctness of the periodical puffs of air on which voice depends (original quality of tone, expression), with other effects not so marked. (c) "Aryténads" (a name scarcely used), or actions of the gristly glottis, giving by various actions the Arabic *hha* or wheeze, and *ain* or bleat, and the Danish *r* (?). (d) "Hissses" (generally restricted to voiceless sibilants), arising from flatus driven through narrow passages, as for *s*, *sh*. (e) "Sonants" (or voiced stops, voiced explosives), arising from driving the voice into closed cavities, where the air rapidly becomes too condensed to sound. (f) "Buzzes" (generally restricted to voiced sibilants), arising from driving the voice laboriously through passages suitable for hisses, and hence producing the effect of a mixture of voice and flatus, as for *z*, *zh*. (g) "Vocals" (a name hardly used in this narrow sense, but, like "sonant," sometimes applied to all voiced sounds), arising from driving the voice easily through a partially obstructed cavity, or one which may be periodically obstructed and relieved by a vibrating membrane, as for *l*, *r*. (h) "Vowels," arising from letting the voice resound clearly in comparatively unobstructed cavities of the mouth separately, or mouth and nose combined, which modify the original quality of tone.

II. *Fixed Forms of Resonance-cavities*.—(a) "Oral vowel positions," the uvula, being pressed against the back wall of the pharynx, shuts off the nasal cavities; the tongue, in part or in whole, is raised to different heights within the mouth, but not sufficiently to touch the palate; the throat (pharynx), in whole or in part, is lengthened, shortened, widened or narrowed; the lips are more or less closed or opened; or all these alterations of tongue, throat, and lips are variously combined. The number of possible oral vowels is infinite; fifteen to twenty of them are common in European languages. (b) "Orinasal vowel positions," the nasal passages are open to the larynx by the advance of the uvula, and the various membranes of the nose are variously brought into action, at the same time that the various oral vowel positions are assumed. Each oral vowel generates various kinds of orinasal vowels (generally called simply nasal vowels). The four French orinasals in the words *an*, *on*, *un*, *vin* are best known. (c) "Oral consonant positions" have the nasal passages cut off, as for oral vowel positions, and either entirely

obstruct the passage of air, flatus, or voice, as (1) for mutes (i. e. voiceless stops or voiceless explosives), *p*, *t*, *k*, positions without sound and rendered effective only by "glides"; (2) for implosents, with a sound due to implosion, as in modern Saxon, *p*, *b* or *t*, *d* (1., 1.); and (3) for sonants (as *b*, *d*, *g*, 1., 3, *e*); or are only adapted for "hisses" (such as *f*, *s*, *sh*, *th*, 1., 3, *d*), "buzzes" (such as *v*, *z*, *zh*, *dh*, 1., 3, *f*), or "vocals" (such as *l*, *r*, 1., 3, *g*), by the formation of narrow or choked passages, or the introduction of a (possibly) vibrating valve.* Such positions are very numerous. (*d*) "Nasal consonant positions" have the nasal passage open, but the mouth (generally) closed as for mutes, and are generally accompanied by voice (as *m*, *n*, *ng*), but many other forms occur.†

III. *Changing Forms of Resonance-cavities*.—(1) If while a violin-string is bowed the stopping finger is slid on the finger-board from the nut toward the bridge, the result is a series of musical sounds, changing by insensible degrees. The first and last sounds may or may not be of sensible duration. In each case the changing sounds are called "glides." (2) If the extreme sounds have sensible duration and the glide is short, the glide becomes a "slur," to which case the word will be here specially limited, although musically it has a wider signification. (3) When no glide or slur occurs, there is a "break" or silence during change of position. (4) In speech, glides and slurs are the cement by which elements are bound into syllables. Speech-glides were first recognized in Ellis's *English Phonetics* (1854), and slurs in his *Early English Pronunciation* (part iv., 1874, p. 1130). They generally arise from continuing sound during change of resonance-cavity, but there are also (5) "force-glides," arising from continuously variable bellows-action of the lungs; (6) "pitch-glides," from continuous alterations, chiefly in the tension of the vocal chords; and (7) "glottal glides," from continuous alterations in the degree of separation of the vocal chords, changing from flatus through whisper to voice, and conversely; and (8) "arytēnad glides," arising from continuous changing position of the gristly glottis. (9) "Vowel glides" arise from passing from one vowel position to another, and may be "lip," "tongue," or "throat glides," separately or combined two or three together, the results being "diphthongs" and "fractures" of the most diverse character and of great philological importance. (10) "Mixed glides" arise from passing from a consonant to a vowel position, and conversely, and are most remarkable in the case of mutes, as in *peep*, *took*, because it is solely by the glide that the mute becomes effective. When final, the mute often glides on to a click or some flatus (in English), and often (in English and German) flatus is interposed between the mute and the vowel, producing a passing glottal glide, the habits of different nations and individuals being extremely different. In such words as *see*, *cease*, *seize* there are glottal as well as mixed glides. (11) "Consonant glides" occur when we pass from one consonant position to another, of which one at least is capable of flated or voiced resonance, as in *tree*, where there is a consonant glide from *t* to *r*, and a mixed glide from *r* to *ee*. (12) All these glides give rise to slurs, which are more convenient to the speaker than breaks, because breathing is uninterrupted, and hence they constantly occur between syllables. (13) "Breaks" occur where the passage of breath is interrupted by some suspension of expiration, some check of the glottis, or some mute consonant. The study of glides is one of the most important parts of phonetics for clear enunciation, intelligible singing, and comparative philology.

The above analysis of speech-sounds, here merely indicated, results from the most recent physiological and linguistic investigations, and its great complication would apparently involve immense difficulty in the attempt to find a method of representing speech-sounds to the eye. All the accepted alphabets of both ancient and modern times are more or less defective as representations of the phenomena of speech. When the Greeks borrowed the Phœnician syllabary, they gave it a real alphabetic character. It was in this form that the Romans adapted the same Phœnician characters to their needs, and from these two original sources all modern European alphabets are derived. At an early

period the Roman alphabetic system became general for most Aryan languages, and was subsequently used for languages of different families, as Basque and Hungarian. The diverse nature of the selection of speech-sounds and systems of glides and accents in use among the different nations of Europe has caused the Roman letters, individually and in groups, to have different significations in the several countries using them, and to be practically increased in number by the addition of various diacritical marks. These systems of writing were in many cases introduced by "clerks" (ecclesiastics), who were satisfied with a rough indication of the sounds of words at remote periods when the sounds of the languages thus reduced to writing were different from those now in use; but there was always an indisposition to make any changes in orthography, and this indisposition has increased since printing became widely used. Hence the groups of letters have in many instances ceased altogether to recall the sounds of the words, and consequently alphabetical writing has in numerous instances almost reverted to ideographical symbolization. This is especially the case in English, where sign and sound are so practically independent, to the great detriment of education, that no one who sees an English word for the first time knows how to speak it, and no one who hears an English word for the first time knows how to spell it.

Missionary enterprise and scientific linguistics have raised the question of a universal alphabet capable of writing all languages. We are still very far from being able to determine what should be the value, number, or form of the separate elementary symbols in such an alphabet, and how their combination should be indicated. Prof. Lepsius, of Berlin, invented the "linguistic alphabet" (German ed. 1855), adopted under the name of the "standard alphabet" by the English Church Missionary Society in 1858 (2d English ed. 1863), and approved by many other missionary societies. It consists of a mixture of Latin and Greek letters, supplemented by a vast complication of diacritical marks, which render its use so laborious that in special adaptations most of these marks are omitted. It requires new fonts of types, and, notwithstanding the number of its symbols (more than 250), it is defective for well-known languages, both in characters for elementary sounds and in the means of representing glides. Prof. Brücke's *Neue Methode der phonetischen Transcription* (1863) with entirely new letters is also inadequate. In A. Melville Bell's *Visible Speech* (1867)* the characters are formed on the principle of picturing the positions of the speech-organs. It embraces a philosophic consideration of vowels as well as of consonants, and although by no means perfect, it was by far the best and most practical attempt yet made. It has been improved by Henry Sweet, who has also provided a corresponding alphabet (revised Romic) consisting of Roman letters and various other signs already used in printing. (See his paper on *Sound Notation*, in *Transactions of the Philological Society* (1880-81), pt. ii., 177-235.) Neither these, however, nor any other system yet proposed can be considered as an entirely satisfactory solution of the problem. For the purposes of Ellis's *Early English Pronunciation* (1869-89) he introduced a temporary system called "Palæotype," because it can be readily printed with ordinary or old types. It is too complicated and confusing, however, for general use.

In the meantime, the question of particular phonetics, or of writing the sounds of a particular language with sufficient accuracy for native use, is comparatively easy. It will be sufficient to mention here four of the proposed methods of writing English on a phonetic basis. 1. Ellis's *Glossic*; see his article in *Transactions of the Philological Society*, 1870, pt. i., *On Glossic, a new sistem ov Ingglish spelling, proapow'zd faur konkurent eus, in aurdre too remidi dhi difekts, widhout ditrak'ting from dhi valeu ov our present aurtthografi*. As this example shows, glossic often uses combinations of letters to express single sounds, but each of such combinations is used always with the same value, and this is in most cases determined by the commonest value of the same combination in the usual spelling of English at the present day. 2. Sweet's broad Romic (less complicated than the revised Romic mentioned above), in which the most important single sounds are now represented by single signs, generally Roman letters used with approximately their original Latin values. See for slightly different forms of it his *Handbook of Phonetics* (1877, pp. 191, 192); *Primer of Phonetics* (1890, pp. 71-82); *Elementarbuch des gesprochenen Englisch* (3d ed. 1891); *Primer of Spoken*

* Ellis's "hisses" and "buzzes" include what are more often called spirants or fricatives. They should be carefully distinguished from aspirates. English *sh* in *shoot*, *th* in *then*, *th* in *there*, for example, are in strict phonetic use not aspirates but spirants or fricatives. See *ASPIRATE*.

† The terminology of phonetics is different with different writers. See the list of terms in the appendix of Jespersen's book mentioned on the next page.

* See also his *Sounds and their Relations* (1881).

English (1890). Similar to this, but more minute, is the system of indicating the pronunciation in the *New English Dictionary* (since 1884). 3. The World-English alphabet of A. Melville Bell; see his *World-English* (1888). 4. The phonetic alphabet proposed in the report of a committee of the American Philological Association in 1877; see that report (in the *Proceedings of the Association*) and *The Spelling Reform*, by Francis A. March in *Circular of Information No. 8*, published by the Bureau of Education in 1893.

In recent years the study of phonetics has been vigorously pursued, and many valuable investigations have been published. Among the books and papers of importance, besides the work of Sweet, are Sievers, *Grundzüge der Phonetik* (4th ed. 1893, excellent; contains also a useful bibliography); Trautmann, *Die Sprachlaute im Allgemeinen und die Laute des Englischen, Französischen und Deutschen im Besonderen* (1884-86); W. Victor, *Elemente der Phonetik des Deutschen, Englischen und Französischen* (3d ed., first part, 1893; Victor was also the editor of *Phonetische Studien*, 6 vols., 1887-93, now succeeded by *Die Neuen Sprachen* with the Beiblatt, *Phonetische Studien*); P. Passy, *Étude sur les changements phonétiques*, etc. (1890; Passy is the editor of *Le Maître Phonétique*, 1889 and since; earlier numbers beginning in 1886 were called *Diéronétique*); Rousselot, *La méthode graphique appliquée à la recherche des transformations inconscientes du langage* (1891), and *Les modifications phonétiques du langage*, etc., in *Revue des patois gallo-romans* (1891, pp. 65-208. The work of Rousselot is particularly valuable for experimental observations with apparatus); Teehmer, *Phonetik* (1880), and articles in *Internationale Zeitschrift für allgemeine Sprachwissenschaft*; Jespersen, *The Articulations of Speech Sounds represented by Means of Alphabetic Symbols* (1889); Sheldon and Grandgent, *Phonetic Compensations* (in *Mod. Lang. Notes*, June, 1888, 354-374, vol. iii.); Grandgent, *Vowel Measurements* (in *Pub. of the Mod. Lang. Assoc. of America*, suppl. to vol. v., pp. 148 ff.; an excellent description of a method for determining the shape of the oral cavity in the vowels of natural speech); R. J. Lloyd, *Speech Sounds: their Nature and Causation* (in *Phonetische Studien*, iii., 251 ff., iv., 37 ff., 183 ff., 275 ff., v., 1 ff., 129 ff., 263 ff.; see also the bibliography in Sievers. Lloyd considers the acoustic side especially, making investigations similar to those of Helmholtz, and throwing new light on the problems of vowel-sounds); Johan Storm, *Englische Philologie*, i., *Die lebende Sprache*, 1. Abteilung: *Phonetik und Aussprache* (2d ed. 1892; this is largely devoted to phonetics in general, and contains admirable discussions of some of the most important works on the subject); R. L. Weeks, *A Method of Recording the Soft-palate Movements in Speech* (in *Harvard Studies and Notes in Philology and Literature*, ii., 213 ff.); L. Soames, *An Introduction to Phonetics (English, French, and German)* (1891; a good introduction to the subject for English speakers); Bremer, *Deutsche Phonetik* (Leipzig, 1893).

ALEX. J. ELLIS.

Revised by E. S. SHELDON.

Phonograph: an instrument for recording and reproducing sound. The problem of recording sound was solved long before its reproduction was accomplished. In 1807 Dr. Thomas Young pointed out a method by which a tuning-fork might be made to trace a record of its own vibrations, but nearly half a century seems to have elapsed before this hint was put into practice by Wertheim and Duhamel. A light pointed style is attached to the end of one prong of the fork, and made to press against a surface of smoked glass or paper; and this is then moved in the direction across which the prong is vibrating. The combination of these two motions produces a sinuous line, and the character of this curve is determined by the nature of the motion which at the same time impresses the ear as sound. In the phonograph of Scott and Koenig (see *Acoustics*) the tuning-fork is replaced by a stretched membrane at one end of a drum, into which the sound is directed, while the tracing of the style is made upon smoked paper encircling a cylinder. The rotation of this cylinder is compounded with lateral motion in the direction of its axis by means of a screw thread cut upon the axial shaft, and moving in a fixed nut when the handle is turned. In Barlow's logograph, constructed in 1873, the drum is replaced by a short trumpet, and to the vibrating membrane a delicate ink-marker is attached. In 1876 Dr. C. J. Blake obtained very fine tracings by employing the tympanum of a human ear for a logograph. In 1878 Prof. E. W. Blake photographed the motion of an elastic disk set

into vibration through sound-waves produced by the voice. To the disk a small mirror was attached, and from this a beam of sunlight was reflected upon a moving photographic plate.

All of the contrivances just described may quite properly be called phonographs. This graphic method has been carried to the utmost perfection by Rudolph Koenig, of Paris; but it implies no attempt to produce a talking-machine, however accurately the peculiarities of articulate speech may be registered. An elaborate talking-machine was perfected by the two Fabers, father and son, in Vienna, the outcome of many years of work. This instrument was exhibited in the U. S. in 1883. An air-blast is sent through a rather complicated arrangement of vents, in which the action of the human organs of speech is imitated as nearly as possible. It is indeed a special form of cabinet organ from which articulate words are uttered in a monotone, each word being phonetically spelled out by skillful manipulation of a keyboard. There is no attempt to register speech, but the mechanical manufacture of speech is successfully accomplished without the reproduction of sounds from any articulate source.

In 1877 Thomas A. Edison applied to a telephone disk a style which pressed upon a strip of tin-foil, his object being the attainment of a self-recording telephone. Accidental motion of the indented foil under the style caused a momentary reproduction of the sounds which had actuated the telephone disk. This suggested his invention of the modern phonograph, which was first exhibited in 1878. A telephone mouthpiece was adjusted close to a cylinder, such as is employed with the Scott phonograph. To the telephone disk was attached a metal point, made to press gently on tin-foil, with which the cylinder was covered. Into the surface of the cylinder a spiral groove was cut, corresponding to the pitch of the axial screw. By motion of the metal point the plastic tin-foil was pressed into the groove beneath it, receiving thus a series of slight indentations, which constituted the registration of the exciting sound. When this line of indentations was made to pass under the metal point again the variable pressure thus given caused the disk to repeat the vibrations originally impressed upon it by the voice; and a talking-machine was thus secured which gave forth articulation, not in a monotone, but with the variations of pitch, loudness, and quality that had characterized the voice of the speaker. The reproduction was not quite perfect, but it was incomparably superior to the outcome of any previous effort to imitate the human voice.

Interesting as was the phonograph, considered as a triumph of ingenuity, it was not found capable of satisfactory commercial use. Modifications of it were devised, of which the most important were the graphophone, by Bell and Tainter, and the gramophone, by Berliner. In the former of these a cylinder of wax, hardened slightly by admixture of paraffin or some other similar waxy substance, was substituted for tin-foil. In Berliner's gramophone, instead of indentations a sinuous line is made, as with Scott's phonograph; but this is traced upon a horizontal revolving disk of zinc, covered with a thin coating of wax. The plate is then dipped into a solution of chromic acid, so that the line is etched into the zinc. Such a plate when passed again under the style gives lateral motion to this, which is communicated to the disk, resulting in very satisfactory articulate sound.

Since 1886 Edison has improved the phonograph, adopting the use of a wax cylinder, with two separate mouthpieces, having specially prepared styles—one for transmitter, the other for receiver. The elastic disks are made of glass, and great improvement has been secured in distinctness of articulation, but with corresponding loss of loudness. From the receiving disk a pair of tubes are conveyed to the hearer's ears. To secure the utmost regularity in speed of rotation an electric motor is employed to actuate the wax cylinder. Its delicacy and accuracy in reproduction are very remarkable. Not only talking, but also whistling, singing, whispering, and the playing of any musical instrument whatever may be very perfectly repeated by it.

The uses to which the phonograph may be put are manifold, but the actual uses have been thus far somewhat limited. The wax cylinders are capable of ready transportation by mail, the capacity of each varying from 100 to 1,000 words, according to size. Aside from the purposes of entertainment, the phonograph is used in business as an aid to the stenographer and the typewriter.

W. L. GUNN, SEVEN.

Phonog'raphy [Gr. *φωνή*, sound + *γράφειν*, write]: any system of writing in which a phonetic spelling is used. The term, however, is used specifically for any system of writing in which the phonetic elements of words are represented by "simple and easily formed signs, which readily enter into

Sign.	Sound.	Name.	Sign.	Sound.	Name.	Sign.	Sound.	Name.
	p	pee.		f	ef.		l	el.
	b	bee.		v	vee.		r	ar.
	t	tee.		th	ith.		m	em.
	d	dee.		Th	thee.		n	en.
	ch	chay.		s	es.		ing	ing.
	j	jay.		z	zee.		y	yay.
	k	kay.		sh	shay.		w	way.
	g	gay.		zh	zhay.		h	hay.
Additional Consonant Signs.								
	r	ray.		w	wth.		y	yeh.
	h	dot.		w	wuh.		y	yuh.
				s	iss circle.		st	steh loop.
				ss	ses circle.		str	ster loop.

FIG. 1.—The consonant signs.

every combination required," the same sign never being used to represent more than one sound or articulation. The name "phonography" was first applied to a system of shorthand writing by Isaac Pitman in the second edition of his system, published in London in 1840, but had been applied as early

be.	nay.	are.	all.	cwn.	food.
et.	pet.	pat.	not.	up.	foot.
eye.	oil.	out.	mute.		

FIG. 2.—The vowel scale.

as 1701 to a little work on phonetic spelling by J. Jones, M. D., London. The appearance of Pitman's system (first ed. London, 1837) marked an era in the history of shorthand writing. By the introduction of a more accurate analysis of the vocal elements of the English tongue, and a more systematic presentation of the shorthand art, Pitman did very much to bring the possibility of verbatim reporting within the reach of persons of ordinary adaptability for the practice of the art. His system has been the basis of every subsequent system which has received any considerable degree of public support. The chief of these are Graham's (that presented in this article), Munson's, Bishops', Cross's, Burnz's, Lindsley's, and Osgoodby's. Graham's system is now written by about 50 per cent. of the official stenographers, and a large proportion of the other shorthand writers, in the U. S.

The *Phonographic Alphabet*. The material of the phonographic alphabet consists of the simplest geometrical

characters—dots, right-lines, and curves—variously modified and combined. Signs are provided for forty elements in the "working alphabet." The consonants, with their appropriate signs and names, are illustrated in Fig. 1. The vowels are represented by means of dots and dashes. They are written by the side of a consonant stroke, and the vowel-scale is made extensive by giving a different vowel-significance to the dot or dash according as it is written opposite the beginning, middle, or end of the stroke. The vowels are read before or after an adjacent consonant, according as they are written before or after perpendicular or inclined, or above or below horizontal strokes. (See Fig. 2.) They are named by their sound. In rapid writing they are not inserted except to indicate words of unusual occurrence or to vocalize proper names. Indeed, the consonant outlines

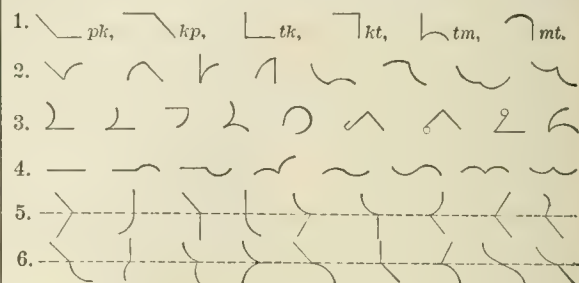


FIG. 3.—Joined consonants.

of words are found to be so legible and suggestive that the vowels are usually left out even in phonographic correspondence. Fig. 3 shows how the consonants are combined in forming words.

Modifications of the Consonant Strokes.—The primary consonant strokes are variously modified to indicate the addition of other consonants; thus a small initial hook indicates the addition of *l* or *r*, according to the side on which it is written. A large initial hook indicates the addition of *lr* (as in *ler*, *lor*, *lar*) or *rl* (as in *rel*, *ral*, etc.), according to the side on which it is written (see Fig. 4). A small final hook indicates the addition of the sound of *f*, *v*, or *n*; and a large final hook the addition of *shn* (*tion*, *sion*, *cion*, *cian*, etc.) or *tive*, according to the side on which it is written. The *iss* circle when written at the beginning of a stroke (hooked or not) implies that the stroke is preceded by *s*; when written at the end of a stroke (hooked or not), that the stroke is followed by *s*. The *ses* circle occurring initially or finally implies the precedence or succedence of *cis*, *ces*, *sis*, *ses*, *sus*, *sas*, etc. The *steh* loop initial or final indicates *st*. The *ster* loop indicates *str* (as in *ster*, *stor*, etc.), but is not written initially. These circles and loops when written finally, on the side of the *n* hook (by making the hook into a circle or loop), signify the addition of *n-s*, *n-ses*, *cis*, etc., *n-st* or *n-str* to the stroke. The sound of *s* may be added to a stroke modified by an *f* hook by writing the *iss* circle within the *l* hook, or by making the *r* hook into a circle. By *halving* a stroke (writing it half length) *t* or *d* is added, according as the

Initial hooks.				Final hooks.				Halving.	Lengthening.	Widening.
p.	p-l.	p-r.	p-lr.	r-l.	p-f-v.	p-n.	p-shn.	p-tive.	b-d.	b-dr.
The <i>iss</i> circle, <i>ses</i> circle, <i>steh</i> and <i>ster</i> loops, initially and finally:										
.p.	s-p.	s-pl.	s-pr.	ss-p.	ss-pl.	p-s.	pf-s.	p-n-s.	p-shn-s.	p-tive-s.
p-s.	pf-s.	p-n-s.	p-shn-s.	p-tive-s.	b-d.	b-dr.	m-p-b.			

FIG. 4.—Consonant modifications.

Prefixes.	Affixes.	Phrase-Writing.	Word-Signs.	Phrase-Sign.
ply.	comply.	bent.	incumbent.	when.
				whensoever.
				I am sure.
				sir.
				I am sure.
				sir.
				by.
				be.
				to be.
				possibility.
				in their own.

FIG. 5.

stroke is light or heavy; by *lengthening* (writing it double length), *tr*, *dr*, *thr*, or *Thr* is added, according as the stroke is light or heavy; by *widening*, *p* or *b* is added.

Expedients for increasing Speed.—Various other expedients are made use of, as an initial dot or tick or small

circle to imply a prefix, as *con*, *com*, *cog*, *circum*, *contra*, *self-con*, or *self-com*; a final dot or tick (light or heavy), or circle, to indicate the imperfect participle of verbs, an adverbial or other affix, as *ing*, *ings*, or *ly*; *self*, *selfers*, *bleness*, *ful-ness*, etc. Other affixes are indicated by an abbreviated termination, as *sv* for "soever" in *whosoever*, *whensoever*, etc.; and the omission of the connecting preposition "of," or of the prepositional phrases "of the," "of a," is indicated by writing two words near together, and the omission of "to" or "two" by writing the following outline just under the line of writing. See Fig. 5.

Two other expedients for increasing speed remain to be noticed—phrase-writing and word-signs. By phrase-writing is meant the junction of several words without lifting the

The harmony of the spheres. Dear sir. Your received, con- noted. favor tents

FIG. 6. The corresponding style.

pen. This does not diminish, but rather increases, the legibility of the writing where the words are grammatically closely related, as in the phrase "I am sure." By the term word-sign is meant a primary character, simple or modified, which is memorized as an arbitrary and abbreviated expression of a certain word or words. The principle of word-signs is carried to a great extent, and like phrase-writing is one of the reporter's most important aids for increasing the speed of his writing. See STENOGRAPHY and Pitman's *History of Shorthand* (1891).

Revised by R. LILLY.

Phonolite [from Gr. *φωνή*, sound + *λίθος*, stone]: a name given by Klaproth to a dense, hard variety of volcanic rock in allusion to its ring under the hammer (German, *Klingstein*; English, *clinkstone*), a property which is much increased by its tendency to separate into thin slabs. Phonolite is an acid igneous rock very rich in alkali, and is to be regarded as the surface equivalent of leucite-syenite. Its essential constituent minerals are sanidine, nepheline, and an alkaline pyroxene, called *ægirite*. It also frequently contains minerals of the sodalite-baüyne group, leucite, hornblende, titanite, apatite, and magnetite. Quartz is never present except as a secondary product, since there is too much alkali to allow of the separation of free silica. Zeolites of various kinds are also very frequent alteration minerals in phonolite.

This rock occurs in dikes, flows, and volcanic necks, for the most part of Tertiary age. It is often accompanied by its tuffs, and in many regions, like the Auvergne, Southern Baden, and Bohemia, forms steep and picturesque mountains of small size. Phonolites are also known in Northern Africa, Italy, the Eifel, England, Brazil, the Black Hills, and Colorado.

GEORGE H. WILLIAM.

Phormion (in Gr. *φορμιων*): an Athenian general who distinguished himself in the wars with Samos, but especially at the siege of Potidæa in 432 B. C. He there fought with Perdiccas, King of Macedonia, against the Chalcidians; in 430 B. C. he led the Acarnanians against the Ambraciots; in 429 B. C. he was victorious at Naupactus against the Peloponnesians, after which he once more commanded the Acarnanians, who ever held him in great esteem. His tomb was near those of Pericles and Chabrias on the road to the Academy.

J. R. S. STERRETT.

Phosphates: See PHOSPHORIC ACID; also APATITE.

Phosphines: bases corresponding to amines, bearing the same relation to PH_3 that amines do to NH_3 . Triethyl phosphine is $\text{P}(\text{C}_2\text{H}_5)_3$.

Phosphorescence [deriv. of *phosphoresce*, shine like phosphorus, deriv. of *phosphorus*]: the emission of light with little, if any, heat, and in most cases with little chemical change. Phosphorus emits light in the dark, and this is due to slow combustion, the change being of the same kind as that which takes place when phosphorus burns actively in the air. Phosphorescence is frequently observed to a very marked degree in sea water. The cause of this is not known, but the phenomenon is believed to be connected with the presence of minute organisms from which the light is given off. Some substances have the power to emit light after having been exposed to a bright light. Prominent among these are the sulphides of calcium, strontium, and barium. According to Becquerel, phosphorescence is a power possessed by all substances, but in most cases it lasts only a

very short time. With calcium sulphide it lasts several hours, and the sulphides of strontium and barium have this power to even a greater extent than calcium sulphide. The cause of the phosphorescence in such substances is not known. See also FLUORESCENCE.

IRA REMSEN.

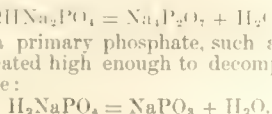
Phosphoric Acid: the principal acid formed by the element PHOSPHORUS (*q. v.*). It occurs in nature mainly in the form of the calcium salt, calcium phosphate. This is the principal constituent of the ashes of bones. It occurs also as phosphorite and, in combination, in the mineral apatite. It can be made in the laboratory (1) by burning phosphorus which converts it into the oxide, P_2O_5 , and then boiling this in water solution; (2) by oxidizing phosphorus with nitric acid. On the large scale it is made from bone-ash or phosphorite, by treating with sulphuric acid, filtering, and evaporating. When its solution is evaporated to the proper consistency the acid crystallizes out on cooling in the form of large crystals having the composition represented by the formula H_3PO_4 . This is called *orthophosphoric acid* to distinguish it from two other varieties of the acid to be mentioned below.

Phosphates are the salts of phosphoric acid, or, more especially, of orthophosphoric acid. This acid is tribasic, and therefore capable of yielding a great variety of salts. Each of the three hydrogen atoms contained in its molecule, H_3PO_4 , can be successively replaced by metallic elements. Those salts which are derived from the acid by the replacement of one or two of the three hydrogen atoms are called *acid phosphates*. Examples are *mono-sodium phosphate*, H_2NaPO_4 ; *di-sodium phosphate*, HNa_2PO_4 ; *secondary calcium phosphate*, HCaPO_4 ; *primary calcium phosphate*, $\text{H}_2\text{Ca}(\text{PO}_4)_2$, etc. The last two salts mentioned are also called *acid phosphates of calcium*. One or both are contained in the preparation commonly called Horsford's acid phosphate. The *normal phosphates*, or *neutral phosphates*, are those that are derived from orthophosphoric acid by the replacement of all the hydrogen by metallic elements. Thus *silver phosphate*, Ag_3PO_4 ; *tertiary calcium phosphate*, $\text{Ca}_3(\text{PO}_4)_2$, etc., are normal phosphates. Among the more important phosphates are those of calcium. As has been said, tertiary calcium phosphate is the chief constituent of bone-ash. It forms 85 per cent. of this mixture. Calcium phosphate exists everywhere in fertile soils, and is taken up by the plants, from which in turn it finds its way into the animal body. It is evident, therefore, that it is of fundamental importance, and that a soil must either contain this salt or something from which it can be formed. See AGRICULTURAL CHEMISTRY and FERTILIZERS.

Metaphosphoric acid, HPO_3 , is formed when orthophosphoric acid is heated to 400°C . (750°F). Under these conditions the latter loses water as represented in the equation: $\text{H}_3\text{PO}_4 = \text{HPO}_3 + \text{H}_2\text{O}$. This is the more common commercial form of phosphoric acid, being known in the market as *glacial phosphoric acid* (*Acidum phosphoricum glaciæ*). Boiled with water it is converted into ordinary or orthophosphoric acid, the reaction above represented being reversed. The salts of metaphosphoric acid are called *metaphosphates*. The acid is monobasic, and it was formerly called monobasic phosphoric acid. Its composition is similar to that of nitric acid, HNO_3 , and chloric acid, HClO_3 .

Pyrophosphoric acid, $\text{H}_4\text{P}_2\text{O}_7$, is formed by heating orthophosphoric acid to 200° – 300°C . (400° – 600°F). The change effected is similar to that which takes place in the conversion of the ortho-acid into the meta-acid (see above). It is represented by the following equation: $2\text{H}_3\text{PO}_4 = \text{H}_4\text{P}_2\text{O}_7 + \text{H}_2\text{O}$. The acid is tetrabasic, and was at one time called tetrabasic phosphoric acid. When a secondary salt of orthophosphoric acid is heated to a sufficiently high temperature a pyrophosphate is formed. Thus di-sodium phosphate yields sodium pyrophosphate: $2\text{HNa}_2\text{PO}_4 = \text{Na}_4\text{P}_2\text{O}_7 + \text{H}_2\text{O}$.

So also when a primary phosphate, such as mono-sodium phosphate, is heated high enough to decompose it, it yields a metaphosphate:



The ease with which the acid phosphates and the acid itself undergo change when heated gave rise originally to considerable difficulty in their study. By a masterly investigation of these substances Graham succeeded in explaining the relations between them and the products formed from them, and he thus laid the foundation of the views at present held in regard to acids.

IRA REMSEN.

Phosphor-iridium: Holland's compound. See IRIDIUM.

Phosphoroscope: a device invented by Edmond Becquerel for showing the phenomenon of phosphorescence in bodies which shine but for a very minute portion of time after their insulation. By suitable perforations in a disk revolving over a box in which is the substance to be examined, sunlight is allowed to fall upon it and to be cut off before the observer can see it through another aperture. By giving to the disk a sufficiently rapid rotation observations may be made after an interval of less than $\frac{1}{100}$ of a second after light has ceased to shine upon the substance. In this way it has been discovered that many substances are phosphorescent (i. e. capable of emitting light) which have never before been known to be so; but there are still a large number of bodies which have no appreciable phosphorescence.

Revised by IRA REMSEN.

Phosphorus [Mod. Lat., from Gr. *φωσφόρος*, light-bringing; *φός*, light + *φέρειν*, carry, bring. Cf. *Φωσφόρος*, name of the morning star]: one of the chemical elements. In the eighteenth century the name phosphorus was applied to every body that gave light without burning. Gradually, however, the name came to be applied only to the element which was discovered in the latter part of the seventeenth century by Brandt (1669), of Hamburg, who obtained it in experimenting on the distillation of extract of urine with charcoal. Phosphorus is manufactured by first making from bones a soluble acid phosphate of lime through the agency of sulphuric acid, and mixing and distilling this with charcoal in earthen retorts at a red heat. Bone-ash contains nearly 20 per cent. of phosphorus, this being the precise proportion in pure *tricalcic phosphate*; but the amount of phosphorus obtained in practice is only from 8 to 11 per cent. The process is also expensively consumptive of fuel and destructive of apparatus, as well as of the health of the operatives, these facts much enhancing the cost of phosphorus. The importance of phosphorus is, however, so great—chiefly as a material for making matches—that the production is carried on on a very large scale, and the annual production of phosphorus is something over 3,000 tons. There are two principal factories—one in France, at Lyons, the other in England, at Oldbury near Birmingham. Some phosphorus is also made in Sweden and at Philadelphia, Pa.

Common commercial phosphorus is a slightly yellowish body of wax-like consistence, and translucent. It is generally cast into the form of sticks, which, on account of their dangerous inflammability, must be preserved under water. It melts at 44° C. or 111° F. to a liquid of oily consistence, which may be cooled if undisturbed much below the melting-point again without solidifying, but then at once solidifies on agitation. Although flexible and highly setile at ordinary temperatures, it becomes brittle and breaks with a crystalline fracture at the freezing-point of water. It may be crystallized from bisulphide of carbon, in which it is soluble, the crystals belonging to the regular system. It boils at 290° C. (554° F.), forming a transparent vapor nearly four and a half times as heavy as air. Phosphorus is slightly soluble in ether and in fixed oils, considerably so in benzene and in many essential oils, including oil of turpentine, largely so in bisulphide of carbon.

Red phosphorus or *amorphous phosphorus* is formed from ordinary phosphorus when the latter is long exposed to the light. The same change takes place when phosphorus is heated for a time in an atmosphere free from oxygen, and rapidly when it is heated to 300° C. in a tube hermetically sealed. This variety of phosphorus differs very markedly from the ordinary variety. It is a red powder. It does not emit light. It does not melt at a low temperature. It is not poisonous, and can not be easily ignited. Further, it is insoluble in bisulphide of carbon. When heated to 260° C. in an atmosphere of carbon dioxide it is converted into ordinary phosphorus, and when heated to this temperature in the air it takes fire, and in burning forms the same product that ordinary phosphorus does.

Oxides of Phosphorus.—There are two known oxides of phosphorus: (1) phosphorous anhydride (P_2O_3), a soft, white,

readily volatile powder formed by the slow oxidation of phosphorus in a limited supply of dry air; and (2) phosphoric anhydride, or phosphoric pentoxide (P_2O_5), the product of the burning of phosphorus with flame in the air. It appears as a white smoke. This phosphoric pentoxide as made in quantities is a snow-white amorphous powder, which sublimates at a moderate heat below redness. It is highly deliquescent, and when added to water combines with it with great heat and explosive violence.

In addition to the acids mentioned under the head of PHOSPHORIC ACID (*q. v.*) phosphorus yields two other acids. These are *phosphorous acid* and *hypophosphorous acid*. The former has the formula H_3PO_3 . Its salts are called *phosphites*. The latter has the formula H_3PO_2 ; and its salts are called *hypophosphites*. Revised by IRA REMSEN.

MEDICINAL USES OF PHOSPHORUS.—Pure phosphorus is locally an intense irritant and caustic to animal tissues, and taken internally is a virulent poison, whether in large single dose or in repeated administration of small quantities. Even in a single fatal dose, however, the symptoms may not begin till several hours after swallowing the poison, and death does not generally occur till after several days. There are the usual signs of irritant poisoning—viz., nausea, vomiting, and sometimes purging, with abdominal pain, but the latter symptom is not so severe as with other corrosive poisons. A garlicky breath, luminosity of the eructations and sometimes of the secretions, profound disturbances of the nervous system, such as delirium, convulsions, coma, with extreme general prostration, follow, and the individual may die suddenly from collapse and syncope, or more slowly after sinking into coma. Then a peculiar feature of phosphorus poisoning sets in—namely, jaundice, from fatty degeneration of the liver. This symptom is often preceded by a remission in the symptoms, which should not be considered as a favorable sign. After death there is found profound structural disintegration of the tissues, with special tendency to fatty degeneration of many of the organs, and extravasations of blood into their tissue. In chronic poisoning, however, no symptoms occur except a profound general debility, in which condition the subject may sink away and die. The antidotes in phosphorus-poisoning that seem to be of most use are permanganate of potassium and peroxide of hydrogen. Oil of turpentine is worse than useless. Given medicinally in doses of a minute fraction of a grain, phosphorus is sometimes of benefit in conditions of nervous debility, and especially in neuralgias and bone disease. Under its use the patient's general state may improve and the special morbid symptoms abate. Phosphorus is most commonly given in pill form, the minute dose being dissolved by warmth in some form of fat which coagulates on cooling. It may also be given in solution in appropriate fluid mixture, but most of these solutions have an excessively offensive taste. As slow poisoning by phosphorus is very insidious, the drug should be taken only under the observation of a physician.

Revised by H. A. HARE.

Pho'tius: ecclesiastic; held a high position in the civil service of the Byzantine government, and was distinguished for his learning and literary taste, when in 858, on the deposition of Ignatius, he was hurried through all the ecclesiastical degrees, and installed by the Emperor Michael III. as Patriarch of Constantinople. A council of 318 bishops, held at Constantinople in 861, confirmed the election, but Pope Nicholas I. objected to the irregularities of Photius's elevation, and convoked a council at Rome in 862, which deposed and excommunicated him. Photius then gave the conflict a doctrinal turn, and the Council of Constantinople (867) condemned and excommunicated Pope Nicholas I. because of heretical views, thereby laying the foundation of the schism between the Eastern and Western churches. In 867 Photius was deprived by Basilus the Macedonian of his office and sent into exile, and Ignatius was reinstated; but after the death of Ignatius he returned to Constantinople, and was once more placed on the patriarchal throne. In 886 Leo the Philosopher again exiled him, and he died a few years after in an Armenian monastery. Of his works, the *Myriobiblon* or *Bibliotheca*, a collection of extracts and summaries of a large number of Greek authors in 280 sections (edited by I. Bekker, 1824), the *Lexicon* (edited by Porson, 1822, and by Naber, 2 vols., 1866), the *Nomocanon*, a collection of acts and decrees of councils up to the seventh œcumenical council, and his letters are of great interest. A collected edition is found in Migne's *Patrologiæ Cursus Completus*.

Revised by B. L. GILDERSLEEVE.

Photo-engraving: the term applied to a variety of processes in which the action of light and the use of certain chemical substances supplant the work of the engraver. About the year 1826 Nicéphore Niepce, a Frenchman, discovered that bitumen, under certain conditions, became sensitive to light, losing solubility by its action. He coated a sheet of metal with bitumen dissolved in oil of lavender, exposed it under a drawing to the rays of the sun; the bitumen became insoluble in all those parts except where the lines protected it; the latter were then dissolved away with oil of lavender, and the metal thus laid bare was etched with an acid. Many modern processes are based upon this action of bitumen, but in others different substances, rendered insoluble by light, are employed, being quicker in their action, although the finest results are still obtainable by the bitumen process.

The modern method of producing a photo-engraved metal block is as follows: A collodion negative is first made of the line drawing, giving clear white lines on a black ground. If from a photograph, or a washing drawing, or from any picture or object where there is a *gradation* of color, what is termed a *half-tone* process must be employed. This consists in placing in front of the sensitive plate a transparent screen having a network of fine lines mechanically ruled upon it, which breaks up the image into a mass of fine dots, varying in size according to the amount of light composing the various parts of the image passing through the network. A polished plate of metal, such as zinc, brass, or copper (the last being used for the finest work), is next coated over with the sensitive solution—bitumen dissolved in benzole or albumen rendered sensitive by the addition of bichromate of ammonium or potassium. When this is dry, the plate is exposed to light beneath the collodion negative and afterward treated with the necessary solvent, turpentine being used for the bitumen and water in the albumen process. With the latter method the plate is dried and dusted over with finely powdered asphaltum, the surplus brushed off, and the plate held over a stove until the asphaltum just melts. An image capable of resisting the action of acid etching-fluids is thus produced upon the metal plate. It may be mentioned that with some processes the image instead of being printed direct upon the plate is transferred to it. The plate is next coated over at the back and sides with an acid-resisting varnish, and then immersed in the acid etching-bath. If upon copper, the etching mordant used is perchloride of iron. The action of the mordant is to bite into the metal where unprotected by the image, and in this manner the printing-plate is produced. Such a plate can be printed from in the ordinary printing-press.

Photogravure.—In printing from a photo-engraved plate the ink is taken up and transferred to paper by the raised or unetched parts of the plate, but in photogravure the ink fills up the intaglio engraved on the plate by the acid and is lifted away again by the paper pressed upon it. The process of making a photogravure plate is as follows: From the ordinary photographic negative a positive transparency is made. A piece of carbon tissue (paper coated over with gelatin containing lampblack) is sensitized in bichromate of potassium and exposed to light beneath the positive. A copper plate is dusted over with very finely powdered resin or asphaltum, and heated, which gives it an etching-ground, rendering it capable of holding the ink. The exposed carbon tissue is mounted upon the copper plate and subjected to the action of hot water. This dissolves away the gelatin unacted upon by light, leaving a negative image upon the copper. It is then etched with a solution of perchloride of iron, and the photograph cleared off, leaving a plate that may be printed from in the same manner as a copperplate etching or mezzotint engraving.

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WALTER E. WOODBURY.

Photography [Gr. *φῶς*, *φωτός*, light + *γράφειν*, write]: the art of producing permanent images or pictures by means of the chemical action of light, or, more strictly, of "radiant energy."

Early History.—The first authentic record of an attempt to utilize the action of light for producing pictures appears

in the early years of the nineteenth century. In 1802 Thomas Wedgwood, son of the famous potter, published in the *Journals* of the Royal Institution a paper giving an account of a "method of copying paintings on glass and making profiles by the agency of light." The sensitive surface which he employed was obtained by impregnating paper or white leather with a solution of nitrate of silver. When this was exposed to sunlight under a design on translucent material the prepared surface darkened in proportion as the light reached it, with the result that a copy of the design in light and dark was produced. Davy, who worked with Wedgwood, afterward found the chloride of silver more sensitive than the nitrate, and succeeded in reproducing the strongly illuminated images formed by the solar microscope; but no device was found for rendering these results permanent. Exposed to daylight the light parts soon darkened, producing a uniform tint over the whole surface and obliterating the picture. As Davy says of it, "Nothing but a method of preventing the unshaded parts of the delineation from being colored by exposure to the day is wanting to render this process as useful as it is elegant." As it was, the process was of course a failure, and the development of photography was delayed for nearly forty years for want of a solvent for the unchanged chloride of silver.

Niepce's Asphalt Process.—A permanent result was, however, obtained in 1814 by Niepce, of Chlons. Having discovered that asphalt is rendered insoluble by the action of light, Niepce exposed a film of dry asphalt varnish on polished metal under a drawing. The film was then soaked in a mixture of oil of lavender and white petroleum, which dissolved the parts which had been protected, laying bare the metallic surfaces, and thus bringing out a copy of the drawing. By this process Niepce also succeeded in securing pictures of landscapes in a camera, many of which were exhibited by him in England in 1827. Although these "heliographs" were not very satisfactory as pictures, the process still survives in modified form in the asphalt process for photo-mechanical printing. In the heliograph method of Niepce is found the idea which lies at the basis of all successful photographic processes for making camera images—the development of an invisible or "latent" image by treatment after exposure. In 1829 Niepce associated himself with Daguerre, but died in 1833 without arriving at any important results. Daguerre, however, pursued the work, and in 1839 brought out the process known by his name.

The Daguerrotype.—The original daguerrotype process was in outline as follows: A carefully polished surface of silver (plated on copper) received a delicate film of silver iodide by fuming with the vapor of iodine. After exposure in the camera for some time there is no visible change produced; but the action of the light is made apparent by placing the plate over a dish of heated mercury, whose vapor condenses on the parts which were illuminated, and in proportion to the chemical effect producing an image in white amalgam of mercury and silver. The image was made permanent by means of a strong solution of common salt. It was soon found that the plates were more sensitive, and thus the time of exposure shortened by using bromine vapor with the iodine; and also, on suggestion of Sir John Herschel, that hyposulphite of soda (sodium thiosulphate) gave a better solution for "fixing" the image than common salt; while both the appearance and the permanency of the pictures were improved by gilding the silver portions with a solution of gold. The pictures taken by this method were of great fidelity and beauty, and were very popular for portraiture until the invention of the collodion process some twelve years after Daguerre's discovery. The first photographic portraits from life were made by this process by Dr. J. W. Draper, of New York, in 1839. The great defect of the method, from the present standpoint, is that no copies of the original daguerrotype are possible, except by an electro-chemical method. Daguerre received from the French Government, on the publication of his process, a pension of 6,000 francs, while Niepce's son, Isidore, who was associated with Daguerre after the death of his father, was given a pension of 4,000 francs.

The Calotype.—While Daguerre was working in France, Fox Talbot, in England, was experimenting on the lines suggested by Wedgwood and Davy. He found that paper soaked in common salt solution and then brushed over with silver nitrate gave a film of silver chloride more sensitive to light than the chloride in the state used by Davy. With this Talbot was able not only to make prints of drawings, lace, ferns, etc., but also to secure images in the cam-

era. Another step was taken with the discovery by Rev. J. B. Reade of the accelerating power of gallic acid, and in 1841 Talbot patented the calotype process. By it a latent image is formed on silver iodide paper and developed by nitrate of silver and gallic acid. The result is a "negative," or picture in which the natural lights and shades are reversed; but, as the paper is somewhat translucent, and can be made more so by waxing, "positive" copies may be produced in indefinite number by exposing sensitized paper beneath it. This method of securing prints by "contact-printing" is essentially the same as that employed now. Among the defects of the calotype process were the lack of transparency of the paper and the fact that its texture was copied in the positive print. The introduction of glass instead of paper is due to Sir John Herschel, who recognized its value on account of transparency, rigidity, and indifference to chemical agents. In the first attempts to use a glass support the film of silver salt was formed on it by subsidence from water. It proved, however, to be of little sensitiveness, and did not adhere well to the glass.

The Albumen Process.—Niepce Saint-Victor, seeing the necessity of an adherent substance to hold the silver salts, coated glass plates with albumen (white of egg) containing the iodide and bromide of potassium and common salt. On drying and heating, the albumen became insoluble, and the film was sensitized by a bath of silver nitrate, which reacted with the salts in the albumen, forming the iodide, bromide, and chloride ("haloids") of silver. A similarly prepared albumen surface on paper was used for positive printing. The results were much finer and more brilliant than those of the calotype process.

The Collodion Process.—In 1851 Scott Archer substituted for albumen, collodion, a solution in alcohol and ether of pyroxylin, made by the action of nitric acid on cotton, and closely allied to the explosive gun cotton. The collodion process could be worked with greater certainty than the albumen; it displaced the daguerrotype, and in various modifications was practically the only process used for making negatives for over twenty-five years. In this process collodion containing soluble bromides and iodides is flowed over a glass plate, and the film, when partly dry, is immersed in silver nitrate. After exposure the latent image is developed by means of an acid solution of a reducing agent, such as ferrous sulphate or pyrogallie acid. This developer does not affect the silver haloids, but reduces the silver nitrate adhering to the film to metallic silver, which is deposited on those parts on which the light has acted, and in proportion to the amount of that action, so that an image is built up in finely divided silver. This image can be intensified by further application of nitrate of silver and developer, and is fixed by hyposulphite of soda. The negative is then washed to remove all soluble substances, dried, and used for the production of positives in the way already indicated.

Collodion Dry Plates.—In this so-called wet-collodion process the plates must be exposed immediately after their preparation. This inconvenience led to many attempts to impart keeping qualities to the film. The most successful of these modifications consisted in washing off the excess of silver nitrate after the bath in that solution, coating the surface with some "preservative," and drying. The "preservatives" were all organic substances of some description, tannin, morphine, coffee, tea, and tobacco being among those recommended by various photographers. The "dry plates" thus prepared kept for a considerable time, but were much slower than the original wet plates.

Emulsion Processes.—About 1864 a collodion film was used in which the silver salts were contained in the state of emulsion, and in 1871 the first successful attempts with a gelatin emulsion were made. This last process developed in the following seven or eight years into the gelatin dry-plate method, which since that time has been in general use. In both of these emulsion processes the silver haloids formed by double decomposition are emulsified in a mass of the vehicle, the soluble products of the reaction removed by washing, and the emulsion rendered more sensitive, or "ripened," by standing for some time, in the case of collodion; or, in the gelatin process, by boiling or treatment with ammonia. The development of the latent image is effected by means of ferrous oxalate or an alkaline solution of some reducing agent such as pyrogallie acid. The exquisite sensitiveness of the modern gelatin dry plate is due to the mode of development as well as to the nature of the vehicle and the state of the emulsified salts.

The Action of Light and of the Sensitizer.—It has been

seen that all successful negative processes depend on the use of salts of silver. The action of light on the silver haloids results in their partial reduction with loss of halogen. This occurs with comparative slowness when the salts are pure; but when they are in intimate contact with some substance which readily takes up the halogen set free by the light, the change goes on with greater rapidity. To the class of halogen absorbants belong silver nitrate, gelatin, tannin, and many other organic substances. These substances act, therefore, as accelerators or sensitizers when associated with the silver haloids. Referring to the various processes which have been outlined, it is seen that in the successful cases some halogen-absorbing substance has been employed. The greater sensitiveness of the calotype paper, as compared with Wedgwood and Davy's preparations, lay in the presence of an excess of silver nitrate. In the albumen and wet-collodion processes, again, it is free nitrate of silver which gives sensitiveness; in the dry collodion, the "preservative"; while in the present dry plate the rôle of sensitizer is played by the gelatin, which is an especially efficient halogen absorbant. In the daguerrotype process it is the silver plate itself which aids the action of light by taking up the halogen.

Ripening.—The greatly increased sensitiveness of the ripened gelatin emulsion has been found to depend on a purely physical change in the imbedded particles of silver bromide, which increase in size as the ripening proceeds. This fact is indicated by the color of the light transmitted through the emulsion, which changes as the process goes on from reddish to gray or grayish violet.

Development.—The first attempts in securing the camera image were directed to the discovery of a "printing-out process," as it would now be called; that is, a process in which the delineation of the picture should be complete in the camera. Daguerre's efforts in this direction were unsuccessful, and his discovery of the mercury development is said to have been the happy result of an accidental exposure to mercury vapor of a plate which had been tried in the camera and discarded as a failure. The hint was not lost on the other workers in photography, and from that time all negative processes were by development of the latent and invisible image produced by the light. The most important developers which have been employed are acid solutions of pyrogallie acid or ferrous sulphate in presence of silver nitrate, ferrous oxalate, and alkaline solutions of pyrogallie acid, etc. All developers are reducing agents which carry on the reduction begun by the light. The action of the acid developers has been explained under the collodion process. The result is the formation of an image in relief. With the ferrous oxalate and alkaline developers, on the other hand, the picture is built up by growth from beneath, the silver of which it consists being supplied by the particles of silver haloid underlying and in contact with the material of the latent image. In this case the image is sunk in the film, forming an intaglio. The alkaline developers are much more powerful than the others, and could not be employed in connection with silver nitrate, as in the wet-collodion process, where they would cause a deposit of silver over all the plate. A number of substitutes for pyrogallie acid have been proposed in recent years, among them hydrochinon, para-amidophenol, eikonogen, and methol.

Positive Printing—The Silver-print.—Since the picture obtained by exposure in the camera and subsequent development is a negative, in which the light parts of the object are represented by a dark deposit of silver, it is necessary to combine with this negative process a positive one, which shall give an image whose shading corresponds with that of the original. As already stated, the usual method of accomplishing this is in principle the same as that used by Talbot. The common silver-print is made on paper coated with egg albumen, which has been "salted" with chloride of sodium or ammonium, and sensitized by floating on a strong solution of silver nitrate. The dry paper is usually fumed with ammonia shortly before it is used. After proper exposure to sunlight under the negative, the print is fixed by immersion in hyposulphite of soda. In the fixing bath the picture acquires an objectionable reddish tint, which is corrected by "toning" with a solution of gold. Combined fixing and toning baths are sometimes used. Other silver-printing processes employ gelatin or collodion in place of albumen. After the prints are toned and fixed, all the soluble substances which they retain must be completely removed by thorough washing with water. If this is not effectually done, the photographs become in time faded and

discolored. When dry they are trimmed and mounted on cardboard, and burnished by being passed between heated metallic rollers.

Among the printing processes which depend upon sensitive substances other than silver salts, the more important survivals are those employing potassium or ammonium bichromate in gelatin or other sensitizer, the blue-print process, and the platinotype process.

Carbon Processes.—Gelatin containing bichromate is rendered insoluble in water by action of light, and its "tackiness" destroyed. The first fact is utilized by mixing some pigment with the chromated gelatin, which is removed with the soluble portions during development (in water), leaving an image in pigmented gelatin; the second, by dusting powdered pigment over the film after exposure, when adhesion to the unaffected parts brings out the picture. In the latter case the lights and shades reproduce those of the plate under which exposure was made; hence the printing must be under a transparent positive. Processes of this sort are known as "carbon" processes.

Blue Prints.—Blue prints are made on paper coated with a mixture of a ferrous salt, usually ammonio-citrate of iron, and ferricyanide of potassium. The image is developed and fixed by merely washing in water, which brings the reduction products into reaction with the result that insoluble Turnbull's blue is formed, and dissolves the unaltered salts, leaving a picture in blue on a white ground. This process is largely used on account of its cheapness and simplicity for copying plans, and by amateurs.

The Platinotype.—In the platinum process the paper is coated with ferric and platinum salts. Light reduces the ferric to a ferrous salt, and this, when brought into solution by the developer (oxalate of potassium), reduces in turn the platinum salt, giving an image in platinum black. The platinotype is very soft and beautiful, resembling a fine engraving, and has the additional merit of being absolutely permanent.

Direct Positives.—A thin negative, produced by short exposure or insufficient development, appears as a positive when seen by reflected light against a black background. This fact has been used for making collodion positives directly, as in the "ambrotype," in which the glass plate receives a dark backing, and in the ferrotype, or "tintype," in which the support and background are a plate of enameled iron.

Photo-mechanical Printing.—A number of photographic processes for the preparation of plates and blocks, from which impressions may be made by mechanical printing, have been developed, some of which are of great perfection, and have largely displaced wood-engraving for purposes of illustration. Most of these depend in their photographic part on the behavior of bichromated gelatin toward light, which has already been alluded to. The limits of this article admit only of a brief sketch of one or two of these processes, and the reader is referred for details and descriptions of others to the books on the subject whose titles are given at the end.

The Woodburytype.—In the Woodburytype development (by hot water) of a bichromated gelatin film gives an image in relief. When dry, the film is stripped from its glass support and forced, face down, by hydraulic pressure on a plate of lead. The gelatin image withstands the enormous pressure, and sinks into the lead surface, producing a mould. From this mould the prints are made. The ink is a mixture of gelatin, water, and coloring-matter. The mould is oiled, and a pool of ink poured on it; then a sheet of specially prepared paper is laid on top and pressed down under a platen, which squeezes out all the ink except that filling the depressions of the mould; this is allowed to set, and on removing the paper adheres to it, forming a relief image whose varying thickness gives gradations of shade.

The Stannotype.—The stannotype process is similar to that just described, but does away with the hydraulic pressure and lead mould. The exposure is made under a positive, so that the gelatin image is itself a mould like that obtained in lead in the last process. It would, however, be destroyed if brought in contact with the ink, and is therefore protected by a facing of tin-foil, and then used for printing in the same way as the lead mould of the Woodburytype.

Photolithography.—In photolithography advantage is taken of the fact that those portions of a bichromated film affected by the light acquire the property of holding greasy lithographic ink. The "artotype" is a form of photolitho-

graph. Other processes give relief blocks for printing by etching with acid the metal which supports the gelatin or asphalt image.

Use of Artificial Light.—While direct or reflected sunlight is generally employed both for the production of the camera image and for positive printing, artificial light may be used to advantage in some instances. The electric arc-light has occasionally served for photographic illumination since the earliest days of the daguerrotype; but the light that has proved most available is that of burning magnesium, which is much used for photographing dark interiors and for the instantaneous "flash-light" pictures. For copying by means of the camera, making negatives of microscopic objects, contact printing on dry plates for transparencies, and on gelatino-bromide paper, gas or oil light is commonly employed.

Chemical Action of Light.—Light from different sources, even if of the same luminous intensity, shows marked differences in its chemical effect. It is well known that ordinary white light is composed of a great number of rays of different colors, and that this difference in color is an expression of a difference of wave-length or vibration-frequency. When white light is passed through a glass prism, its component rays are refracted more strongly as their wave-length is less, so that a narrow beam is spread out in fan shape and produces on a white screen a "spectrum" of color extending from the least refrangible red through yellow, green, and blue to violet. Light and color form but one of the modes in which the radiation from a luminous source or "radiant energy" can manifest itself. Each has in general, besides this power of exciting vision, a heating and a chemical or "actinic" effect. Nor are these effects limited to the visible spectrum; the heat extends far into the region beyond the red, and chemical action is found beyond the violet; moreover, the intensity of these effects is not similarly distributed; luminous intensity reaches its maximum in the yellow part of the spectrum; the greatest heating effect is usually in the infra-red; while the chemical action differs with the substance on which it is exercised, and in the case of the silver salts used in photography is most in the blue and violet, and almost altogether absent in the yellow and red.

This fact has several important consequences. From the moment of making the sensitive emulsion until the negative is in the fixing bath, the material of the film must be protected from all actinic rays except those of the camera image; and the inactivity of the red and yellow makes it possible to conduct all necessary operations in light which has been filtered through glass or paper of red or orange color, instead of in the uncertainty of utter darkness. Again, this fact explains the frequent failure of the photograph to give in its light and shade a truthful representation of the effect of colored objects. Reds and yellows photograph black, while the blues usually appear much lighter than in nature. This difficulty has been in part overcome in the "ortho-chromatic" and "iso-chromatic" plates, in which, by the application of certain dyestuffs (first suggested by Vogel, 1873), the film is rendered sensitive to the usually inactive rays, and a more naturally shaded picture is secured. Finally, the photographic lens has to receive a somewhat different form from that of the optical lens. For light in its passage through lenses suffers dispersion, or separation into color, along with the refraction by which the image is formed. In a single lens this results in the production of a series of colored images, the red one farthest from the lens and the violet one nearest. By the combining two lenses whose dispersive power is opposed, most of this effect can be done away with and a single sharp image formed. It is, however, impossible to bring all rays to exactly the same focus, and in optical lenses the correction is made for the most luminous rays, so that the actinic rays form an image whose position differs somewhat from that of the visible one. Consequently, after focusing sharply with such a lens, the negative would be found blurred. The elements of the photographic lens are therefore ground so that the actinic and the visual foci shall coincide.

Lenses.—The photographic camera is a development of the camera obscura which was described by Porta in the sixteenth century. Light entering a darkened room through a small orifice forms images of the objects without; but a lens in place of this simple opening gives images which are much brighter and sharper. The lenses for this purpose must be of the convex class, as these alone give "real" images which can be caught on a screen. The lenses used

in photography may be grouped in the following classes: (1) single corrected lenses; (2) rapid rectilinear; (3) wide-angle rectilinear; (4) portrait lenses. All except the single lenses consist of two combinations, which differ in detail and are mounted at different distances apart, according to the special work for which they are intended.

The focus of a lens is the point in which rays which enter parallel meet after emergence. The distance from the optical center of the lens to the focus is called the focal distance, or, in the case of compound lenses, the "equivalent" focal distance, being so termed from comparison with a single lens of equal power. The image is formed at a distance from the lens which is greater as the object is nearer the lens; for very distant objects, nearly at the focal distance.

Diaphragms.—Accompanying the lens are a number of diaphragms or "stops," which are brass plates with circular openings of different diameters. Placed in the lens-tube in a slot provided for their reception, the diaphragms cut off the outer rays of the entering beam to a greater or less extent, and, by correcting certain deficiencies of the lenses, increase the sharpness of definition and the depth of focus. Since the light admitted through the diaphragm varies as the area of its opening, or the square of its diameter, the time of exposure must be varied inversely as these diameters. The size of the diaphragm is usually expressed in terms of the focal distance of the lens; thus, $\frac{f}{10}$ means that the diaphragm marked in this way has an opening whose diameter is one-tenth of the focal distance of the lens to which it belongs.

Photographs without a Lens.—Since images are formed by admission of light through small apertures, it is possible to take photographs without a lens. To get clear definition, the diameter of the orifice must be several hundred times less than its distance from the sensitive plate, so that the exposures have to be very long. The images have, however, the advantage of being entirely free from all distortion.

The Camera.—The camera is a light-tight wooden box, or, as in many modern cameras, a framework of wood whose parts are connected by a bellows of leather, so that the camera may be light and occupy little space when closed. In front is fixed the lens, and at the back is a screen of ground glass for focusing the image by an arrangement which serves to shorten or lengthen the camera body. With the camera are one or more plate-holders, usually carrying two plates back to back, and which fit the back of the camera so that the film of one of the plates may occupy exactly the position of the focusing screen. The plates in the plate-holder are protected from the light by a slide which is withdrawn during the exposure. Light is admitted for the exposure either by uncapping and capping the lens-tube, or by means of a mechanical shutter fitted to the tube, which is controlled by a pneumatic bulb, and, in case of "instantaneous" or very brief exposures, is operated by a spring released by air from the bulb.

"Detective" cameras, which are much in vogue, are small boxes with mechanical adjustment for focusing, and a finder, consisting of a small auxiliary lens and ground glass screen for ascertaining the position of the image. In these cameras the film is on a flexible support, as paper or celluloid, in a continuous roll wound on two spools at the back. After an exposure the film is reeled from one spool to the other, a mechanical check indicating when a proper amount of fresh surface is brought into position. The shutter is made to flash across the opening by pressing a button.

Printing.—In printing from negatives, the negative is placed in a "printing-frame," glass side out, and the prepared paper faced down on it and held in close contact with the film by a back secured by springs. The back is in two parts, hinged together so that one part may be opened to examine the progress of the printing, while the paper is prevented from shifting by the other.

Photography in Natural Colors.—One of the earliest dreams of photographers was to fix the natural colors of the camera image. Until quite recently all attempts in this direction were unsuccessful. Within a short time encouraging results have been obtained by Lippmann by a method based on the interference of light. Lippmann's process has been improved by Messrs. Lumière, who are said to have applied it successfully to landscapes and portraits. At present the necessary exposure is long, and no copies can be made, while the picture is clearly visible only when viewed at a certain angle.

Ives's Process.—A process which gives colored images by an indirect method has been brought out by F. E. Ives. In it nature is imitated by a superposition of monochromatic images. Starting with the Young-Helmholtz theory, that all color is the result of three primary sensations responding to red, green, and blue-violet rays respectively, which being excited, singly or together, produce all possible tints, three negatives are made of the colored object, one through a screen which allows only red to reach the plate, a second in green, and a third in blue-violet light. Transparencies from each of these negatives are made, and the three pictures projected by a lantern through red, green, and blue color screens respectively. When the images are superposed on the screen a picture resembling the natural object in tint is produced. This process has also been applied with moderate success to the production of photo-engravings by preparing blocks from the three negatives and printing in superposition with properly colored inks.

For the so-called *New Photography*, see X-RAYS.

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J. T. STODDARD.

Photolithography: See PHOTOGRAPHY.

Photometer [Gr. *φῶς*, *phōs*, light + *μέτρον*, *metron*, measure]: an instrument for the comparison of artificial light sources with a standard. All such instruments are based upon the power of the observer to determine by inspection when two contiguous fields of view are equally bright. Reliable judgment of this character can be formed, as has been pointed out by von Helmholtz, only when the *lights illuminating the two fields of view are identical in color—that is to say, in composition*.

The above may be regarded as the fundamental assumption in all photometric operations. The lack of precision in photometry as frequently practiced is indeed due chiefly to the attempt to compare *unlike* sources of light without taking into consideration their differences in quality.

It follows that for lights which differ in composition a class of instruments must be used in which each wave-length in the spectrum of the standard is compared separately with the corresponding wave-length in the spectrum of the light under investigation. Such instruments (spectrophotometers) have, however, not been largely introduced in the commercial measurement of gaslight or of electric lamps. The present article will be confined to the consideration of photometers designed for the comparison of similar light sources.

The earliest of these photometers appears to have been due to Bouguer, although frequently ascribed to Rumford. It consists simply of an upright rod casting shadows upon a

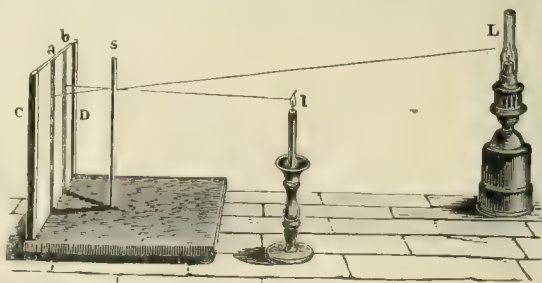


FIG. 1.

white screen placed behind it (Fig. 1). If the only light falling upon the screen come from the two light sources *l* and *L*, which are to be compared, the spaces occupied by the two shadows which the rod *s* will cast upon the screen will be illuminated respectively by the source to which the shadow in question is not due. The brightness of the two fields within the areas covered by the shadows may now be made equal by adjusting the distances of the two sources of light,

when we have the following simple relation between their intensities and their distances from the screen,

$$\frac{I_L}{I_l} = \frac{D_L^2}{D_l^2},$$

where I_L and I_l are the illuminating powers of L and l respectively and D_L and D_l are their distances from the screen. This relationship holds in the use of all photometers based upon the principle stated in the opening paragraph of this article.

Rumford pointed out the conditions under which this instrument will give the best results, the chief of which consists in arranging the apparatus so that the two shadows, instead of being widely separated as in the figure, will be contiguous and separated by a well-defined boundary-line. Thus constructed, the Rumford-Bouguer photometer is as sensitive as any known form when used with lights of identical composition. It is, however, more sensitive to slight color differences, and brings out more strongly than many other forms the uncertainties to which the photometric process is subject when we attempt to apply it to dissimilar sources.

Photometers of the above type have been almost entirely abandoned in industrial work because of the greater convenience of a form devised by Robert Bunsen.

The Bunsen photometer is so constructed that the two fields of view, the illumination of which is to be brought into equality, lie between the light-sources, which are placed at the ends of a track or bar (the photometer bar). This bar carries a scale which may be divided equally throughout to advantage in 1,000 parts, or in such manner as to be direct reading in standard candles or in some other unit. The essential feature of the Bunsen photometer, however, is the disk. This in the original form consisted of a piece of unsized paper of considerable thickness, a portion (usually a central circular spot 2 or 3 cm. in diameter) of which had been rendered translucent by treatment with oil or paraffin.

The appearance of the disk by reflected light is that of a dark spot upon a bright ground. A considerable portion of the light which is reflected from the surface of the opaque portions of the paper and serves to render it visible is transmitted by the translucent part. By transmitted light the reverse is true, and when the disk, mounted upon a suitable ear, is shifted along the bar between the two lights to be compared it passes through an intermediate stage where the translucent and the opaque portions, whichever side one may view them from, present an almost identical appearance. This happens when the illumination on both sides is alike, and it only remains to note the position of the disk upon the bar and to apply the formula given in a previous paragraph. Sometimes for convenience in preparation the center of the disk is protected by being clamped between two flat, circular pieces of metal or wood, and the whole is dipped into melted paraffin. This gives an opaque spot in the middle of a translucent screen, in which case all the above-mentioned appearances are reversed.

In order to render possible simultaneous observations of the two sides of the disk two mirrors are mounted obliquely on either side, as shown in Fig. 2, in which D is the disk, $M M$ are the mirrors, and $A A$ is the aperture through which the observer looks. The arrows indicate the directions in which the rays come from the

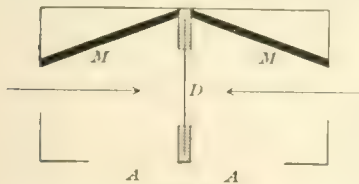


Fig 2

two light-sources. Fig. 3 shows the bar or track and the position of the bar between the two sources. L_r and L_l indicate, respectively, the directions in which light comes from its sources.

Many modifications of the Bunsen disk and substitutes for it have been devised, but only one of these offers such a decided advantage over the original form as to make it necessary to describe it here. This is the photometer of Lummer and Brodhun, in which the rays from the two sources are reflected obliquely from the direction of the photometer bar so as to make an angle of 90° with one another and of 45° with the bar. At the point in which they cross each other a pair of rectangular prisms, cemented together, are placed, as shown in Fig. 4. These would form a com-

plete cube with faces perpendicular to the two rays were it not that a portion of the left-hand prism is cut away, as shown in the diagram.

The result of this arrangement is that a bundle of rays, $r_1 r_2$, from the observer's right enter the prism $b_1 c_1 b_2$.

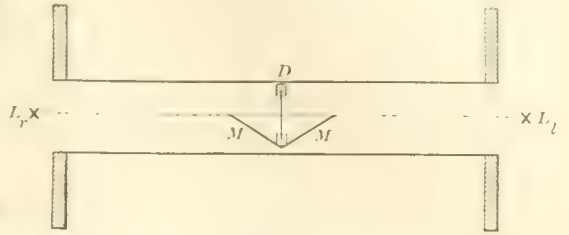


Fig. 3.

Those portions which reach the interface between a_1 and b_1 (also $a_2 b_2$) are totally reflected, while those between a_1 and a_2 pass through. To an observer at O the appearance is that of a bright ring with a dark center. If, further, the bundle of rays $l_1 l_2$ fall upon the prism $b_1 c_1 b_2$, only those which reach the face $a_1 a_2$ will be transmitted. When the intensities of the two rays are equal the dark center will disappear. When l is brighter than r the center will be brighter than the ring.

This form of photometer possesses a higher degree of sensitiveness than those previously described. Working upon a photometer bar of 1,000 divisions, with similar in-

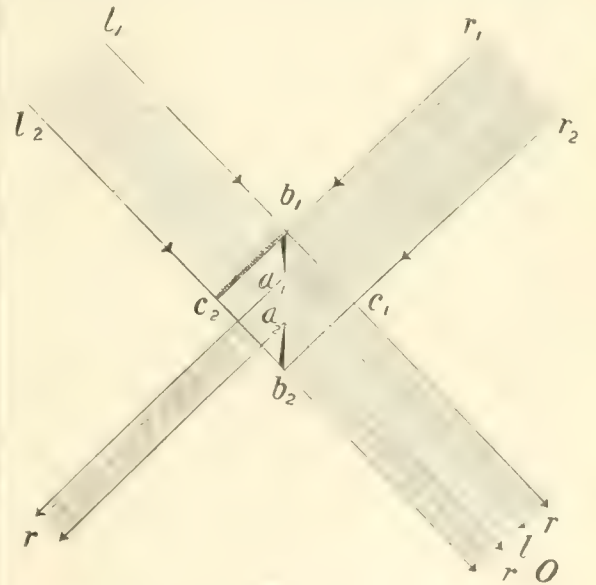


Fig 4

candescant lamps at the ends, the lamps being maintained at the same candle-power, a series of fifty readings made with the ordinary Bunsen photometer and with the Lummer-Brodhun photometer respectively gave as the mean error of a single setting:

Lummer-Brodhun.....	± 0.884 s. d.
Bunsen.....	± 1.459 s. d.

The sensitiveness to slight color differences is less in case of the Lummer-Brodhun than in other photometers. A comparison with the Bunsen disk, which probably comes second in this respect, gave for the change of voltage to which a 100-volt glow-lamp could be subjected before the color difference between it and a similar lamp at constant voltage with which it was being compared was observable with certainty:

For Lummer-Brodhun.....	8.6 volts.
For Bunsen.....	5.76 volts.

This lack of sensitiveness to color differences affords at least some apparent advantage, since the observer is freed from a disturbing element; whether the readings, rendered more concordant on this account, are really of greater accuracy is an open question. The chief advantage of the

Lummer-Brodhun form undoubtedly lies in the fact that observations are made through a telescope, only one eye being employed. The errors thus avoided are not considerable, as will appear from the following experiment:

Ten observers in the physical laboratory of Cornell University (1889) made a series of observations, using the Bunsen photometer and employing the two eyes simultaneously in the customary manner, for the purpose of determining this error. Two lamps of intensities I_2 and I_1 were placed

at the right and left ends of the bar. The ratio $\frac{I_2}{I_1}$ was $1.0032 \pm .0015$. The mean of ten readings by these observers, however, gave:

Observer.	$\frac{I_2}{I_1}$	Observer.	$\frac{I_2}{I_1}$
A	1.0590 \pm .0040	F	1.0902 \pm .0057
B	0.9504 \pm .0044	G	1.0733 \pm .0053
C	1.0021 \pm .0022	H	1.0293 \pm .0042
D	1.0191 \pm .0072	I	1.0297 \pm .0050
E	1.0182 \pm .0039	J	1.0220 \pm .0027

It will be noted that all but one of the observers set the disk persistently to the left hand of its true position. The error appears to be analogous to that which arises in the attempt to bisect a straight line by judgment formed in unaided vision. It disappears in those methods in which only one eye is used.

For further information concerning photometers, see PHOTOMETRY; for a discussion of light standards, see CANDLE and CARCEL. The reader is further referred to Palaz, *Photometrie Industrielle*.

E. L. NICHOLS.

Photometry [Gr. *φῶς*, *φωτός*, light + *μέτρον*, measure]: the operation of measuring the intensity of light. In setting such a process on a satisfactory scientific basis, a great difficulty is met with in the fact that the effect measured is not a physical one, but merely an excitation of the optic nerve, the amount of which does not permit of any precise determination. Making abstraction of the different colors of light, and considering only ordinary white light, the principles on which photometric investigations are conducted are these: A comparison of the intensity of two lights can be made only by increasing or diminishing one or both of them until they appear to the eye to be equal. For example, in comparing the light from a gas-jet with that of a candle, we may, by using various instruments, and by putting the jet at different distances, so diminish the light which comes from the latter that the eye shall see side by side the light of the candle and one-fifteenth the corresponding part of the light of the gas-jet; if they then look equal, we shall know that the light emitted by the gas is fifteen times that emitted by the candle. The instruments by which these various comparisons are made are called photometers. See PHOTOMETER.

If all light were of one kind the application of this method of comparing lights would offer no difficulty; but, as explained in the article LIGHT, this agent is a heterogeneous mixture of light of widely varying wave-lengths. No accurate comparison can therefore be made between lights of different colors; in any case the comparison will be a matter of guesswork, and people will guess differently from each other when two lights of different colors appear equal. Yet some system of photometry is not only a necessity in astronomy, but in the practical comparison of different systems of illumination. Let us therefore inquire what view we shall take of the relation between the intensity of beams of light of different colors.

It is shown in the article on LIGHT that, when considered as a physical agent, light is nothing but radiant heat. Hence the only absolute measure of the intensity of a ray of light is the heat or radiant energy which it conveys. If we form its spectrum by dividing it into its prismatic colors, the proper measure of the intensity of each color, or each region of the spectrum between two given wave-lengths, is the amount of heat which is there conveyed; but even the intensity of the heat at a given point of the spectrum will depend on the way in which the spectrum is formed. If we proceed by the units adopted in the article LIGHT, we may classify the parts of the spectrum as follows: That of wave-length between 3 and 4 units; that between 4 and 5; that between 5 and 6; that between 6 and 7, etc.

Of course we could subdivide these regions into as many others as we chose. Then a complete statement of the intensity of the different parts of the spectrum would be merely a statement of how much heat was conveyed by the light between these several limits of wave-lengths. When,

however, we refract the light by a prism these four regions spread out unequally. Thus the heating effect in different parts of the spectrum will not give a correct expression even for the amount of heat belonging to that part of the spectrum. It follows that we must correct any determination of the relative amounts of heat thus made, by allowing for the different degrees in which the parts of the spectrum are spread out. There are, however, two insuperable difficulties in the way of reducing photometry to a mere measurement of heat. One is, that the very object of photometry is to determine visibility, and not to measure heat. The eye must therefore be the sole arbiter. Besides this, the eye is so much more delicate than any instrument for measuring heat that it will perceive a ray of light the heat from which could never be detected. What is then really wanted as a basis of photometry is a determination of the relation between the amount of heat carried by rays between each two limits of wave-length and the corresponding visibility of the light. It must not be forgotten that there can be no general comparison for either the heating or the illuminating effect of different parts of the spectrum. In fact, the relative intensity of radiation in different parts of the spectrum depends on the nature of the body from which the light comes, and the absorbing media through which the light has passed. Such expressions as "the brightest part of the spectrum," or "the relative heat in different parts of the spectrum," can be true only of the spectrum of some one body—the sun, for example—or of a given substance at some given temperature—iron at 2,000°, for example.

There are two possible units by which the purely illuminating effect of light of different wave-length can be compared. One is afforded by the determination of the least quantity of light that can be seen. If we agree to take this quantity as a unit at each part of the spectrum it will afford us a basis for comparing the luminosity of light of different colors. Yet another unit would be the smallest amount of light by which the eye could read, or distinguish letters at a given distance. Should we hang up a page containing a few sentences in large print—or, better yet, the test types used by oculists—and then illuminate them with red light, yellow, green, blue, etc., until the eye could just distinguish them, we should have a basis for such a comparison; but from what has already been said it will be seen that the results of this comparison would be incomplete unless the amount of heat carried by these various units of light was also determined. This is quite within the power of science, and, in fact, Prof. Langley has already made researches in this direction. When a table can once be constructed, showing for light of each wave-length what fraction of a unit of heat per second must be conveyed to produce a definite effect upon the human eye, we shall have a scientific basis for photometry.

S. NEWCOMB.

Photo-relief Printing: See PHOTOGRAPHY.

Phranza, or **Phranzes**, GEORGE: last of the Byzantine historians; b. 1401, d. 1478; was chamberlain of Manuel II., Palæologus. At the siege of Patras (1429) he saved the life of Constantine, afterward emperor, but was himself taken prisoner and made to endure a harsh captivity. He was protovestiar of Constantine XIII. At the capture of Constantinople by Mohammed II. his entire family were made slaves; his daughter died from her sufferings, his son was murdered in the sultan's harem, but he and his wife escaped to Sparta and thence to Corfu, whence he conducted some diplomatic negotiations. Finally he retired to the monastery of Tarchaniotes, where he wrote his valuable *Chronicon* or Byzantine History. This covers the period from 1259 to 1477, and is interesting and reliable. It was published at Vienna in 1796 in folio. Bekker gave a new edition with Latin translation in 1838.

E. A. GROSVENOR.

Phrenology [Gr. *φρήν*, *φρενός*, faculty, mind + *λόγος*, discourse, reason]: the so-called science of mental faculty as exhibited in the shape, size, and contour of the skull. This mode of investigating the mental capacities of individuals rose into prominence through the "systems of phrenology" of Franz Joseph Gall (1758-1828) and Kaspar Spurzheim (1776-1832). As a method by which the external examination of the "bumps and hollows" of the skull is made to reveal the intellectual and emotional gifts of particular men—so considered, the whole scheme is now known to be worthless. The only semblance of justification it has is found in the facts of brain LOCALIZATION (*q. v.*); but this extends only to the senses and movement, and shows all men to be alike in their localizations. It gives no ground

whatever to the elaborate pretense of the "phrenologists" to describe character. It is possible that morphology may some day show that certain ratios in skull measurements may, in the process of evolution, have come to have some significance for mental faculty in great averages, but even that is forbidden to us in the present state of anthropometric research. See PHYSIOGONOMY. J. MARK BALDWIN.

Phrygia (in Gr. *Φρυγία*): a province in the western half of the peninsula of Asia Minor, whose boundaries varied greatly in different epochs. The Phrygians emigrated from Macedonia and founded a powerful empire, whose capital city was situated on a hill across the gulf from Smyrna and within sight of the city. It is now called Tantalus, or city of Tantalus. The Acropolis walls and the tomb of Tantalus still exist. Later on the Phrygians secured a large portion of the crumbling Hittite empire, and removed their capital into the interior. This was the city of the Midases and the Gorduses. About this city of Midas many remains of the Phrygian civilization still exist near the modern village of Kumbet. (See MIDAS and GORDIUS.) The best account of Phrygia and the Phrygians is in Perrot and Chipiez, *History of Art in Phrygia*, etc. (London, 1892), pp. 1-231, where all the literature relating to the subject is cited.

J. R. S. STERRETT.

Phrygian Language: the language of the ancient Phrygians, located in western central Asia Minor. The language is known to us only through a few glosses and brief inscriptions, but, so far as can be judged from these scanty remains, it was an Indo-European tongue, bearing close relations to the Armenian, and also, though more remotely, to the Balto-Slavic group. According to the reports of Herodotus and Strabo, the Phrygians were anciently regarded as related both to the Armenians and the Thracians. (Cf. Herod., vii., 73; Strabo, c. 47, 295.) The Phrygian glosses are collected in Lagarde, *Gesammelte Abhandlungen*, pp. 283 ff. (1866). See also Fick, *Sprachenheit der Indog.* *Europas*, pp. 408 ff., and Zum Phrygischen, *Bezenberger's Beiträge*, xiv., 50 f.

BEIN, IDE WHEELER.

Phryne (in Gr. *Φρύνη*): a Greek hetæra (see HETÆRE) of surpassing beauty, who was employed by Praxiteles as a model for his Cnidian Venus, and by Apelles for his Venus Anadyomene. She was born at Thespie in Boeotia in humble circumstances, but when Alexander the Great destroyed the walls of Thebes she offered to rebuild them. When accused of profaning the Eleusinian mysteries, and summoned before the tribunal of the Heliasts, Hyperides, her defender, threw off her veil and exposed her breasts, whereupon the judges immediately acquitted her, and the people carried her in triumph to the temple of Aphrodite.

Revised by J. R. S. STERRETT.

Phrynichus (in Gr. *Φρύνιχος*): one of the framers of Attic tragedy, the first to bring female characters on the stage, and the first to develop a true dialogue, though the lyric element was still predominant, and Phrynichus was best remembered by his sweet and graceful melodies, which were sung as late as the time of Aristophanes. The most famous of his pieces was the *Phœnician Women*, *Φοίνισσαι*, brought out with great splendor by Themistocles in 476 B. C. to commemorate the victory over the Persians, and soon afterward imitated by Æschylus in his *Persians*. An earlier piece, *The Capture of Miletus* (*Μιλήτου ἀλωσις*), is memorable for the story told by Herodotus that the audience was so moved by the representation of the sufferings of their kindred that they burst into tears, and the poet was fined 1,000 drachmæ—a significant warning against realism in art. Fragments are to be found in Nauck's *Tragicorum Græcorum Fragmenta*.

B. L. GILBERTS.

Phthalic Acid ($\text{H}_2\text{C}_6\text{H}_4\text{O}_4 = \text{C}_6\text{H}_4(\text{COOH})_2$). **Alizaric Acid**, **Naphthalic Acid** [*phthalic* is a deriv. of (*na*)*phthalene*]; an acid obtained first in 1836 by Laurent, by boiling naphthalene tetrachloride with nitric acid. It crystallizes in white nacreous laminae arranged in rounded groups; is slightly soluble in cold water, readily soluble in alcohol and ether. By distillation with an excess of lime it yields benzene and calcic carbonate; with a smaller proportion of lime, calcic carbonate and benzoate. It forms acid and neutral salts, and yields substitution products with bromine, chlorine, nitric acid, etc. By distillation it yields *phthalic anhydride*, $\text{C}_8\text{H}_4\text{O}_3$. When this is heated to 195° C. with resorcin it produces fluorescein. Fluorescein forms a red crystalline powder; crystallizes in yellow needles from methylic alcohol; and its solution in an alkali exhibits a most

beautiful and intensely green fluorescence. Fluorescein has become of great industrial importance as a basis for the preparation of the beautiful dye called *eosin*, which rivals safflower and saffron in dyeing rose-red. Eosin is the potassium salt of tetrabrom fluorescein. Other dyestuffs, also called *phthalic acid colors*, are made by heating phthalic anhydride with other substances belonging to the class of phenols. Besides eosin and fluorescein the more important are *phenol phthalein*, used as an indicator in volumetric analysis, *pyrocin*, which is tetraiod fluorescein, and *gallein*, which is pyrogallol phthalein. Phthalic-acid colors are among the most brilliant of the artificial dyes, and are used on cotton, silk, and wool, for the preparation of lakes, printer's inks, etc.

C. F. CHANDLER.

Phthisis: See CONSUMPTION and CLIMATE.

Phycis: See FORKED-EARS.

Phycology [Gr. *φύκος*, seaweed + *λόγος*, discourse, reason]: the botany of the algæ, or seaweeds, in the broadest sense. It thus includes the green members of the PROTOPHYTES, PHYCOPHYTES, and CARPOPHYTES (q. v.). See also DESMIDS, DIATOMS, FUCOIDS, KELP, RED SEaweeds, and STONEWORTS.

Phycomyces: See MUCORACEÆ.

Phycophytes, or **Phycophyta** [from Gr. *φύκος*, seaweed + *φυτόν*, plant]: a branch of the vegetable kingdom in which the result of the sexual union of two cells is the formation of a single "resting-spore" (zygospore or oöspore). Phycophytes are the lowest plants which exhibit sexuality, and by this they are easily separated from the PROTOPHYTES (q. v.). They are distinguished from the CARPOPHYTES (q. v.) by the simple spore which results from the sexual act, in contrast with the many-celled "fruit" of the higher group.

The structure of the plant-body ranges from the simple cell, as in PROTOCOCCUS, DESMIDS, and DIATOMS, to the large KELP and other FUCOIDS (q. v.) with stems and leaves. Phycophytes are separable into two well-marked classes, and seven orders as follows: Class I., *Chlorophyceæ*: Orders, *Protozooidæ*, *Conjugatæ*, *Siphonæ*, and *Confervoidæ*. Class II., *Phæophyceæ*: Orders, *Phæosporææ*, *Dictyofææ*, and *Fucoidææ*. In the first, second, and third orders some of the families are degraded, chlorophyll-less parasites and saprophytes. All others are independent plants (holophytes), possessing chlorophyll (or an equivalent), although sometimes hidden by brown or smoky coloring matter, as in the Diatoms, Kelps, and Rockweeds. See also EMBRYOLOGY IN PLANTS.

CHARLES E. BESSEY.

Phylacteries [from Gr. *φυλακτήριον*, guard-post, safeguard, amulet, deriv. of *φυλακτήρ*, watcher, guard, deriv. of *φυλάσσειν*, guard, watch]: properly, amulets worn to protect the person from evil influences. In the New Testament the name is given to the leathern cases containing on fine parchment the four passages, Ex. xiii. 1-10; xiii. 11-16; Deut. vi. 4-9; xi. 18-21. They are fastened by leathern straps to the forehead and the arm, and also to doorposts and the like. This custom has been maintained from very ancient times by the Jews, and is based upon a literal interpretation of Ex. xiii. 9, 16; Deut. xi. 18.

Revised by S. M. JACKSON.

Phylæ [= Lat. = Gr. *φυλαί*, plur. of *φυλή*, tribe, clan]: the tribes into which ancient Attica was divided. Their number was originally four, but after the expulsion of the Pisistratidæ it was raised to ten by Cleisthenes; two more were afterward added in honor of Antigonus and his son Demetrius. At the head of each tribe was a phylarch, who superintended the registering of the members of the *phyle*, organized the choirs for the festivals, presided over the communal assemblies, and commanded the contingent of cavalry. Afterward, however, the office was divided, the phylarch retaining only the military duties, while the civil duties were transferred to a new office, that of the *epimeletes*. To the Athenian senate each phyle sent fifty members.

J. R. S. STERRETT.

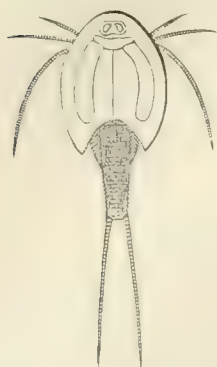
Phylarchus (in Gr. *Φύλαρχος*): Greek historian of the third century B. C.; wrote the history of Greece from the expedition of Pyrrhus against the Peloponnesus down to the death of the Spartan king Cleomenes (220 B. C.), of whom he was a passionate partisan. Fragments are to be found in Müller's *Fragmenta Historicorum Græcorum* (vol. i., pp. 334-358; vol. iv., p. 645).

B. L. G.

Phylloma: See MORPHOLOGY (Vegetable).

Phyllopoda [Mod. Lat., from Gr. *φύλλον*, leaf + *πόδος*, foot]: the lowest or most primitive group of Crusta-

cea, embracing segmented forms provided with numerous (ten to sixty, or more) pairs of leaf-like feet. In some the segments are easily seen in the anterior region of the body; in others this portion is covered by a "carapax" formed by a duplication of the skin, which either covers



Apus equalis (after Packard).

the body like a scale, or is folded so that it forms a bivalve shell, in which the body can be entirely retracted. None are marine; most species live in fresh water, but some are found in strong brine, for example in Great Salt Lake. It is interesting to note that Schmanke-witch has pointed out that by transferring fresh-water forms to brine he was able to change not only specific but generic characters. Another fact of interest is that the eggs require desiccation and then reimmersion in water before they will develop. Corresponding to the development of the carapax noted above three families are recognized, the *Branchiopodidæ*, without carapax, the *Apodidæ*, with simple carapax, and the *Estheridæ*, inclosed in a bivalve shell. To the first belong the "fairly shrimps" common in roadside pools in the spring, and the brine shrimps; the second family occurs in North America only, W. of the Mississippi. The *Estheridæ* of the ponds are liable to be mistaken for small bivalve molluscs. To the naturalist these forms possess the greatest interest, as they probably represent the stock from which all other Crustacea have descended. They occur in all geological ages from the Cambrian to the present.

LITERATURE.—Lankester, *Quarterly Journal Micros. Sci.* (xxi, 1881); Packard, *Monograph of Phyllopoda* (in Twelfth Annual Report U. S. Geological [Hayden's] Survey); Claus, *Development, Arbeiten. a. d. zoolog. Inst.* (vi., Vienna, 1886).

J. S. KINGSLEY.

Phyllostom'idæ [Mod. Lat., named from *Phyllostoma*, the typical genus; Gr. φύλλον, leaf + στόμα, mouth]: a family of bats, so named from the leaf-like nasal appendages. The nostrils are in the front part of the cutaneous nasal appendages or open by simple apertures at the extremity of the muzzle; true molars are developed; there are four upper incisors, and the stomach is sacciform.

Phyllotaxy: See BOTANY and LEAF.

Phylloxera [Mod. Lat.; Gr. φύλλον, leaf + ξηρός, dry]: a genus of plant-lice. There are but few species so far known as indigenous to Europe, but about twenty species have been described from the U. S.

The genus is essentially gall-inhabiting. It is distinguished from the other genera of the *Aphididæ* by the three-jointed antennæ (the third joint much the longest), by the simple venation of the wings, and by these being carried flat on the back, and not roof-fashion, as in the more typical Aphides.

For a long time the term *phylloxera* was known only to the naturalist; but since about 1870 the grape phylloxera, or *Phylloxera vastatrix*, Planchon, a species which injuriously affects the grapevine, has attracted so much attention, particularly in Europe and North America, that it has come to be known as the phylloxera. This insect, while it occasionally acquires the gall-making habit, normally dwells underground upon the roots of the food-plant. A native of North America, discovered in New York in 1854 by Fitch, it is found from Canada to the Gulf wherever the grapevine grows, and has doubtlessly existed on the wild vines from time immemorial. Early in the history of grape-culture in the U. S. the gall-making type was observed on the leaves of certain varieties, especially on the Clinton. The more normal root-inhabiting type was not suspected, however, till discovered by Riley in 1871. Meanwhile, about 1865, a peculiar grape-root disease began to attract attention in France. At first noticed in the lower valley of the Rhône, it spread rapidly until the entire destruction of the grape interest was threatened. In 1879 infested vines had been taken up and destroyed from nearly 3,000,000 acres. For several years annual appropriations amounting to almost \$200,000 were made by the government for the carrying on of phylloxera investigations, and in 1874 a reward of 300,000 francs (\$60,000) was offered for the discovery of an effective

tual remedy. The study and investigation which this induced soon brought to light the facts that the insect producing the disease was identical with that which is indigenous on American vines, and that it was imported into France from the U. S. in 1863 on vines sent to French nurseries. It now occurs in all the vine-raising countries of Europe, and has been reported from South Africa, Algeria, New Zealand, and Australia.

Natural History of the Insect.—The species, as already intimated, presents itself in two types—the one (*gallicola*) gall-inhabiting, the other (*radicola*) root-inhabiting. The former is easily distinguished from the latter (see accompanying figures) by lacking the tubercles or warts on the back. On carefully opening one of the galls we find it to contain the mother-louse and many pale-yellow eggs scarcely one-hundredth of an inch long, and not quite half as thick. The louse is about .04 inch long, of a dull-orange color, and looks like an immature seed of the common purslane. The eggs hatch in six or eight days, and the young lice differ from their mother in their brighter yellow color and more perfect legs. Issuing from the mouth of the gall, the young lice scatter over the vine, most of them finding their way to the tender terminal leaves. Here they begin sucking the sap, forming galls, and depositing eggs, as their parent had done before. This process continues during the summer until the fifth or sixth generation. Every egg brings forth a fertile female, which soon becomes wonderfully prolific. By the end of September the galls are mostly deserted, and those which are left are usually infected with mildew, and eventually turn brown and decay.

The young lice attach themselves to the roots and thus hibernates. It is an important fact that the gall-inhabiting insect occurs only as a parthenogenetic and apterous female form. It is but a transient summer state, and does, compared with the other or root-inhabiting type, but trifling damage.

The more normal or root-inhabiting type presents many more forms and many interesting biological traits. The newly hatched lice are precisely like those which hatch in the galls, but, as they develop, rows of tubercles appear on the back where only minute short hairs were observed before (Fig. 5). During winter these young are found, somewhat dulled in color, adhering closely to the roots. As vegetation starts in spring they become active, rapidly enlarge, and soon begin laying unimpregnated eggs, for there are at that time no males. These bring forth females, which in their turn develop and lay unimpregnated eggs, and this virginal reproduction continues for five or six generations, the development increasing in rapidity with the heat, but the number of eggs decreasing. In July some of the individuals show little wing-pads at the sides, and begin to issue from the ground and to acquire wings.

These winged individuals become very numerous in August, and continue to appear in diminishing numbers thereafter till the leaves have fallen. They are all females, and carry in the abdomen from three to eight eggs of two sizes, the larger ones about one-fiftieth of an inch long and half as wide; the smaller, three-fourths as long. These eggs are also unimpregnated, and are laid by preference on the under side of the more tender leaves,

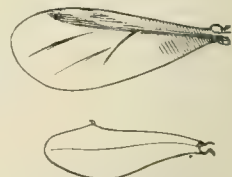


FIG. 1.—Upper and under wings of phylloxera.

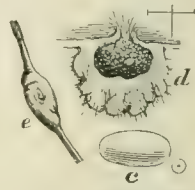


FIG. 2.—c, egg; d, section of gall, showing mother-louse and eggs; e, swelling of tendril; dot and lines showing natural size.

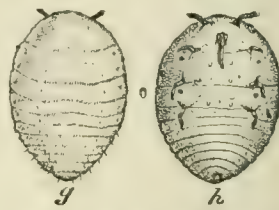


FIG. 3.—Mother gall-louse: g, dorsal; h, ventral view; natural size indicated between them.

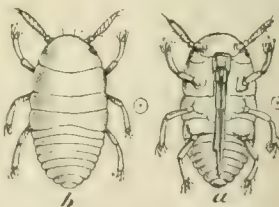


FIG. 4.—Newly hatched larva: a, ventral; b, dorsal view; natural sizes in circles at sides.

attached by one end amid the natural down. They increase somewhat in size, and give birth in about ten days to the true-sexual individuals, the larger eggs producing females, the smaller males. These individuals are born fully developed, and are wingless and without mouth parts. A remarkable fact is that some of the females that never acquire wings, but always remain on the roots, also produce the few different-sized eggs



FIG. 5. Wingless mother root lice: f, dorsal; g, lateral view; natural size indicated at side.

from which males and females hatch. The sexes pair soon after hatching, and the female is delivered on the third or fourth day of a solitary egg, and then perishes. This im-

underground. The young hatching from it is the normal parthenogenetic mother, which lays a large number of eggs, and recommences the virginal reproduction and the cycle of the species' curious life. The impregnated eggs laid early in the season doubtless hatch the same year, but most of the eggs pass the winter before hatching, and from this fact are known as "winter-eggs."

Appearance of the Phylloxera Disease.—A vine attacked by phylloxera has the more fibrous roots covered with little swellings; and a careful examination of the swellings during the growing season will disclose numerous yellowish lice of different ages, and groups of brighter yellow eggs barely visible to the naked eye. The swellings in course of time rot, and the lice settle on the larger roots. Vines that are more susceptible to the disease generally show external signs the second year of attack in a sickly, yellowish appearance of the foliage and in stunted growth; while the third year they frequently perish, when on examination the lice are no longer to be found—they have left or died—and all the finer roots have decayed and wasted away.

Spread of the Disease.—The wingless phylloxera travels over the surface of the ground from vine to vine, or beneath the ground where roots interlock; while in the winged form it may fly or be carried as many as 15 or 20 miles, and, under exceptional conditions, even more. Through man's agency, by commerce in plants and cuttings, it may be carried to indefinite distances. Hence the importance of precautionary measures in grape-producing countries still free from the scourge, and the wisdom of laws—such as have been enacted by Australia, Algiers, Italy, Germany, and other countries—prohibiting the importation of vines from infested regions.

The Disease more Virulent in Foreign Countries than where it is indigenous.—A certain harmony or natural adaptation exists between the autochthonous fauna and flora of a country, the result of a long-past "struggle for existence." Plants and animals suffer most from diseases which they have not been accustomed to. American vines, though showing a varying power of resistance to the attacks of phylloxera, are less susceptible than the European vine, which has been so long under cultivation and which is more highly developed and more tender.

Practical Considerations.—Of the many remedies that have been proposed, none is universally practicable or satisfactory. Such an underground enemy is measurably beyond man's reach. Submersion, where feasible, is a sufficient protection. Bisulphide of carbon and sulpho-carbonate of potassium have proved useful, while petroleum emulsions may be used to advantage. Having discovered that the cultivated American vines possess a varying degree of resistance to the disease, there has been an immense demand from Europe for cuttings of the least susceptible of American vines. Many vineyards in France are being replanted with American vines. In 1881 22,000 acres in seventeen departments were so planted, while by 1890 719,500 acres in forty-four departments were covered with American vines. The varieties most employed are Clinton, Taylor, Jacques, and those more particularly belonging to the species *æstivalis*, as Cunningham, Norton's Virginia, Herbeumont, Cynthia, etc.

C. V. RILEY.

Revised by VERNON L. KELLOGG.

Phylogeny [from Gr. φύλον, tribe, race + root of γίγνομαι, be born]: a term introduced by Haeckel to include the evolution of the race. Ontogeny, the contrasted term, is the development of the individual from the germ. See MORPHOLOGY.

Physalis [from Gr. φυσάλλis, bladder, kind of plant with bladder-like husk or calyx]: a genus of annual or perennial herbs of the family *Solanaceæ* or nightshades, embracing about thirty species, seventeen of which are found in the U.S. The *P. peruviana*, otherwise known as strawberry tomato, ground-cherry, winter-cherry, yellow aikekengi or Cape gooseberry, is cultivated in gardens in England,



FIG. 8. Male phylloxera: dot in circle showing natural size.



FIG. 6. —a, healthy root; b, root on which the lice are working, showing the knots and swellings caused by their punctures; c, root deserted by them, on which the rootlets have begun to decay; d, d, lice on the larger roots, natural size; e, female pupa, dorsal view; f, winged female, dorsal view, greatly enlarged.

pregnated egg is never laid on the leaf, but always on the wood, in sheltered situations above ground, or on the roots

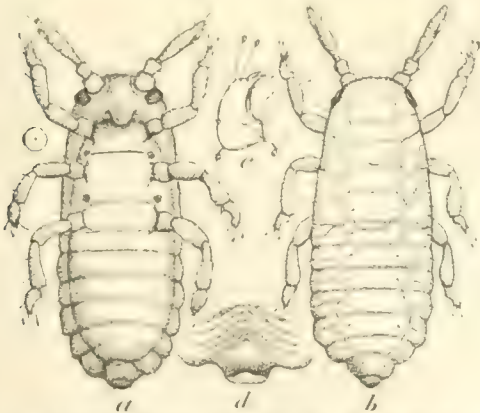


FIG. 7. True female phylloxera: a, ventral view, showing obsolete mouth and solitary egg occupying nearly the entire body; b, dorsal view; c, tarsus; d, contracted anal joints after the egg is laid; dot in circle showing natural size.

France, and the U. S., and bears an edible fruit inclosed in a balloon-shaped netted angular calyx. The *P. alkekengi*, probably a native of Spain or North Africa, bears a brilliant scarlet berry, and is an ornamental garden plant. An American species, *P. philadelphica*, or purple ground-cherry, has a dark-purple berry an inch in diameter, which is sometimes preserved. Revised by CHARLES E. BESSEY.

Physap'oda: See ENTOMOLOGY.

Physeter'idæ [Mod. Lat., named from *Physe'ter*, the typical genus, from Gr. *φυσήτης*, blower, bellows, kind of whale, deriv. of *φυσάν*, blow, blow up]: a family of toothed whales, containing the sperm-whale (*Physeter*) and pigmy sperm-whale (*Kogia*). Its members have a blunt head, which projects forward in advance of the jaw; the blowhole well forward, and in the sperm-whale on the left side; there is no back fin. The skull, which is unsymmetrical, has its front upper edges turned upward to form a sort of basin in which rests the cartilage containing the spermaceti. The halves of the lower jaw are anteriorly in contact for some distance, and in the adult teeth are present in the lower jaw only. See CACHALOT.

F. A. LUCAS.

Physical Education: the training of muscles and nerves, which constitutes the modern practice of gymnastics. Though the term physical education is of comparatively recent date, and the thought suggested complicated and extensive, the idea itself is older than any records, and the underlying principles and methods which we now apply consciously and understandingly were prehistorically applied, perhaps unconsciously, yet at least effectively, as shown by the physique developed. As we compare the physique of to-day with that of two or three thousand years ago, we find very slight differences. Again, in those races which are still in their childhood as to mental and social development, we find essentially the same physical proportions. This physique has resulted from the physical activity necessitated by the environment of the generations which have preceded.

Ancient Aims and Methods.—In the earliest records we learn nothing of any conscious body training. The early peoples did what they were forced to do, hunted, farmed, or took care of their flocks, each one doing a multitude of things, and thus getting, perforce, a good all-round body training. Their relations to their neighbors were not always pleasant, and it was important to be able to fight effectively; hence the practice with the club, bow, spear, and sword naturally assumed a prominence in the education of the youth. Here we find the first hint of physical education in the training of the body for a definite future end. In all primitive peoples this seems to have been the main factor, and has determined the body training toward endurance of fatiguing travel, running, swimming, and in the use of weapons. The plays of childhood, then as now, tended to the imitation of the most attractive occupations of the parents, so again we have the use of toy weapons as well as spontaneous games which arose from the pure enjoyment of physical activity. Strength meant so much to the more warlike of the primitive peoples that it is not surprising that they worshiped it as an attribute of the gods, and sought to develop it by constant practice, crowning the strongest, bravest man as hero and leader. In studying the early records we find that the ideals of the peoples affected markedly the physical life. Warlike nations tended to skill and endurance in the use of weapons and armor, while others, as in India, prized grace and suppleness.

The Greeks.—Among the early Greeks the ability to wield effectively the sword and spear, javelin and bow, to run, climb, and endure fatigue transcended in practical value all other accomplishments, so it is not surprising to find that the education of the youth consisted essentially of this training. Later the ideals of the Greeks became broader, and we have the conscious training for grace and symmetry. The physical training of the Greeks was of a general character, consisting largely of games and contests, including running, leaping, wrestling, throwing the discus and spear, boxing, use of bow, various games with balls, and swimming. Many gymnasia were maintained for systematic training in athletics and gymnastics. The physical life was considered as of equal importance with the mental in the palmy days of Athens, and at the contests in Olympia and elsewhere the successful competitors were crowned with olive as were the poets and orators. The educational value of gymnastics was recognized by them in addition to the merely utilitarian, and "mens sana in corpore sano" is here first suggested.

The spirit of friendly contest was gradually lost, and professionalism resulted from the lowering of physical ideals, gymnastics and athletics becoming a duty of the slaves for the amusement of their effeminate masters. The Romans borrowed generously from the Greeks in their ideas of body training, outdoing them in building magnificent baths and gymnasia; but in their history is repeated the same change in physical ideals and resulting effeminacy. The barbarians who conquered them possessed the physical power in which they were wanting.

Middle Ages.—Until the invention of firearms military success was dependent upon bodily strength. We find this holding true through the Middle Ages, when the educational side of exercise was ignored and only the utilitarian valued. In contrast to this military attitude was the monkish, in which the body was disowned and the soul only regarded. On the one hand, we have chivalry developed with strength, grace, and beauty as ideals, while in sharp antagonism we have the monasteries filled with men who looked upon the body as a fetter to the soul, a thing to be scourged and starved into subordination. With the advent of gunpowder the utilitarian stimulus to training was lost, for men no longer won battles by brute force, and physical training became a thing of the past, aside from the spontaneous games of childhood and youth.

Beginning of Modern Gymnastics.—Luther began a reaction from this condition, though little was accomplished for many years. A German physician, Mercurialis, published a treatise (*De Arte Gymnastica*, 1573) on the old Greek gymnastics in which he emphasized the hygienic effects of exercise. Similarly an English physician, Thomas Fuller (1654 to 1734), advocated a return to the Greek methods. Montaigne and Locke made strenuous efforts in behalf of a broad education to include physical training, but it remained for Rousseau by his *Emile* (1762) to rouse general public interest in the movement.

Germany.—Basedow, Salzmann, Pestalozzi, Gutsmuths, Vieth, and Nachtigall became successively interested, and established gymnasiums in connection with certain schools. They worked enthusiastically, devising new movements and testing them, selecting and systematizing those which seemed valuable. The movement had not become general till Jahn, an accomplished gymnast, conceived the idea of nationalizing Germany by educating the youth, and rousing in them the spirit of patriotism. To this end he organized societies for systematic instruction and training in gymnastics and athletics. He also invented many pieces of apparatus, such as the parallel and horizontal bars, and greatly enriched systematic gymnastics by adding new and varied exercises. Jahn is indeed the father of modern gymnastics. His influence spread quickly through Germany; societies were organized in the towns and villages, and the youth became strong, active, brave, and patriotic. Much credit must be given to Spiess, also, for suggesting many features which popularize gymnastics. After the German war for independence the gymnasiums flourished till 1819, when they were suppressed for political reasons, but revived in 1844. The spread of gymnastics in the U. S. and other countries at this time was due to exiled teachers from Germany. In Switzerland a complete system was organized by Clias at the same time Jahn was working in Germany, and this extended throughout the schools and spread to France, Italy, and England. The German influence has been preponderant in the U. S. At Milwaukee a normal school for the training of gymnastic teachers has been maintained by the Turners for years, and their societies are found in all the larger cities supporting well-equipped gymnasiums, constantly used by the enthusiastic members, and always exerting a strong influence for the broader school curriculum which shall include gymnastics. A marked characteristic of the German system is that it grows spontaneously, because it embodies the play instinct, and rouses all the stimulating emotions of play, at the same time giving the needed exercise.

Swedish System.—Ling, the founder of the Swedish system, was familiar with what Jahn and others were doing in Germany and Denmark, but worked out a system of movements from an entirely different standpoint. He analyzed movements into elements, each performed by as few muscles as possible, thus claiming to localize the will and train co-ordination. After drilling on these elementary movements for "purity" he combined them into groups forming complete exercises. The resemblance to the a-b-c method of learning to read is striking. Ling's aims were hygienic, educational, therapeutic, and military, and he worked out

what must be regarded as the most definite system of physical training that has yet been evolved. He formulated the idea of progression, making it more extensive than the Germans, because he forced all to begin with rudimentary movements, while the Germans built upon what the pupils already knew. Ling made a rigid artificial progression, while with the others the natural power was the guide to progress. He made a "day's order" the unit of work, insisting that all parts of the body should be exercised, and that exercise should begin gradually, reaching a maximum of effort before the end of the work, and finishing with slow easy movements to aid the heart to resume its normal beating. He worked constantly for discipline and initiated each movement by a command, thus keeping the attention fixed. This necessitated the naming of all movements, and has resulted in an extensive nomenclature. Music can not be used with the order movements, and is deprecated by the Swedes. The Swedish work was introduced in the form of "movement cure" by Taylor, of New York, many years ago. Dio Lewis based his "Mutual Help" gymnastics for schools upon the Swedish idea of analysis, but made the valuable addition of resistance in all the movements. Since 1889 a strong effort has been made to introduce the unmodified Swedish system generally into the schools of the U. S.

Physical Training in England.—England's contribution to physical training has been chiefly the development of sports and games, such as archery, football, cricket, tennis, boating, hare and hounds, handball, etc. These furnish undoubtedly as complete and thorough body development as was gotten in the primitive days. Dr. Parke has stated it very strongly: "The national games of English boys are infinitely superior to any system of artificial exercise ever devised." The great difficulty is that such games can not be made available for the proper development of all the children of the nation, owing to lack of time and space. In 1862 Lord Elcho made a strong effort for scientific physical training, and soon after Maclaren began his work at Oxford, which has resulted in such valuable contributions to our knowledge of the hygiene of exercise and training. (*Physical Education*, 1869, and *Training in Theory and Practice*, 1874.)

In the United States.—Between 1821 and 1879 several of the schools and colleges in the U. S. established gymnasiums, chiefly influenced by the Germans. The building of the Hemenway gymnasium in 1879 by Harvard College marks the beginning of an era in gymnastics in the U. S. Its influence may be seen in the rapid increase in the number of gymnasiums, all founded, essentially, upon the Harvard system of measurements and appliances. These now number more than 1,000, including the Y. M. C. A. gymnasiums, and have cost millions of dollars.

The Harvard System.—The Harvard system of developing appliances started in 1869, when Dr. Sargent took charge of the Bowdoin College gymnasium as student-instructor. At this time the equipment of a gymnasium consisted of certain German apparatus, parallel bars, horizontal bar, trapeze, etc., which were used by a few of the students only. The mass of the students were not experts in these exercises, and did little or nothing in the way of gymnastics aside from the enforced military drill, from which they revolted. They were hardy fellows and accustomed to heavy outdoor work, yet few were really well developed, most of them having done work which left its impress in characteristic asymmetry and faulty attitudes. A careful study of the problems thus presented led to the formulation of certain general principles which have since served as valuable guides. It was seen that attitudes necessitated by occupations became fixed habits in ratio to the length of time they were held uncorrected by other attitudes; also that in individuals possessing unequal muscular development faulty attitudes were often the result of the apparent shortening of stronger muscles, the increased tonicity of these muscles exerting a constant pull with the result mentioned. Thus the necessity of supplementing the development due to occupation was clearly seen, and also the rational method of effecting this by the local development of the relaxed weaker muscles. To do this economically and definitely various machines were devised which offered the required resistance. The first of these was the adjustable chest-weight (1869). This exercising-machine enabled one to exercise so much of the body that it was practically universal in its application, and was adopted by the gymnasiums of the U. S. till now it is a staple part of their equipment. The

chest-weight was followed by other "developing appliances" as this kind of apparatus came to be called, all from the same motive, to furnish means selectively to build up weak and relaxed muscles to the best advantage. Such developing appliances are the high and low pulleys, leg-machines, wrist and ankle machines, chest expanders and developers, quarter circle, abdominal machine, etc., forty in number, devised chiefly between the years 1869-79. Dr. Sargent's gymnasium in New York was the first to be at all fully equipped with this apparatus (1878), and the Hemenway gymnasium, Harvard University, was the next (1879); this is one of the most fully equipped in the U. S. The developing appliances were devised to supplement other gymnasium work, not to replace it. The movements are practically similar to the Swedish, but differ essentially in that they are all made against external resistance which can be adjusted to strength, hence co-ordination is trained to an economical expenditure of energy in overcoming such resistance. This is an important distinction which serves as one basis for the classification of movements, for in slow free movements, such as the Swedish, much of the resistance comes from the contraction of antagonistic muscles. The individual's need may be made the basis of work, and a clear prescription given specifically directing his work toward the attainment of his ideal form and condition, not only from a physical standpoint, but in relation to his intellectual activity. This makes it important to have a trained physician study the individual and decide the problems presented in each case.

Zander, of Sweden, has devised an elaborate set of apparatus for resistive movements both active and passive, answering much the same purpose as the developing appliances, but too expensive to be generally available.

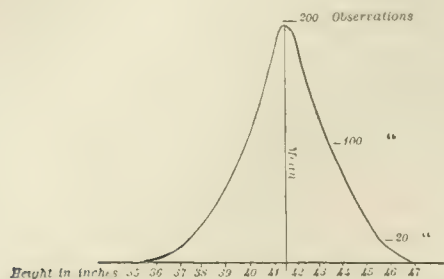
Anthropometry.—Doubtless for ages measurements have been taken as a means for comparing muscular development and recording the progress of an individual while in training. These measurements were chiefly of the height, weight, upper arm, forearm, chest, thigh, and calf, and were made at first with no idea of collecting data, but for immediate limited use. About 1870 anthropologists and ethnologists became interested, and by their suggestions gave an impetus to a broader consideration of the subject. The value of the measurements of a large number of individuals of school and college age was now first realized as contributing to a study of the rate of growth, influences affecting growth, males as compared with females, different nationalities, etc.; all questions of vital importance. To the more obvious measurements taken previously were added bone lengths, joint circumferences, and girths of important parts of the head, trunk, and limbs, together with certain strength tests, as grip, number of times pull-up and push-up, strength of back, leg, and chest muscles, of expiratory muscles, capacity of lungs, and a record of color of eyes and hair, history of diseases and habits, and nationality of parents and grandparents. This list of measurements was definitely selected and methods of taking formulated in 1878, and presented by Dr. Sargent in a report to the American Association for the Advancement of Physical Education in 1886, to insure the general use of the same methods, and hence to make the results of all examinations comparable. Valuable tables of measurements have been contributed since 1869 by Baxter and Gould, army recruits; Galton, of boys, 1875; Bowditch, of school children, *Rep. State Board of Health, Massachusetts*, 1877-79-91; Roberts, *Com. Rep. British Association*, 1878; Hitchcock, Amherst students, 1887-89-90-92; Erisman, Russian factory employees, 1889; Pagliani, Italian children; Wood, Wellesley students, 1890; Porter, school children of St. Louis, 1893; Sargent, Harvard students, etc. The number of persons of whom complete measurements had been charted in percentile grades was 15,000 in 1893.

The method of graphically representing the values of individual measurements relative to the whole mass of measurements by percentile grades, published by Galton in 1885, has been of the greatest assistance in studying the statistics gathered, bringing to light as it has numerous minor problems before overlooked. This method also made possible the charting of tables so that they can be used quickly and conveniently.

Attention is now being directed to the necessity for tests which shall show the condition of an individual as a vital unit, not merely as a mass of muscle and bone; tests of quickness, accuracy, endurance of mental and muscular power, of voluntary muscular control, delicacy of adjustment of automatic control, of circulation general and local,

of respiration, response of circulation and respiration to exercise, fatigue, tone of nervous and muscular systems, etc. These are problems constantly facing one practically interested in physical education, but so difficult of approach that little has yet been done. Mosso, Demeny, Galton, Warner, and others are working on the problems in Europe, and Harvard University has established a laboratory for such research in the U. S.

Charting Measurements.—The classification of large numbers of individuals shows a remarkable uniformity in the distribution of variation of corresponding measurements. The law of this variation is shown by the chart given herewith, of heights of individuals of the same age. It will be



Curve of distribution of 848 observations. Heights of boys five years old. From Bowditch's tables.

seen that at the center we have by far the larger number of observations suggesting for this age a tendency to a "medium" height. All other measurements may be similarly plotted and the means determined. Putting these means together, of all the items measured we may determine the parts of what may be called a medium or normal individual. By a similar method were gotten the data for modeling the statues representing the normal college student, male and female, exhibited by Dr. Sargent at the Columbian Exposition, Chicago, 1893. This medium individual, of course, shows the actual general type prevailing, not the highest type perhaps attainable, and the test of its correctness is the fact that if a number of new measurements of the same class of individuals is added it does not change this type, but merely falls into proper relation to it. Dr. Porter has contributed a valuable study of the relation of weight to scholarship in school children of St. Louis. He has taken weight as an index to strength and development, and has expressed the relation of weight and age to scholarship in percentile grades. This has brought out the fact that large children take higher intellectual rank than small ones in all the grades of the school, and that the rate of growth is practically the same for all grades of intellectual precocity. President Hyde of Bowdoin College has shown that scholarship and physical development in college work go similarly hand in hand. Dr. Bowditch has clearly shown the rate of growth in children of school age, and demonstrated the physical superiority of girls from eleven to fourteen years of age, due to their more rapid development. See Sargent, *N. A. Rev.*, Feb., 1883; *Physical Training in American Colleges and Universities*; Hartwell in *Report of the Commissioner of Education* (1886), p. 663; and J. Stanley Hall, *A Bibliography of Education* (1886). D. A. SARGENT.

Physical Geography: the geography of nature, or the science of the surface of the earth and its envelopes. The structure of the earth and the history of the changes to which the structure and surface configuration are due are the field of geology; the general form of the earth as a spheroid belongs to geodesy; its motions and its relations to other planets and the sun belong to astronomy; the distribution of human races on the earth belongs to ethnography; the partitioning of the earth among governmental organizations to political geography; and the redistribution of natural products through human transportation to commercial geography. Physical geography includes physiography, or the classification and explanation of the various elements of the surface configuration; oceanography, or the description and study of the aqueous envelope; meteorology, or the description and study of the gaseous envelope; zoögeography, or the natural distribution of animals; and phytogeography, or the natural distribution of plants. See GEOGRAPHY, PHYSIOGRAPHY, HYDROGRAPHY, OCEAN, METEOROLOGY, and GEOGRAPHICAL BOTANY. G. K. GILBERT.

Physical Training: See PHYSICAL EDUCATION.

Physics, or Physical Science [*physics* is from Gr. *φυσικός*, natural, deriv. of *φύσις*, nature]: literally, the knowledge of the processes, both mechanical and vital, which occur in nature. In this sense the word physical has the same meaning as natural, but in the development of science the words have been specialized and the former has been used so as to exclude the study of organized bodies and the mineral world. Thus physics lies between pure mathematics—that is, arithmetic, algebra, and geometry—on the one hand, and natural history on the other hand. Chemistry is properly a physical science, but custom has excluded it from the domain of physics. The following is a list of the principal divisions of physics:

I. MECHANICS (*q. v.*), which includes kinematics (see MOTION), DYNAMICS (*q. v.*; see also ENERGY), STATICS (*q. v.*; see also COMPOSITION OF FORCES), or the subject may be divided according to the nature of the body studied. Thus we have the mechanics of a particle, of a rigid body, of an elastic body, and of a fluid, the last being subdivided into HYDROSTATICS (*q. v.*) and hydrodynamics (see HYDRAULICS).

II. The secondary physical sciences, viz.: OPTICS (*q. v.*, where its subdivision into different departments, light, etc., is given); ACOUSTICS (*q. v.*; see also REFRACTION OF SOUND, etc.); ELECTRICITY (*q. v.*); MAGNETISM (*q. v.*; see also MAGNETISM OF IRON AND MAGNETISM, TERRESTRIAL); and the branches dealing with the action of pressure and heat in changing the volumes and physical states of bodies, for which see HEAT, GAS, LIQUIDS, PNEUMATICS, THERMODYNAMICS, etc.

R. A. ROBERTS.

Physics of Vegetation: See PHYSIOLOGY, VEGETABLE.

Physiocrats: See POLITICAL ECONOMY.

Physiognomy [from Gr. *φυσιογνωμονία*, art of judging a man by his features, deriv. of *φύσις*, nature + *γνώμων*, judge]: the art of interpreting the character of man by facial conformation and expression. It was first presented as a systematic study by Lavater in 1775. It was included in the systematic phrenology of Gall and Spurzheim. While much has been, and is still, claimed for physiognomy inconsistent with the facts of the natural history of man and the laws of physiology, the face may be regarded as an index, by facial expressions developed both voluntarily and involuntarily, of the prominent characteristics of intellect, emotion, and will. The physiognomy of infants, while the intellect is latent, expresses only happiness and pain or sorrow. With the training of the tongue and lips in phonation, and the development of the language of expression by the control of the muscles of the eye, the nostrils, and mouth, combinations of facial lines and individuality of features become established. By electrical excitation of muscles and groups of muscles of the face, the various expressions of mirth, sorrow, impotency, power, etc., may be produced irrespective of the mental condition—expressions which the subject's character had never developed. In hypnotic experimentation, also, the state called catalepsy is favorable to the systematic study of the muscles of facial expression. Recent research shows that a large part of facial expression is acquired by unconscious imitation of that of others. See Charles Bell, *The Anatomy of Facial Expression*; Darwin, *The Expression of the Emotions*. Also see FACE.

Revised by J. MARK BALDWIN.

Physiography [Gr. *φύσις*, nature + *γράφειν*, write]: as a part of physical geography, the science which describes, classifies, and explains the forms of the earth's surface. The features of the earth are conveniently grouped according to form, and also under the processes by which they have been produced. In this article they are arranged primarily according to form, and those of like form are classified by genesis. The processes through which they originate are: 1, diastrophism, or uplift and downthrow; 2, volcanism; 3, erosion and deposition by water; 4, erosion and deposition by wind; 5, erosion and deposition by waves; and, 6, erosion and deposition by glaciers. These are described under *Dynamic Geology* in GEOLOGY (*q. v.*).

FEATURES OF THE LAND.—Upon the uneven surface of the earth rests a great body of water which, being gathered in the hollows, divides the surface into a submerged or oceanic portion, and an emergent portion, the dry land. As viewed on the map and in respect to climate and various activities of man, the relation of the land to the ocean is of great importance, and the shapes of the land, as defined by coasts, are distinguished as continents, islands, peninsulas, etc.

Continents are the greatest of the land areas. Their ex-

tent, connections, and peculiarities of outline depend on what may be regarded as an accidental condition—the amount of water on the earth's surface; but they may also be regarded as the summits of the greater prominences of the earth's surface, and these prominences are the result of subterranean processes, the nature of which is little understood. See **CONTINENT** and **EARTH**.

Islands are in general small continents, and similarly owe their character to the accident of ocean-level, but something more specific can be said as to their origin than in the case of continents. Some of them are produced by the local and narrowly limited uplift of the ocean-floor; others by the building of subterranean volcanoes whose peaks are finally carried above the surface; yet others are occasioned by the elevation or subsidence of broad tracts of the earth's surface, elevation bringing above water the shoals of the ocean-bed, subsidence causing the sea to overflow the lower parts of the land, leaving plateaus or mountains as islands; yet another class have an organic origin, being formed by the growth of coral reefs which eventually reach the surface. Low and temporary islands are formed along some coasts through the shifting of sands by winds and currents. Out of fresh-water lakes, which usually result from the flooding of tracts previously dry, pre-existent hills and mountains sometimes project as islands, and certain rhythmic factors in the flow of streams cause them to divide their waters from time to time so as to inclose islands. See **ISLANDS** and **RIVERS**.

Peninsulas, differing from islands only in their narrow connections with mainlands, may be ascribed to all the causes which originate islands, and in the progressive development of geographic forms there is a constant interconversion of islands and peninsulas. Upon the subsidence of land or rise of water new peninsulas are won from the mainland, old peninsulas are converted into islands, and islands are submerged; by the reverse process new islands emerge from the waters, old islands become joined to the land, and old peninsulas become surrounded by land. A special variety of peninsula, called a *spit*, is built by waves and currents in a peculiar manner. A wind which drives waves against a shore also drifts the water along the shore. Sand and pebbles rolled upon the beach by the waves are carried by the current in the direction of its motion, and wherever the current leaves the shore, as, for example, at a cape, the drifted particles come to rest, being built into a low embankment, chiefly submerged but rising a few feet above the water. Currents from other directions, and especially tidal currents, often curve the spit at its end, and in this way the end sometimes grows broad, as in Sandy Hook, N. J., so as to produce the typical peninsular outline. The barriers or banks of the coast from New Jersey to Texas are of similar character, and are essentially peninsulas, though often temporarily converted into islands. See **COAST**.

Isthmuses, being only those parts of peninsulas which distinguish them from islands, hardly deserve special mention. In general they express only a relation between a pre-existent surface form and a particular position of water-level; but there is one variety which is a work of construction. Where an island lies close to the mainland or close to another island, the waves and currents usually build a spit from one land toward the other, and the completion of this process unites the two by a natural causeway, which is over-run by the water only during the most violent storms.

Capes also in general express the relations of ancient forms to modern ocean-level. They are original salients of land masses. There is, however, a special type depending on the modifications of shores by waves and currents. An examination of the map of the Atlantic coast from Virginia to Florida will show a series of cusps which are largely independent of the forms of the neighboring mainland. They consist of low bars of sand, and are probably associated with eddies of the oceanic circulation.

Passing now to those interior features of the land which depend upon the slope or relief of the surface, we recognize that certain ones are convex or prominent, others are concave, and yet others are intermediate in character. The principal convex features are plateaus, mountains, hills, and ridges; the concave, basins, valleys, and gorges; the intermediate, slopes, plains, terraces, and cliffs.

Plateaus are broad uplands of somewhat even surface. They may be indefinitely bounded; they may be limited on all sides by cliffs overlooking adjacent areas, or descending cliffs may limit them on one side and ascending cliffs or slopes on the other. Their surface may be continuous, or

may be interrupted by stream gorges or by valleys. A plateau traversed by many deep waterways is said to be dissected. Many plateaus, including all the greatest, are produced by the uplifting of plains; others are sculptured from greater uplifted masses, and owe their forms to the presence in those masses of tabular bodies of resistant rock; yet others are produced by the flooding of an upland with lavas which, yielding less rapidly to subsequent erosion, not only themselves survive, but protect the rocks beneath them while the surrounding country is worn down. Plateaus of moderate size, and especially those with lava caps, are called "table mountains," and in the western part of the U. S. the term "mesa" is applied to small plateaus definitely bounded by cliffs. See **PLATEAU**.

Mountains differ from plateaus by having narrow or acute summits, and they are always bounded by steep slopes. Many are due to uplift along relatively narrow belts, accompanied with folding and faulting of the rocks. Others are built by the heaping of lava and scoria about volcanic vents. Yet others are residua of plateaus which have suffered stream dissection until the extension of gorges and valleys has obliterated the original even top. As the dissection of plateaus proceeds more rapidly in soft rocks than in hard, the residuary mountains usually mark the positions of the harder parts of the great mass originally lifted in the creation of the plateau. See **MOUNTAIN** and **VOLCANOES**.

Hills are prominences smaller than mountains. Some of them, like some mountains, are volcanic heaps, and many, like other mountains, are produced by the dissection of plateaus and plains; but none are the direct results of uplift. A large number are occasioned by glacial deposition, and a few by æolian deposition. Hills due to differential wear by rain and streams are partly located by hard rock masses and partly by the positions of minor divides, which often have no relation to rock texture. Where the degrading agent is glacial ice, relative hardness is probably the chief determining condition. Hills of glacial drift are limited to the tracts which were overrun by the Pleistocene glaciers (see **PLEISTOCENE PERIOD**), and arise from the irregularity of the process by which the detrital load of a glacier is deposited. Hills of æolian origin (see **DUNE**) are traveling bodies of sand, and are essentially related to the rhythmic process by which the wind transports such material. In general hills are round-topped as compared with mountains; but in arid regions the hills containing cores of hard rock are apt to have acute summits, and in the Western U. S. such hills are partly discriminated by the term "butte."

Ridges, being merely long and narrow hills or mountains, may seem ill entitled to consideration as a separate class; but usage has given them a distinctive name, and several of the processes of their genesis are equally distinct. The greatest of ridges are produced by uplift and are called mountain ranges, and the same process is appealed to in explanation of certain very small ridges measuring but a few yards in height and a few rods in width. Among glacial deposits the moraine, the esker or esker, and many drumlins are ridges. Where streams deposit their detrital loads in deltas the heaviest deposits are made next the banks, so that the water, when at low stage, flows between parallel ridges or natural levees. The spits, barriers, and bars of gravel and sand which are built along coasts by the action of waves and currents are submerged ridges, and if afterward the coast is lifted above water, these appear as ridges of the land. Perhaps the most important of the ridge-producing processes is dissection. When a plain is lifted so high as to be dissected by its streams it often happens that the principal streams run parallel to one another, and as their valleys broaden the intervening tracts are reduced to ridges. Ridges of similar origin on mountain-flanks are called "spurs." When a plateau consisting of folded strata is deeply dissected, as, for example, in the Appalachian district, the ridge is the most important of the resulting features. The original folding and faulting of the rocks causes the outcrops of the various beds to occupy long, narrow, parallel belts; and the unequal degradation of these, dependent on differences in the qualities of the rocks, produces a system of parallel valleys and ridges.

Basins are tracts limited by divides or water-partings. They are thus units with reference to the drainage of the land by rivers. They may be regarded as secondary results of the various causes which produce mountains and other uplands. Their interior shapes depend largely upon the action of streams, which are ever engaged in remodeling the

face of the land, excavating here and filling there. It is a general law of stream sculpture that the upper slopes are steeper than the lower, and basins are therefore in general concave in cross profile, as the name implies. Exceptions to this rule are introduced by local uplift, and other exceptions depend on the great differences among rocks in their ability to oppose and retard the work of water. Thus basins are diversified. See RIVERS.

A special class of basins, those which do not drain to the ocean but are completely encircled by water-partings, deserve separate mention. They are known as interior or closed basins. Many of them, including the greatest, arise from the unequal uplifting of the land, and this process is supplemented, especially in the arid interiors of continents, by local accumulations of alluvium, which gathers with relative rapidity along the bases of mountains. In a region of great rainfall the alluvial process is inoperative, because the entire water-supply of a basin escaping from it at one point constitutes so powerful an agent of transportation that an alluvial dam can not be formed across it. Where the rainfall is so scanty that the rivers are not perennial, the local mountain storm may create at the critical point an alluvial dam which is not immediately removed, and which, once established, tends to grow and become permanent. This is well illustrated in the Great Basin of the Western U. S., where uplift has produced a multitude of ranges trending N. and S., and the storm-swept alluvium from these has partitioned the intervening valleys into many separate basins. Valleys of various kinds are also dammed by lavas and thus divided into basins; and the heaping of volcanic ejecta about a vent walls in a circular basin called a "crater." In districts where the prevailing rock is limestone a considerable part of the drainage is often subterranean, the rain-water finding its way through crevices to stream-bearing channels beneath. Such crevices are in time enlarged, assuming funnel forms, when they are known as "limestone sinks" or "swallow-holes," and they are often afterward clogged at the bottom and converted into basins. The irregular heaping of sand by the wind leads to the inclosure of small basins, and in arid regions basins are sometimes hollowed out by the erosive action of the wind. The action of a stream upon its channel produces a somewhat uneven bed, so that if the water is afterward dried away there remain a series of small basins. On a greater scale ice-streams produce uneven beds, and the great areas overrun by Pleistocene ice abound in lake basins carved from the rock. Most of these are shallow, but a few, like the hollows holding the Laurentian lakes, are deep. Many other basins arise from the obstruction of valleys by morainic drift, and the uneven surfaces of the greater moraines abound in small hollows. The glaciated area is thus characterized by its numerous basins, and as the rainfall is abundant, these are mostly occupied by lakes and ponds. See BASIN and LAKES.

Valleys are lowlands between uplands. Many valleys are individual basins, but others are parts of drainage basins, and yet others belong to several basins. An important class are caused by differential uplift, or perhaps by a local sinking of the land. Another important class are carved out by streams in the dissection of a plateau. The ice of the Pleistocene period was chiefly instrumental in altering the forms of valleys which had been previously created by streams, but such alteration was sometimes of greater importance than the original stream work. The name valley is commonly applied only to those hollows having at bottom lowlands of some width, but in physical geography the term is sometimes used generically for all hollows of the land surface, including valleys proper and gorges. See VALLEY.

Gorges.—The channel occupied by a stream may be excavated from the rock or earth beneath or inclosed by the building of banks with detritus brought by the stream itself. When a stream flows at base-level, it retains a constant depth of channel, building on one bank as much as is cut away from the other. If the tract is lifted into a mountain or plateau, the stream at once cuts its channel deeper, producing a trench or gorge. When uplift is arrested, a limit to down-cutting is eventually reached, and the stream then moves to the right and left laterally, broadening the gorge and producing a valley. The gorge is thus the first step of dissection and the prelude to the valley. Where uplift is unequal or where the rocks traversed are of diverse character, the valley phase is reached earlier by some parts of the stream than by others, and thus many streams traverse alternately valleys and gorges. Gorges are produced also by stream-action in a district the configuration of which

has been modified by volcanism or by glaciation, and in general they testify to the recency either of a drainage system or of conditions by which it is affected. The synonymy of the word *gorge* is extensive but chiefly local. The *ravine* is of small size; a *glen* in North America is similar to a ravine, but in Great Britain is a narrow valley; the use of *chasm* is largely poetic, but always implies vertical walls; *cloue* is restricted to the Catskill Mountains and neighboring regions; *cañon* is a term widely used in the western parts of the U. S. See GORGE and CAÑON.

Slopes.—The meaning of the word mountain includes the idea of mass; the meaning of valley includes that of volume. If we avoid these implications and give attention only to the surface, we see that it is composed of various facets or slopes—for example, the sides of mountains, the sides of valleys, etc. A special terminology applies to the various features of slopes. Surfaces nearly level are *plains*; a class of fragmentary plains are *terraces*; surfaces nearly vertical are *cliffs*; and certain slopes of intermediate grade have also received names.

Plains.—Tracts of land are rendered approximately level and smooth in various ways. When sediment is deposited beneath a lake or ocean, the agitation of the water tends to prevent it from coming to rest on prominences and thus leads to the filling of hollows, and the ultimate result is an even surface. Many of the great plains have been thus formed beneath the water and afterward lifted into dry land. Other plains are produced by streams, which work toward this result by two processes. (1) A river flowing at base-level, that is, having its surface but little above the body of water to which it discharges, pursues a sinuous course, and washes away the bank on the outer side of each curve, at the same time building up the bank on the inner side. In this way it enlarges its valley, and it also spreads over the bottom of the valley a sheet of alluvium. The surface of this sheet, being overflowed when the volume of water is greatest, is called the flood-plain of the stream. Although the material just beneath the surface of the flood-plain is deposited by the stream, the plain owes its extent primarily to the action of the stream in cutting at the sides of the valley so as to enlarge it. (2) Wherever a stream deposits more than it excavates, so as to build up its bed, it produces a plain by burying all inequalities of the pre-existent surface under its alluvium. Deltas are plains of this character, and wherever the local conditions cause a stream to deposit its load in an interior valley, the result is a detrital plain known as an alluvial cone. Such plains surround the bases of the mountains of the Great Basin. When a tract remains for a very long time with the same relation to the sea, its streams all arrive at base-level and open out broad valleys, and eventually the divides between the valleys waste away so that the whole tract constitutes a single plain. This is called a base-level plain, and when the process of formation is approximately complete, but the positions of some divides are still marked by hills, it is known as a *peneplain*. A few plains have been produced by great floods of lava filling depressions and obliterating previous rugosity of the surface. A more important class are ascribed to the destructive and constructive processes pertaining to coasts. The waves attack promontories, cutting them away and accumulating the material in contiguous bays. Their tendency is thus to render the surface more even; and if a continent is slowly depressed, so as to permit the waves to accomplish their work progressively over the whole surface, there results a subaqueous plain, and this, through subsequent uplift, may become part of the land. It is called a plain of marine denudation. See PLAIN, DELTA, and FLOOD-PLAIN.

Terraces are subordinate and nearly level plains interrupting steeper slopes. Usually they are bounded upon one side or both by cliffs. Where a series of them occur on the same slope, they are comparable to a flight of stairs. Whenever a stream held long at base-level has developed a broad flood-plain, and the land is afterward lifted so that the stream can deepen its valley, the old flood-plain is left as a terrace on the side of the valley. Developing a new flood-plain at the new base-level, the stream may obliterate the terrace, or a second uplift may cause it to abandon the newer flood-plain and thus leave two terraces at different heights. Repetition of the process may produce an indefinite number of terraces on the same valley-side; but a series may also result from the continuous descent of a stream channel toward an ultimate base-level, provided the descent is so slow that it does not prevent a considerable amount of

lateral cutting. When a region occupied by level strata of alternating character is trenched by streams, the sides of the gorges are eaten back by the wash of rains, which removes the rock as fast as it is disintegrated by frost, etc. As some beds are disintegrated more rapidly than others, the valley-side is carved into a series of terraces. Terraces of another type were produced by the Pleistocene glaciers, which at various stages of their recession occupied the lower parts of valleys, and received against their flanks flat-topped accumulations of alluvium which remained after the ice had disappeared. The sloping strands wrought on coasts by the waves, and the deltas built at the mouths of rivers, both appear as terraces if subsequent changes cause the waters to retreat. See TERRACE.

Cliffs are produced directly by uplift when the rock on one side of a fracture rises above the other. The steep faces of some mountains are of this origin. The sides of a gorge are cliffs due to stream-cutting, and in stream valleys a cliff or bluff is produced wherever the meandering current encroaches on the valley-side. In the latter case the cliff is associated in origin with the flood-plains, and in terraced valleys such cliffs sometimes occur in series. The same differential process which develops terraces from level strata of alternating texture also develops cliffs, and cliffs and terraces constitute a stairway. Cliffs are also produced by unequal erosion by glaciers, and at the heads of mountain glaciers the ice eats backward by a sapping process, producing a semicircular cliff known as a cirque or amphitheater. Where waves erode a coast, their direct work is limited to a zone at the water-level, and they undercut higher masses of land, causing them to fall away in cliffs. See CLIFF.

Talus.—The stability of a precipitous cliff depends on the strength of its material, and it wastes away as rapidly as its rock is fractured by frost or sudden heating. Loosened fragments fall to the base, and there accumulate in a steep slope which eventually extends to the top. Such a sloping heap of detritus, called a talus, is found at the base of every cliff which is not by some process perpetually renewed. Its grade, known to engineers as the earth slope, makes an angle of about 30° with the horizon.

FEATURES OF THE WATER.—By outline, by size, and by relation to land, bodies of water are distinguished as oceans, seas, lakes, bays, straits, etc. The forms of their bottoms are distinguished as deeps, oceanic plateaus, shoals, etc.

Oceans.—The earth's aqueous envelope, collectively known as the ocean, is divided, through the relation of its parts to continents, into a number of parts, likewise called oceans. The ocean basins are but complements of the continental prominences, and are referable to the same unknown cause. It is probable that the ocean-beds are of heavier material than the continents, and that an adjustment of level is prevented by this difference of density, but the cause of the difference is not understood. See OCEAN.

Seas are small oceans, and their basins are referable to the same general cause; but it is generally believed that while the ocean basins are part of the original configuration of the earth, or at least of immense antiquity, some of the sea basins are relatively young, having been produced by the submergence of land basins through the depression of large continental tracts.

Lakes.—The basins occupied by lakes and ponds have already been discussed as basins of the land. Given an interior basin, or cup-like hollow, the existence of a permanent lake is a question of climate. After every storm the water gathers in the bottom of the basin, and a portion of it at least is thence evaporated. The rate of evaporation depends on climate and the extent of the water surface, and the extent of water surface has its maximum determined by the size of the basin at the level of the lowest point of its rim. Thus the special configuration of the basin and the local conditions of rainfall and evaporation determine whether or not it shall contain a permanent lake, and if permanent whether the lake shall have outlet over the rim. The basins of all lakes are slowly filled by sediments washed into them from the sides; the channels of lake outlets are gradually deepened by the outflowing streams; thus in two ways physiographic processes tend to abolish lake basins, and but for the persistence or recurrence of the processes which create them, they would cease to diversify the face of the land. See LAKES.

Bays, the converse of capes, are re-entrants of the land. Some of the larger are called *gulfs*, and some of the least inclosed *bights*. It is possible that some are remnants of

the primordial topography of the globe, but the greater number may be ascribed to the local uplift of the promontories that partly inclose them, and to the flooding of basins by the depression of broad continental tracts. Where the submerged hollow of the land was previously a stream valley, the resulting bay is called an *estuary* or drowned river valley, and the name *fjord* is applied to submerged valleys originally shaped by glaciers. The extension of spits into shallow water sometimes partitions off a portion of the sea which is known as a *lagoon*.

Straits, the converse of isthmuses, have a similar history which need not be recited. When the passage between an island and mainland is extensive, it is sometimes called a *channel*, and the word *sound* has a local but not consistent use in the same sense.

The configuration of the bed of the ocean, becoming known only through the plummet, has been little discussed with reference to its causes. Doubtless the greater features, the deeps and oceanic plateaus, result from the same causes which have produced the ocean basins themselves. By comparison with the volcanic peaks which project above the surface, it is easy to infer that many prominences of the ocean-floor are due to eruption. The idea formerly prevalent, that the sea-bottom has become smooth through sedimentation, has been largely dispelled, first, by the discovery that the bed of the deep sea is not more level than the surface of the land; second, by the discovery that the sediments washed from the land are not widely spread, but fall to bottom chiefly near the shore. The submerged belts close to the coast are indeed smoothed and shallowed by sedimentation, but they constitute only a small part of the oceanic area. By reason of their contrasted character they are sometimes called the continental shelves. The points of the ocean-bed which approach the surface are sometimes acute, and are then called reefs; more often they are comparatively smooth, and are designated as shoals or banks. It is probable that most of the shoals are submerged islands or capes whose surfaces have been leveled by sub-aerial processes of sculpture.

DIFFERENTIATION AND INTERPRETATION OF FEATURES. In the brief outline of the subject here presented only the principal topographic species and their more important genetic varieties have been mentioned, and no attempt has been made to explain how the varieties are discriminated. It is in general true that all the various topographic forms produced by each physiographic agency are essentially distinct from all the forms produced by each other agency, notwithstanding the fact that the resemblances are often so great that the same name may with propriety be applied to results from several processes. Thus certain results from uplift, from aqueous erosion, from glacial deposition, and from littoral deposition have such formal resemblances that they are all called ridges; but comparative study shows that there are details of form by means of which each individual ridge may be referred to its cause. These criteria are supplemented in many instances by differences of material and differences of topographic relation. Through attention to such distinctions an intelligible meaning is found in each feature of the landscape; and each interpretation of a topographic form is a contribution to the history of the globe's surface. To unravel that history the geologist studies the internal structure, the geographer the surface configuration. The earlier history is discovered by the geologist alone; there is an intermediate chapter to which both contribute, and the closing paragraphs belong to the student of geography.

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Physiologus (Gr. *Φυσιολόγος*): the title given to a Greek treatise composed in the early Christian centuries, in which the habits or qualities of beasts, birds, reptiles, and even precious stones are related as affording allegorical or mystical illustration of Christian truths. The natural history of the book is of the most fabulous kind, as is illustrated by the account of the panther. This beast, says the *Physiologus*, when he has eaten his fill, sleeps three days; then wakes and lifts up his voice, at the same time emitting with his breath a wonderfully sweet odor. Attracted by this, all the other animals from far and near approach, except the serpent, which is the panther's enemy. So Christ, risen from the dead on the third day, gathered about him both Jews and Gentiles; but the serpent is the devil, whom Christ overcame. Still better known than this is the account of the fabulous Phoenix, symbolic of the Resurrection.

There is much uncertainty about the date and circumstances of the composition of the *Physiologus*. It is probable that it was originally written at Alexandria in the second century A. D., and intended for the edification of Christian believers of a mystical turn of mind. It immediately became extremely popular, and for many centuries was a source of allegorical illustrations for Christian writers and preachers. It was translated into many languages—Latin (early fifth century), Ethiopic, Armenian, Syriac, Arabic, Anglo-Saxon, German, Icelandic, English, French, Provençal, Spanish—not all of these, of course, directly from the Greek original. No small part of the remarkable attributions of qualities to animals, so common in all the literatures of Europe, is due to the wide circulation of this treatise in its many forms. The Greek text is best printed by Pitra, in the *Specilegium Solesmense* (vol. iii., 1855); the Latin text, by Cahier, *Mélanges d'Archéologie* (vols. ii.-iv.). For an account of the origin, character, and diffusion of the work, and a bibliography of the editions of the various texts, see F. Lauchert, *Geschichte des Physiologus* (Strassburg, 1889; has also a Greek and a German text). See also the introduction of F. Hommel, in his *Aethiopische Uebersetzung des Physiologus* (Leipzig, 1877). A. R. MARSH.

Physiology [Gr. *φύσις*, nature + *λόγος*, discourse, reason]: that department of natural science which treats of the laws, processes, and phenomena of living organisms. The prominent features of the physiology of the human being are vital force and nutrition. Vitality is the first condition of animal existence—the condition determining growth and maintenance; nutrition supplies the material of the germinal and incipient stages of organism, the mature growth of the body, and constant renewal and regeneration which counterbalance the waste of tissue metamorphosis.

The blood is the circulating nutritive fluid of the body—one-thirteenth of the entire weight, or about 12 lb. It is alkaline, and has a specific gravity of 1.052. It consists of the plasma, or water with albumen, fibrin, and salts in solution, and the solid elements, the red and white blood-cells and blood-plaques. The blood-cells constitute from one-third to one-half of its volume. The white are the largest, but relatively few—one to three or more hundred of the red. The white have active amoeboid movements, and probably migrate from the vessels under certain circumstances to form new cells and tissues or for processes of repair. Red corpuscles carry oxygen from the lungs to the tissues; they convey nutritive matters, and bring about changes in certain of the products of digestion. Spectroscopic analysis of red globules reveals hæmoglobin, salts of potash, and many other substances.

The heart is the center of the circulation, propelling the blood into the arteries with a force of 5½ lb.—a force steadily decreasing as the arteries subdivide and approach the capillaries. Capillary circulation is effected chiefly by a remaining element of cardiac force. The veins return the blood to the heart. The veins are more numerous than the arteries—have a much greater capacity; hence, the venous blood circulates with less rapidity than the arterial. Venous return is aided by the compression of the integuments, exercise, and the presence of valves in the veins. In 1553 Servetus discovered the circulation of the blood through the lungs. In 1603 Fabricius demonstrated the valves of the veins; he was Harvey's preceptor at Padua. In 1616 Harvey demonstrated the general circulation of the blood, publishing his researches in 1628. In 1661 Malpighi discovered cells in the blood; in 1673 Leuwenhoeek determined these anatomical elements more definitely; in 1770-75 William Hewson discovered the white blood-cells.

Respiration is a double act of inspiration and expiration, expansion and contraction of the lung. Freshly inhaled air parts with oxygen in the vesicles of the lung, which is taken up by the red corpuscles of the blood, while expired air is loaded with carbonic-acid gas, received from venous blood. Respiration is an involuntary act, formerly regarded as reflex from the presence of impure air in the lung, now established as largely emanating from the cognizance which the medulla oblongata takes of the nutritive demand of all parts of the body for a constant supply of oxygen. Certain lower animals have no lungs, but receive the oxygen by direct surface absorption, or through structures which are the analogues of lungs.

The materials of the blood are supplied by food after preparation by the processes of digestion. Appetite and hunger are also sensations of centric origin, indicative of the nutritive demands of the tissues. Food must be varied in character, and include nitrogenous substances, hydrocarbons, carbohydrates, water, and a proportion of salts. The preliminary steps of digestion are mastication, insalivation, and deglutition. Albuminous substances are digested by the gastric and pancreatic juices, starchy and saccharine substances by the saliva and pancreatic and intestinal juices, and fatty substances by the secretions of the small intestine, pancreas, and liver. Emulsified food is but little absorbed from the stomach, but chiefly by the lacteals of the bowels, and emptied by the thoracic duct into the blood. The lacteals are a part of the general lymphatic or absorbent vessels distributed throughout the body, discovered by Eustachius and Asellius in the sixteenth century. Secretion is the action of special glands in the body, which elaborate elements of the blood for special purposes, as the fluid bathing the pleura and peritoneum, the synovial fluid lubricating joints, mucus to moisten the air-tubes and intestines, saliva, gastric and intestinal juices to digest food. Excretion is a glandular separation from the blood of effete products—the urine, feces. Fæcal matter is partially *débris* of digested food. Bile is to be regarded secretory so far as it aids digestion. Certain ductless glands—the spleen, suprarenal capsules, thymus, thyroid, pituitary, and pineal glands are specially concerned in the elaboration of the blood. Nutritive waste and supply and glandular activity evolve heat to maintain the normal temperature of the body—in the healthy adult, 98.5° F., with little variation.

The nervous system was divided by Bichat into the cerebro-spinal and the sympathetic. The first comprises the brain, spinal cord, motor and sensory nerves, and nerves of special sense. The brain and cord have gray and white substances; the gray is ganglionic, composed of cells which originate force or receive impressions; the white is tubular, nerve-tracts which transmit motor stimulus from the brain to the muscles or sensory impressions from the body to the brain. The rapidity of nerve action is about 111 feet per second. Motor nerve-fibers terminate in neural plates upon the surface of the muscular fiber. Sensation is received by the tactile bodies of the hands and feet, the sensitive papillæ of the skin, taste-buds of the tongue, etc. The brain comprises the cerebrum—the seat of the mind—the basal ganglia, the cerebellum, pons Varolii, and medulla—controlling vital functions. The spinal cord is a column of nerve-fibers connecting the brain with their distributions throughout the body. It possesses a vast number of nerve-cells, and is the seat of independent reflex action; it also has a partial control of co-ordinated action of groups of muscles. The cranial nerves proceed from the brain to their destination without entering the cord; they are partly nerves of special sense—sight, hearing, smell, and taste; the facial nerve governs the expression of the face; the pneumogastric nerve has important connections with the action of the heart, respiration, and movements of the larynx, and also influences the digestive processes.

Speech is produced by movements of the larynx, tongue, teeth, and lips, methodically trained to create sounds, which, by custom, are representative of ideas; it is an artificial method, the invention of man, and slowly developed and perfected. Sight is the impression received by the brain of light and the images of objects, transmitted through the optical media of the eye to the sensitive retina and optic nerve. Hearing is a transmission of sound-waves to the tympanum, and, by the system of ossicles and resonating canals and cavities, to the filaments of the auditory nerve. Generation, or reproduction of definite species and of individual characteristics, is the result of predetermined law. Conception begins with the fecundation of germinal elements, which

develop vitality, motion, and nutritive growth; by successive steps—cellular multiplication, nutritive membrane, nerve-canals, primitive blood-vessels, heart, lungs, glands, lateral walls of the body, inclosing cavities, budding of the extremities, and facial conformation—the embryo progresses to the perfect human being.

Revised by EDWARD T. REICHERT.

Physiology, Vegetable: that branch of science which deals with the activities of the cells, tissues, and organs of living plants. To treat of these exhaustively would far exceed the limits of this article, so only a general outline of the subject is here given. For convenience, the phenomena involved may be considered under five heads, viz., Nutrition, Growth, Reproduction, Physics of Vegetation, and Plant Movements.

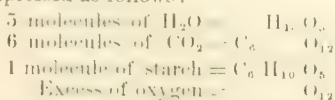
NUTRITION includes all those activities which have to do with the supply of matter to meet the wants of living cells. It must be remembered that the life of a cell involves the use of matter, and that as long as a cell is living it must have a continual supply of certain substances. Accordingly we find that every mass of living protoplasm under favorable conditions is continually absorbing watery solutions. Imbibition is one of the most pronounced of the properties of living protoplasm, and its absence is one of the marked distinctions between living and dead cells. Along with the water thus absorbed are taken in the various substances dissolved in it; these may have been solids dissolved in the water, or liquids, or even gases. It appears, however, that solutions are not always absorbed without modification; thus, of a 2-per-cent. solution outside of the cell proportionately more water than dissolved substance may be absorbed, so that the solution in the cell may have a strength of no more than 1 per cent.; or the opposite may occur, and the strength of the solution in the cell may be greater than that outside of it. This selective power may even bring about chemical changes in the watery solutions, when the plant-cells absorb certain constituent parts of the chemical compounds.

Once absorbed, the solutions diffuse through the watery protoplasm and the watery contents of the vacuoles, "cell-sap." This diffusion continues from cell to cell in thin-walled tissues, and is here known as osmosis, the thin cell-walls serving as permeable membranes through which the solutions pass. In laboratory experiments the rate of diffusion varies greatly, and is dependent upon the solution itself, the substance in which it diffuses, and the temperature; thus hydrochloric acid diffuses more than twice as rapidly as common salt, and seven times as rapidly as cane-sugar. This law must hold for solutions in plants also.

Gases also are absorbed directly by living cells, and these are diffused through other gases in the plant, or they enter into watery solutions as described above.

In all the foregoing the plant is simply taking material, but the latter does not yet properly constitute a part of its living substance. It is still unassimilated plant-food, and must undergo considerable changes before the plant can make use of it. One of the best known of the assimilative processes is that by which the plant obtains its carbon, hence called carbon-assimilation, or, on account of its great importance, often spoken of as assimilation exclusively. The term here used, carbon assimilation, is to be preferred, inasmuch as it permits us to speak of other kinds of assimilation in the plant.

Carbon assimilation takes place only in protoplasm which is stained with chlorophyll. When a green mass of protoplasm is supplied with carbon dioxide (CO_2), it is able in the sunlight (or other strong light) to break up this compound and to use its carbon. At the same time some of the water (H_2O) is broken up and its constituents are united with those of the carbon dioxide. The successive steps can not be given with certainty. One of the best-known compounds formed in the series of changes is starch ($\text{C}_6\text{H}_{10}\text{O}_5$), which may usually be detected in the green cells after they have been exposed to the light for some time. The results thus far may be expressed as follows:



Now, while starch is not made in such a direct way, it is worthy of note that in the chemical changes involved there is a setting free of oxygen as required by the expression above. In some cases the carbon compound formed at this

stage is not starch, but something equivalent (physiologically) to it, as oil, or possibly glucose ($\text{C}_6\text{H}_{12}\text{O}_6$). These carbohydrates are readily taken into the protoplasm as constituents of its substance, from which in turn it may build a cellulose wall ($\text{C}_6\text{H}_{10}\text{O}_5$), or form glucose ($\text{C}_6\text{H}_{12}\text{O}_6$), sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$), inulin, gums, oils, acids, etc. The importance of carbon assimilation may be inferred at once from the fact that about one-half of the dry substance of plants is composed of carbon, all of which has been obtained from carbon dioxide by the process outlined above.

Another important assimilative process is that by which nitrogen is obtained. This substance, although not present in such large quantity as carbon, is of high importance on account of its entering largely into the composition of protoplasm, and especially the cell nucleus. Inasmuch as about 80 per cent. of the air is free nitrogen, it might be supposed that plants derive it from this source, but careful experiments show this not to be the case. On the contrary, the nitrogen is derived from compounds in the air and water, chiefly in the form of nitrates of various bases (e. g. soda, potash, lime, ammonia, etc.), or some ammonia salt (e. g. the nitrate, chloride, sulphate, carbonate, etc.). In the higher plants it has been shown that these compounds undergo decomposition and reconstruction in the leaf, the result being the formation of proteid substances; but it is also held that probably every living cell is capable of taking part in these processes.

Of the assimilation of sulphur and phosphorus still less is known than in the case of nitrogen. We know that sulphur is absorbed in the form of sulphates (of ammonia, potash, lime, and magnesia), and some of these are to be found in the cells of plants, but where and how they are broken up is not known. It has been suggested that the crystals of calcium oxalate which occur in many plants are residua of chemical changes by which sulphur was set free from calcium sulphate. If true, this would show that the assimilation of sulphur takes place in all active tissues of the plant. Phosphorus is absorbed in the phosphate of lime, which undergoes decomposition in the tissues, but the details of the process are not known.

A number of other substances—e. g. potassium, calcium, iron, etc.—enter into the proper food of plants as solutions of their salts, which afterward undergo decomposition, thus allowing their assimilation. They are commonly called the "ash" of plants, and are often erroneously regarded as consisting of unassimilated matter. That they enter into the vital activities of the plant has been shown by the experiment of withholding them, with the result that the plant so treated always languishes or dies.

Even after the various substances which constitute plant-food have become assimilated they undergo many chemical changes. Every living tissue, and perhaps every living cell, is the seat of chemical changes in assimilated matter, whose results have in many cases been made out by chemists who have made numerous analyses, but in no case are the details of these chemical changes certainly known. We know that in many of these operations oxygen is absorbed by the active cells, and that as one result of their activity they excrete carbon dioxide. These after-changes of assimilated matter have been known in physiology as metastasis or metabolism.

To the foregoing general account of the nutritive activities of plants should be added the following: In homogeneous-celled holophytes (i. e. green plants whose cells are all alike) every cell performs all the operations noted above; but in heterogeneous-celled holophytes there is a division of labor, some cells or masses of cells engaging in certain activities quite different from those engaged in by other cells or tissues. Thus in a moss the cells of the root-hairs (rhizoids) which clothe the subterranean part of the stem engage in the absorption of watery solutions almost exclusively, and since they do not take part in carbon assimilation they are destitute of chlorophyll. On the other hand, the cells in the leaves are active in carbon assimilation, and have an abundance of chlorophyll. They absorb carbon dioxide and but very little, if any, water or soluble food-matter. The cells of the leaves and stem must therefore obtain their supply of watery solutions from the cells in the soil. The cells contiguous to those which absorb the solutions from the soil absorb from the latter, those next removed now absorb from those newly supplied, and so on from cell to cell to those at the upper extremity of the plant. In this way, by simple absorption from cell to cell, water and solutions are transported to all portions of the plant-body. Now, many of the cells above ground are often in contact with

dry air into which some of their water evaporates. The cells which suffer this loss of water repair it by absorbing water from contiguous cells, and these absorb from still others, and so on. There is thus a general upward movement of water in the moss-stem due to the loss of water from the leaves. Again it is seen that the carbohydrates are formed in the green cells alone, and from these they are diffused and absorbed as solutions from cell to cell throughout the plant. Thus there may be an upward movement of water while there is a downward diffusion of carbohydrates (and probably of other assimilated matters also).

In a plant with a still more complex structure, as, for example, the common sunflower, the cells of the surface of the roots absorb watery solutions, which are then absorbed from cell to cell in the large and numerous roots, finally passing in the same way from cell to cell in the stem and even to the leaves and flowers. The loss of water by evaporation from the leaves is much less proportionately than from the leaves of mosses, the latter consisting of but a single layer of unprotected cells, while the active cells in the sunflower-leaf are protected by a layer of specially modified thick-walled cells (the epidermis) less pervious to moisture. When, however, the stomates (breathing pores) are open for the ingress and egress of gases, much moisture escapes, and this is replaced by absorption from cell to cell as in the moss. The fact that moisture escapes through the open stomates has led to the assumption that they are for the purpose of permitting moisture to escape, and that the leaves of higher plants are "organs of evaporation." On the contrary, the stomates are clearly for preventing as far as possible the loss of water, while permitting the free interchange of gases, and the leaf is rather a skillfully devised structure in which a multitude of thin-walled cells gorged with moisture are exposed freely to the air with a minimum of loss of water by evaporation.

The stomates of the leaves and stem when open admit the external gases to the intercellular spaces of the whole plant, and also allow the internal gases to escape into the air. There is thus a respiration in plants of the high organization of the sunflower, but when examined closely this does not differ in any essential from the simple absorption and excretion of gases by a single-celled plant.

In the hysteroxytes (parasites and saprophytes) the solutions absorbed consist partly or wholly of assimilated matter. When this includes the carbon products of assimilation the plant does not develop chlorophyll, as in the dodders, Indian-pipes, broom-rapes, and the vast assemblage of "fungi." When, however, there is little or no absorption of carbon compounds, chlorophyll is present and the leaves are well developed, as in the mistletoe. In the dodders the absorption is performed by suckers (outgrowths) on the stems, and as a consequence the roots do not develop. In these leafless, rootless, and eventually almost stemless plants there is probably little assimilation of any kind; they are nourished much as the flower and fruit-clusters of ordinary plants are. The evaporation of water is probably as rapid in hysteroxytes as in holophytes of equal structural complexity and similar habits. The fungi quickly lose their water and become wilted and dried up when their supply of moisture is cut off. On the other hand, among the flowering hysteroxytes the absence or small size of the leaves greatly reduces the amount of evaporation. Clearly, also, the respiration of hysteroxytes is less than in holophytes, there being little or no absorption of carbon dioxide. Oxygen, however, is absorbed, and carbon dioxide excreted by most if not all hysteroxytes.

GROWTH.—A young cell consists of a nucleus and a solid (continuous) mass of protoplasm closely invested by a wall. During the nutritive processes described above the substance of the protoplasm is increased, and this requires an increase in the area of the wall; these two increments constitute the simple growth of the cell. Later, the absorption of water and the formation of a large vacuole, with or without an increase in the mass of the protoplasm, may require the increase in the area of the wall: this, also, is growth of the cell. In its increase in area the wall is first distended by the internal pressure, and new matter (cellulose) is secreted upon or in it, thus permanently increasing its area.

In simple plants every cell may grow, producing an aggregate growth of the whole plant-body. As each cell reaches a certain size it divides into two, which then grow, and divide again, and so on. Continued growth thus involves the growth of the cell and its fission, and where the plant-body is made up of similar cells the growth is general

throughout it. Where, however, the plant-body is made up of dissimilar cells, involving and implying dissimilarity of function, growth is confined to particular masses of cells, occupying definite portions of the plant-body or its organs. In such a case we generally say that growth is confined to the younger cell-masses; this is necessarily true, but conveys little information; it would be more accurate to say that such and such cell-masses have a short growing period, while others retain their power of growth for long periods. The woody stem of an ordinary dicotyledonous shrub or tree consists of masses of different kinds of cells which soon lose their power of growth; thus the wood-cells, vessels, and even the parenchymatous cells of the wood, pith, and bark are soon incapable of growth in size, and retain but little longer the power of growth in thickness of the wall. In the same stem certain other cells (lying between the wood and bark) retain their growing power for many months.

REPRODUCTION.—One of the most important functions of plants is reproduction, or the formation of new individuals from the living cells of those already existing. For a discussion of this subject, see *REPRODUCTION (in Plants)*.

THE PHYSICS OF VEGETATION.—Since all parts of plants are composed of matter, it follows that they are subject to physical forces. In a living cell there is no suspension of the action of any force or of any physical law. Every atom of matter in the cell is as much under the control of force as it was before it entered into living matter. In the cell there are many forces, and what we see is the resultant of all, not of one alone, and it is this complex result which sometimes has puzzled us. We can no more reasonably doubt that the matter in living cells is still subject to physical forces because of apparently paradoxical results than we can entertain doubts of the mutual attraction of all matter because smoke rises, or the similar poles of magnets repel one another. It is only when we take a superficial view of such cases that they appear paradoxical.

It is not necessary, even if it were possible, to discuss in detail the action of the various physical forces upon each mass of matter in living plant-cells. It concerns us more in this place to note the behavior of the living cells, cell-masses, or the whole plant under the influence of physical forces of varying intensities.

Heat.—For every cell there is a certain range of temperature in which it is active, culminating in an *optimum* temperature; above this its activity decreases rapidly to its *maximum* temperature, where all activity ceases. In like manner below the optimum temperature activity decreases; not so rapidly, however, until the *minimum* is reached, where activity ceases again. This range of activity is not the same for all plants, and in many-celled plants it often differs considerably for different parts of the plant-body. Prof. Sachs, of Germany, determined this range for the germination of the following seeds:

SEEDS.	Minimum.	Optimum.	Maximum.
Indian corn.....	9.4° C. = 48.92° F.	34° C. = 93.2° F.	46° C. = 114.8° F.
Pumpkin.....	14.0° C. = 57.2° F.	34° C. = 93.2° F.	46° C. = 114.8° F.
Wheat.....	5.0° C. = 41.0° F.	29° C. = 84.2° F.	42° C. = 107.6° F.
Barley.....	5.0° C. = 41.0° F.	29° C. = 84.2° F.	37° C. = 98.6° F.

Common observation shows that plants differ much as to the degree of heat necessary for germination, as well as for other activities, but we have little in the way of careful measurements upon anything more than the germination of seeds. Certain experiments appear to indicate that the range in green parts of plants is much greater than has usually been supposed, in some cases approaching 0° C. and in others reaching 50° to 55° C. (122° to 131° F.), or even more. On the other hand, it is certain that other parts of plants will not endure such temperatures; e. g. roots and underground stems.

When the maximum temperature for a plant-cell is exceeded, a point is generally soon reached where by coagulation of the albuminoids or by some other changes the structure of the protoplasm is permanently altered, rendering further activity impossible, even upon the return to a favorable temperature. Such a cell is "dead." Reduction of the temperature below the minimum sooner or later results in a similar permanent alteration of the structure of the protoplasm, with the consequent "death" of the cell. Here it is noticed that watery cells can not endure as low temperatures as those which contain little water; e. g. a dry embryo in a kernel of Indian corn will endure a temperature of 40° or more below 0° C. (−40° F.), but when it has

made a little growth a slight frost (0° C. or 32° F.) will quickly kill it. In many respects the results of too great a reduction of temperature are similar to those produced by too great an elevation; the albuminoids become coagulated and the protoplasm structure is permanently changed. In both cases the power of imbibing water and of rendering the cell turgid is lost, and in ordinary temperatures chemical changes in the free solutions soon set in, resulting in their rapid disintegration.

Light.—Directly or indirectly all plants are dependent upon the light. Although many parasites and saprophytes grow in complete darkness, they do so by using material which developed in the light. We have seen (*isoprop*) that carbon assimilation is possible in the light only in cells whose protoplasm is stained with chlorophyll. All the carbon of vegetation came originally from chlorophyll-bearing cells, made active by the light. Just how the light affects the green protoplasm in carbon assimilation is not known, nor do we know how light brings about the formation of chlorophyll by the protoplasm. We can only regard light as a force which, acting upon the complex compound protoplasm, produces molecular changes resulting in the secretion first of chlorophyll, and second of a carbon compound. Here it must be remarked that not all cells secrete chlorophyll in the light, although many which are normally colorless become green under its influence; thus while many roots and underground stems become green on exposure to the light, the petals of many flowers, the stems of the dodders, and the cells of fungi when so exposed develop no chlorophyll. It is a fact, however, that some kind of coloring-matter is produced in nearly all cells on exposure to the light, as is well shown by the familiar experiment of growing flowers, fruits, and various fungi in complete darkness, when they are usually much paler or wholly wanting in color. The color of some flowers appears to be independent of the direct action of light, as shown by Prof. Sachs, who obtained perfectly normal flowers of the tulip, iris, squash, and morning-glory when grown in the darkness, although the leaves were completely etiolated.

It has been shown by experiment that light somewhat retards the growth of certain cells. A shoot grown in darkness or deficient light is always longer than one grown in strong light. Even in the daily growth of plants the rate during the day is less than during the night. This has been called by Prof. Vines, of England, the "tonic influence of light." Here we must note that while the stem grows more rapidly in darkness, the leaves grow less rapidly, and in complete darkness remain very small.

Gravitation.—Many cells always grow in a particular direction with respect to the earth's mass (gravitation). Thus the principal roots usually grow toward the earth, while most stems grow away from it. When a seed germinates its roots invariably take a downward and its stems an upward direction, and it does this regardless of its immediate surroundings. This is well illustrated in the experiment shown in Fig. 1, in which seeds are planted half an inch deep

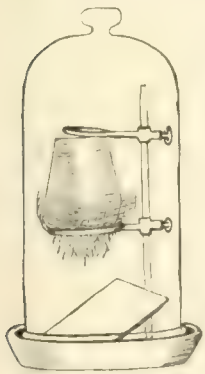


FIG. 1.—Experiment.

in a flower-pot, which is then covered with coarse netting and inverted upon a ring-stand. Below it is placed a mirror, standing at a proper angle to reflect light upon the under surface of the flower-pot. A tall bell-jar is put over the apparatus and water is kept in the dish so as to preserve a moist atmosphere. The whole is now placed in a light room of the proper temperature. Upon germination the stems invariably grow upward, deeper and deeper into the ground and darkness, while the roots grow down, out of the ground, and into the light. If, now, we make another experiment we may understand the matter better. Two small flasks containing a little water are slipped over opposite ends of a wooden rod and retained in place by a coil of wire, as shown in Fig. 2. A sprouted seed is previously fastened to each end of the rod by a stout pin, and the whole is rotated rapidly upon the steel rod *s* by a water or electric motor. As the roots develop they grow outward in the direction of the centrifugal force, and the stems grow inward, or in opposition to that force. Upon slower rotation both roots and stems grow diagonally, the angle depending upon the rate of revolution.

In considering the mode of action of gravitation upon parts of plants we can not suppose that the root-cells are more subject to it than the cells of the stem. Perhaps the best statement which we can now make of this matter is that each cell exhibits what we may call "polarity" with respect to the lines of constant force (gravitation, or centrifugal force). When these lines are vertical, as in gravitation, the cells exhibit vertical polarity; when the lines of force are horizontal, the cells exhibit horizontal polarity; and when, as in the experiment above, there are two lines of force acting at right angles to each other, the axis of polarity is diagonal. This general statement, while incomplete, and here applied only to the principal roots and stems, is capable of a far wider application, and doubtless may be useful as a working hypothesis.



FIG. 2.—Rotating apparatus.

Electricity.—While plants exhibit electrical conditions in common with other material objects, they seem at present to possess no physiological significance. Every chemical change in the cell probably produces some disturbance of its electrical conditions and of those of its neighboring cells. So, too, the considerable amount of evaporation of water from leaves and other aerial parts probably produces electrical disturbances. Various observers have noticed weak electrical currents between different tissues upon making transverse sections of stems or leaves. None of these appear to be of any importance physiologically, at least as now understood. Strong electrical currents, especially when interrupted, quickly disorganize the protoplasm; weak currents retard or arrest protoplasmic movements, and very weak currents produce no perceptible effect.

Humidity of the Air.—Since the walls of living plant-cells are usually permeable to water it follows that when exposed to relatively dry air they lose a portion of their watery contents by evaporation and soon cease their activity. In many-celled plants this loss is repaired by the absorption of water from contiguous cells not so exposed, and the latter in turn repair their loss by absorption from the surrounding moisture (water or moist earth). The condition of the atmosphere may thus set up many disturbances in the plant, but it must not be forgotten that the loss of water by the plant is a purely physical process.

Supply of Energy to the Plant.—The work done by a plant involves the expenditure of energy. In hysterozytes the decomposition of the chemical compounds absorbed by them affords a supply of energy fully, or nearly, adequate for all their needs. In holophytes the case is far different; they absorb compounds of simple chemical constitution supplying relatively little available energy, but in their chlorophyll-stained cells they are able to arrest the energy of the sunbeam, and divert it to the work of the plant. Doubtless green plants derive some energy from the decomposition of the compounds absorbed by them and perhaps more from the heat to which they are exposed, and possibly to a slight extent from other sources, but the great supply of energy is the light of the sun. It has been shown experimentally that any other bright light, whether produced by lamps of various kinds or by the electric arc, when of sufficient intensity may be a source of energy for green plants.

PLANT MOVEMENTS.—It is one of the essential characteristics of living things that they move, although "motility" and "life" are not synonymous. A complete examination of the motility of plants would include the many kinds of movements exhibited by protoplasm, whether naked (as in zoospores) or inclosed within walls of greater or less rigidity, and in addition the very slow movements connected with growth and nutrition.

Nutation.—Under this term are gathered those cases in which terminal parts of plants move spontaneously and somewhat regularly in definite directions. It has been observed that the growing ends of climbing plants perform circular nutations; thus in the hop and honeysuckle the free ends of the stems rotate in the direction of the hands of a watch (Fig. 3, *a*), while in the yam, bean, and morning-glory the rotation is the reverse (Fig. 3, *b*). In other cases the nutation is a simple swaying back and forth, as Darwin has observed, in many leaves and growing shoots.

Geotropism.—This term includes all those movements of plants or their parts due directly or indirectly to gravitation, discussed above. In many works the movement toward the earth is termed geotropism, and organs exhibiting it are

said to be geotropic. Organs which move away from the earth, then, exhibit negative geotropism, and are said to be negatively geotropic.

Heliotropism.—In like manner the movements of plants or their parts due to the light are included under the term



FIG. 3.—Twining stem of hop (a) and yam (b), showing opposite nutations.

heliotropism. Organs which turn toward the light are heliotropic (or sometimes positively heliotropic), while those which turn away from it are said to be negatively heliotropic, and the phenomenon is negative heliotropism. The upper surface of most leaves is positively and the lower negatively heliotropic; yet some leaves have both surfaces positively heliotropic, and their blades are therefore approximately vertical and parallel with the meridian, as is notably the case in the compass-plant (*Silphium laciniatum*) of the prairies of the U. S. The tendrils of many plants are negatively heliotropic, as are also the runners of some others.

The movements of plants with the decrease in the amount of light, as at nightfall, often called the "sleep of plants," are heliotropic in their nature. Some of these are quite marked, as in many of the clovers, beans, peas, and their allies. The species of *Oxalis* are notable for their nyctitropic movements.



FIG. 4.—Ordinary (a) and "sleeping" (b) positions of leaves of white clover.

parts of plants exhibit movements as a result of physical contact with some object. For this sensitiveness to contact the term irritability has been used. One of the best examples of this is the well-known "sensitive-plant" (*Mimosa pudica*), whose leaflets quickly assume a particular position when rudely touched. A more remarkable example is the Venus's fly-trap (*Dionaea muscipula*), in which each lobe of the leaf has three sensitive hairs upon its upper surface; and when these are touched the two halves of the leaf close together quickly. (See INSECTIVOROUS PLANTS.) Many stamens are sensitive to touch, as in the barberry, portulaca, and purslane.

The tendrils of many plants exhibit irritability, and when touched by an object bend toward and eventually coil around it. If after contact and some bending the tendril be freed once more, it will soon straighten out as before, and may be made to bend in the opposite direction by another contact; and this may be repeated a number of times. See, further, BOTANY, PROTOPLASM, and HISTOLOGY, VEGETABLE.

LITERATURE.—The most important of the recent general works on plant physiology are the following, in which may be found full references to books and papers on special topics: Charles Darwin, *The Movements and Habits of Climbing Plants* (2d ed., 1875), and *The Power of Movement in Plants* (1880); W. Pfeffer, *Pflanzenphysiologie* (1881); W. Detmer, *System der Pflanzenphysiologie* (1882); G. L. Goodale, *Physiological Botany* (1885); S. H. Vines, *Lectures on the Physiology of Plants* (1886); J. Sachs, *Lectures on the Physiology of Plants* (Eng. ed., 1887); A. Zimmerman, *Die Morphologie und Physiologie der Pflanzenzelle* (1887);

W. Detmer, *Das Pflanzenphysiologische Praktikum* (1888); J. Wiesner, *Elemente der Wissenschaftlichen Botanik* (3 vols., 1889-91); J. Sachs, *Gesammelte Abhandlungen über Pflanzenphysiologie* (1892-93); W. Oels, *Pflanzenphysiologische Versuche* (1893), English translation by D. T. MacDougal under the title of *Experimental Plant Physiology* (1894). CHARLES E. BESSEY.

Phythiseism: See INDIANS OF NORTH AMERICA.

Physopoda: See ENTOMOLOGY.

Physos'tomi [Mod. Lat.; Gr. *φύσα*, bellows (i. e. air-bladder) + *στόμα*, mouth]: those teleostean fishes which are provided with a duct connecting the air-bladder with the intestine as by a mouth, in allusion to which the name has been given. The name has been used with varying limits by different authors.

Phytoph'thires [from Gr. *φυτόν*, plant + *φθέρω*, louse]: that group of Hemipterous insects which contains the leaf-fleas (*Psyllidæ*), plant-lice (APHIDES, *q. v.*), and scale-insects (*Coccidæ*), characterized by having usually wingless females, wings when present with few veins and uniform texture, and the body frequently concealed by a waxy or powdery secretion from certain dermal glands. All are parasitic on plants, and cause no little damage to agricultural and horticultural interests. Exceptions to this rule are to be found in the cochineal insect (*Coccus cacti*) the lac-insect (*Coccus lacca*), and the manna-insect (*C. maniparus*), which produce directly or indirectly products of value to man. Among the most injurious forms is the grape PHYLLOXERA (*q. v.*), though many of the scale-insects are serious pests. J. S. KINGSLEY.

Phytozo'ön, pl. **Phytozo'a** [Mod. Lat., from Gr. *φυτόν*, plant + *ζῷον*, animal]: a term sometimes applied to the antherozoids, or male sexual cells of certain cryptogamous plants.

Piacenza, pē-ā-chen-zā (anc. *Placentia*): chief town of the province of Piacenza, Italy; on the right bank of the Po, a little below its junction with the Trebbia; 43 miles S. E. of Milan (see map of Italy, ref. 3-C). Formerly a fortress of considerable strength, it is still surrounded by ramparts and trenches forming a circuit of 4 miles. The streets are broad, the Stradone Farnese being the finest, and the principal square, the Piazza de' Cavalli, in which are equestrian statues in bronze of Alessandro Farnese, governor of the Netherlands, and his son Ranuccio, has a busy aspect. The city in general, however, has a decayed and somber look, owing partly to the mediæval character of many of the buildings. The cathedral, begun in 1122 on the foundations of a much earlier church, is Lombardo-Gothic in style, and in its interior contains numerous frescoes mostly by Guercino and L. Caracci. Among other noticeable churches are Sant' Antonio, once the cathedral, built in 324 (on the spot, it is said, where St. Barnabas first preached to the people), but much altered by restorations, and San Sisto, which is known as giving its name to Raphael's famous Madonna, now in Dresden. The Palazzo Farnese, called La Cittadella, was a splendid structure, but is now a barrack. The Palazzo Comunale (1281), in the main front of the lower story, constructed of marble, presents fine open-pointed arcades. The municipal library contains 120,000 volumes. This town, of Gallic origin, served the Romans as a strong point of defense against Hannibal, and the construction of the great military road of M. Æmilius Lepidus and various large canals raised it to great prosperity. Under the Goths it was allowed to govern itself, and under the Lombards and Franks it had a feudal lord. In 1545 it was united with PARMA (*q. v.*) to form a duchy for Pierluigi Farnese, son of Paul III. In 1859 it was united to the kingdom of Italy. The trade of Piacenza is chiefly in the products of the rich neighboring country—grain, wine, cheese, etc.; the manufactures are silk, cotton and woolen goods, and pottery. Pop. (1892) 37,000. The province has an area of 954 sq. miles. Pop. (1892) 229,039.

Revised by R. A. ROBERTS.

Piacenza, DUKE OF: See LEBRUN, CHARLES FRANÇOIS.

Pi'a Ma'ter [Mod. Lat., fancifully taken from Lat. *pīa mater*, pious or gentle mother; see DURA MATER]: the innermost of the meninges or membranes covering the brain and spinal cord. It is so named because it serves in nourishing the nerve-centers. It is a fine plexus of blood-vessels covering the brain, dipping down into its convolutions, forming the velum interpositum in the third and the choroid plexus in the fourth ventricle. A small part, over the crura

and pons, is not very vascular, but tough and fibrous. It is abundantly supplied with nerves and lymphatics. The pia mater is liable to inflammatory diseases which are collectively designated meningitis. The pia mater of the spinal cord is less vascular than that of the brain, with which it is continuous. It is partly composed of longitudinal fibrous bundles. It is intimately connected with the cord, of which it is the neurilemma. The tunica vasculosa of the testes is also called pia mater.

Revised by WILLIAM PEPPER.

Pianoforte [Ital.: *pia no*, soft; Lat. *plūnus*, smooth, whence Eng. plane, plain) + *for'te*, strong, loud]: a musical instrument played by a double row of keys upon a finger-board, each key being connected with a hammer which strikes a steel string. The principle of the keyboard was applied to a musical instrument, the clavichord, as early as the fourth century, and other instruments of the same class, as the cithara, the harpsichord, and the spinet, were popular down to the eighteenth century. The invention of the pianoforte has been claimed for Germany, Italy, France, and England. The best evidence seems to assign it to Bartolommeo Cristofori, a harpsichord-maker at Padua, Italy, about the year 1710. Marius claimed a similar invention in Paris in 1716, and Christoph Gottlieb Schröter in Germany in 1717. It was not until 1760 that the instrument was manufactured in England by German mechanics; and it was first practically introduced into France by Sébastien Érard. (See *ÉRARD*.) The firm of Broadwood & Stodart soon took a leading position as English manufacturers, and improvements were rapidly made, the instrument speedily attaining popularity. The grand piano seems to have been first made in 1781, the upright in 1795. Few pianos had been exported to the U. S. when, in 1822, Jonas Chickering began their manufacture at Boston, being thus the pioneer of an important industry. In the form of the instrument called the grand piano the strings are placed horizontally and parallel to the keys. In the "upright" piano they run perpendicularly. The manufacture of the so-called "square" piano has practically ceased, owing to the more convenient form of the "upright," especially where little space is available. The former objection to the "upright" piano—viz., that it soon got out of tune—has been remedied. The piano is essentially the musical instrument of modern times. It has become a household requisite, and as a consequence its manufacturing industry has become a colossal one, extending over the whole civilized world. Outside its own characteristics and powers as a solo instrument, no other can so well represent the orchestra or successions of complex harmonies perhaps originally written for voices. In fact, it is the musician's indispensable assistant in every way. Its own literature, both singly and in combination with other instruments, is the richest, the great composers from Bach and Scarlatti down to the present day having bequeathed to the piano a wealth of their best thought and inspiration. Revised by DUDLEY BUCK.

Piarists, called also the **Pauline Congregation**, and popularly known as **Scolopins** [*Piarists* is from Lat. *pīus*, pious; *Scolopins* is from Lat. *scho'la pia*, religious (liter., pious school)]: a congregation of regular clerks of the Roman Catholic Church, founded in 1599, for the purpose of spreading education, by St. Joseph Calasanz, who was born at Calasanz, in Aragon, Sept. 11, 1556; studied law at Lerida and theology at Alcalá; was ordained a priest in 1582, and settled in 1592 in Rome, where he died Aug. 25, 1648. His remarkable success as a teacher induced him to form an association, which in 1612 had over 1,200 pupils in Rome. The Piarists were confirmed by Paul V. (1617) and by Gregory XV. (1622), when they received the official title of Regular Clerks of the Pious Schools. The congregation was allowed by Gregory XV. to take solemn vows. Alexander VII. brought them back to their original condition, while Clement IX. (1669) re-established them in the state of regulars. They are found chiefly in Europe. See *History of Religious Orders*, by C. W. Currier (1894).

Piassava, or **Piassaba**. **Fiber** [*piassava* is via Portug., from the Braz. name]: a coarse substance used for making brushes and brooms for street-sweeping. It is exported from Brazil, and is produced chiefly from the palm-trees, *Leopoldinia piassaba* and *Attalea funifera*. See *CHICQUEPALM*.

Piatt, JOHN JAMES: poet; b. at Milton, Ind., Mar. 1, 1835; was educated at the Columbus (O.) High School and Kenyon College; removed to Illinois in 1856, and soon after

became a contributor to the Louisville *Journal* and confidential secretary to its editor, George D. Prentice. From 1861 to 1867 he was clerk in the Treasury Department at Washington. In 1867-70 he was engaged upon newspaper work at Cincinnati, O. In 1870 he became clerk to the U. S. House of Representatives, and librarian to the House in 1871. He was consul at Cork, Ireland (1882-94); joint author, with W. D. Howells, of *Poems by Two Friends* (1860); with his wife, wrote *Nests at Washington* (1863); sole author of *Poems in Sunshine and Firelight* (1866); *Western Windows* (1868); *Landmarks*, etc. (1871); *Poems of House and Home* (1879); *Idyls and Lyrics of the Ohio Valley* (1884 and 1888), etc.—His wife, SARAH MORGAN (Bryan) PIATT, b. at Lexington, Ky., Aug. 11, 1836, and married in 1861, is also distinguished as a writer of verse. She has published *A Woman's Poems* (1871); *A Voyage to the Fortunate Isles* (1874); *That New World* (1876); *Dramatic Persons and Moods* (1880); *The Witch in the Glass* (1889), etc.

Revised by H. A. BEERS.

Piahy, pē-ow-ee' (also written *Piauh*): a northeastern state of Brazil; between Ceará, Pernambuco, Bahia, Maranhão, and the Atlantic. Area, 116,506 sq. miles. It lies entirely in the basin of the PARAHYBA (q. v.) E. of that river; the coast is very short, and the mouth of the river forms the only seaport. The interior consists of table-lands, divided by numerous tracts of lower lands; there is little true forest, the land being open or varied with dry *catinga* woods. The climate resembles that of Ceará in its long dry seasons and occasional severe droughts; the vegetation withers and most of the streams disappear in the dry months. Piahy is one of the poorest as well as least populous of the Brazilian states. The only important industry is cattle-raising. The exports are hides, cotton, vegetable wax, and a few drugs. Small steamers ascend the Parahyba. The capital, Teresina, is a small place on that river. Pop. (1894) estimated, 300,609.

HERBERT H. SMITH.

Piazza Armerina, pē-aat'sā-ār-mā-ree'nāa: city; in the province of Caltanissetta, Sicily; 39 miles E. S. E. of the town of Caltanissetta (see map of Italy, ref. 10-F). It is situated on a hill surrounded by an undulating country of great fertility. It has a cathedral, built in the eighteenth century, an episcopal palace, and a communal library. Piazza Armerina is a very ancient town, settled, tradition says, by a colony of Greeks from Platæa. Under the Normans it rose to importance; it was destroyed in 1160, but rebuilt three years later. Its prosperity depends on the abundance of grain, wine, oil, chestnuts, and walnuts produced in the vicinity. Pop. of city about 17,040; of commune, 19,600.

Piazzi, pē-aat'sēe, GIUSEPPE: astronomer; b. at Ponte, in the Valtellina, Italy, July 16, 1746. His master was the mathematician Father Giambattista Beccaria, and he himself joined the order of the Theatines. After being professor of philosophy in several of the large Italian universities, he was appointed in 1780 Professor of Mathematics at Palermo, where he promoted the establishment of an observatory, and finally went to France and England to obtain instruments for it. This observatory was opened in 1791, and there Piazzi compiled his famous *Catalogue of the Stars*. On Jan. 1, 1801, he discovered the planet or asteroid Ceres, which opened the way for the discovery of so many others. Piazzi revised the plan of the new observatory at Naples, of which he was afterward for some time the director. D. July 22, 1826. On occasion of the erection of a monument to Piazzi at Ponte, B. E. Maineri published his biography.

Pi-Beseth [Egypt. *Pa-Bast*, dwelling of Bast, the cat-headed deity; Gr. *Βούβαστρος*; Mod. *Tell Basta*]: the Hebrew (Ezek. xxx. 17) name of Bubastis, a very ancient city of Egypt; situated on the Tanitic branch of the Nile, about midway between Heliopolis and Tanis. Manetho has preserved a legend which mentions the place as existing as early as the second dynasty, and monumental remains have been discovered which date from the fourth, sixth, twelfth, and succeeding dynasties, as well as others which indicate that it had a continuous history down to Roman times. Specially noteworthy are the remains left by Ramses II. and Osorkon II. It was also a stronghold of the Hyksos, and the name of one of these foreign sovereigns was discovered there by Naville, who reads the hieroglyphics as *Ian-ra*, corresponding to the Iamias or Annas of Josephus. It may have been the royal residence at the time of Joseph, and in that case it corresponds well with the Biblical narrative in being near to the land of Goshen (q. v.). See Herod-

otus, ii., 59, 67, 137, 166; Naville, *Bubastis* (London, 1891) and *Festival Hall of Osorkon II.* (London, 1892), being the eighth and tenth *Memoirs of the Egypt Exploration Fund.* CHARLES R. GILLET.

Pibroch [from Gael. *piobai-rachd*, pipe music, deriv. of *piobair*, piper, deriv. of *pioba*, pipe, bagpipe, from Eng. *pipe*]; the war-notes of the Highland bagpipe. There are numerous compositions of this kind, scarcely distinguishable from each other by the untrained ear. The use of this pipe in Scottish warfare has been traced back no farther than 1594.

Pic'amar [Lat. *piz*, *pi'cis*, pitch + *ama'rus*, bitter]: an oily body found in wood-tar.

Picard, *pē'kaar'*, ALFRED: civil engineer; b. in Paris, France, Dec. 21, 1844; studied at the École de Ponts et Chaussées, graduating in 1864; engineer in chief in 1880; inspector-general of first class in 1891; honorary director-general of the commissions of bridges and roads, of mines, and of railways; president of section of the council of state; president of the consulting commission on railways, and of many other Government commissions; editor of the official reports of the Exposition of 1889; commissioner-general of the Universal Exposition to be held at Paris in 1900; grand officer of the Legion of Honor; vice-president of the international railway congress of St. Petersburg in 1892.

Picard, JEAN: astronomer; b. at La Flèche, department of Sarthe, France, July 21, 1620; accomplished the first exact measurement of a degree of the meridian, between Amiens and Malvoisin; made a number of valuable improvements in the instruments of observation and methods of calculation; was the real founder and constructor of the Observatory of Paris; founded the *Connaissance des Temps*, the French astronomical ephemeris, the publication of which has continued annually for more than two centuries; is noted for the noble disinterestedness with which he aided other astronomers, such as Ole Römer the Dane, Cassini the Italian, etc., and wrote, among other works, *La Mesure de la Terre* (1671), and *Voyage d'Uranibourg, ou Observations astronomiques faites en Danemark* (1680). D. in Paris, Oct. 12, 1692.

Revised by S. NEWCOMB.

Picard, LOUIS BENOIT: dramatist; b. in Paris, France, July 29, 1769. At the age of eighteen he became an actor, and in 1789 he produced his first play; thereafter he continued in the double rôle of actor and author. He entered the Théâtre Français in 1792; about 1800 became director of the Théâtre Louvois, afterward the Odéon; in 1807 was called to direct the Opera, and returned in 1816 to the Odéon. D. Dec. 31, 1828. He wrote a large number of popular comedies, marked by naturalness, gaiety, and fertility of invention. They are partly contained in his *Théâtre* (8 vols., Paris, 1821) and *Théâtre républicain* (1832).

Picards: See BRETHREN AND SISTERS OF THE FREE SPIRIT.

Pic'ardy: an old province of France; bordering on the English Channel. It is now divided into the departments of Somme and Pas-de-Calais; parts of it belong to the departments of Aisne, Oise, and Yonne.

Piccini, *pi-chee'nē*, or **Piccinni**, NICOLO: composer; b. at Bari, Italy, in 1728; received his musical education in the conservatory of Naples; made in 1754 his *début* as a composer with the opera *Le Donne dispettose*; achieved in 1760 an almost unprecedented success by his opera, *Cecchina, ossia la buona figliuola*; went in 1776 to Paris, and engaged in a musical contest with Gluck, brought about by the directors of the Grand Opéra. He composed during this period *Roland*, *Phaon*, *Atys*, *Iphigénie en Tauride*, etc., in all fifteen operas; but, although most of them were received with great enthusiasm, Gluck was victorious, and, other troubles being added to the defeat, Piccini left Paris for Naples in 1791. In Italy he composed several successful operas, *Griselda*, *Il Servo Padrone*, etc., but the Government suspected him of sympathizing with the French Revolution, and in 1798 he returned to Paris, where Bonaparte gave him a position as inspector of music at the National Conservatory. D. at Passy, May 7, 1800. He was a talented representative of the Italian music of that period, and his productivity was enormous; from 1754 to 1775 he composed 133 operas, besides many pieces of church music, etc.

Piccolomini: a celebrated Italian family which flourished in Siena and Amalfi. Its most noted members were ÆNEAS SYLVIVS PICCOLOMINI, afterward Pope Pius II. (1458–

64), his nephew, FRANCESCO TODESCHINI, who also became pope, under the name of Pius III., but died in the year of his election, and the general OCTAVIO PICCOLOMINI (1599–1656), who fought in the Thirty Years' war on the Imperial side, joining the army of Wallenstein in 1627, and winning distinction in the battle of Lützen in 1632. Though promoted to a high command by Wallenstein, he turned against and was one of those who conspired to overthrow him, receiving for this service a part of Wallenstein's estates. After this he fought with some success against the Swedes and in the Netherlands; entered the Spanish service in 1643, was recalled by the emperor in 1648, and made marshal.

Picea [Mod. Lat., from Lat. *piz*, *picis*, pitch]: a genus of coniferous trees including about a dozen species, known as spruces, all natives of the cooler portions of the northern hemisphere. They have four-sided needle-shaped leaves, scattered singly over the surfaces of the twigs, which after the fall of the leaves are covered with the elevated leaf bases. The cones are composed of persistent scales, and hence do not fall away from the axis, as they do in the firs (*Abies*). Six species are natives of North America, the best known being *P. alba*, the white spruce, *P. nigra*, the black spruce, *P. pungens*, Rocky Mountain spruce, and *P. engelmanni*, Engelmann's spruce. The European *P. excelsa*, Norway spruce, is commonly planted in North America as an ornamental tree.

CHARLES E. BESSEY.

Pichegru, *pēesh'grü'*, CHARLES: general; b. at Arbois, department of Jura, France, Feb. 16, 1761; was a teacher of mathematics at the military school of Brienne while Bonaparte was a pupil there; entered the artillery service of the Revolutionary army, and rose rapidly; was commander-in-chief of the army of the Rhine in 1793, of the army of the North in 1794; conquered Holland and organized the Batavian republic in 1795; resumed the command of the army of the Rhine, but entered into negotiations with the Bourbons, and falling under suspicion on account of his inactivity and the reverses that his army sustained, he was deprived of his command in 1796. In 1797 he was a member of the Council of Five Hundred, and chosen its president, but, his plottings with the *émigrés* and the Royalist party being discovered, he was arrested, Sept. 4, 1797, and transported to Cayenne. In 1798 he escaped to England, where he formed a conspiracy with Cadoudal, the Polignacs, and others against Napoleon's life. He repaired secretly to Paris, but the conspiracy had in the meantime become known to the police; he was captured, imprisoned, and found strangled in his cell Apr. 5, 1804. See *Lives* by Gassier (1814), Pierret (1826), and Bouziers (1870).

F. M. COLBY.

Pichiciago: a name for the little armadillos of the genus *CHLAMYDOPHORUS* (*q. v.*).

Pichin'cha, La: a volcano of Ecuador; immediately N. of the city of Quito and almost under the equator. It has several peaks and craters: the highest, called the Guagua Pichincha, is 15,916 feet above the sea, and appears to be gradually rising. The crater of Guagua Pichincha, which can be visited without great difficulty, is 2,500 feet deep, or one of the deepest in the world; there have been no violent eruptions since 1660, but vapor issues continually. On the side of this volcano was fought, May 24, 1822, the battle of Pichincha, in which the patriots, under Sucre, defeated the Spaniards and secured the independence of Ecuador. The province of Pichincha (named in honor of this victory) includes the city of Quito and the surrounding plateau. Area, 6,218 sq. miles. Pop. (1890) about 205,000.

H. H. S.

Pichler, JOHANN: gem-engraver; b. at Naples, Jan., 1734. He was the pupil of his father, Anton Pichler (1697–1779), and began to cut intaglio-gems while still a boy. He copied many antique gems, and, as he seems to have sold them at low prices and to have done such work to order, it is probable that a great number of supposed antiques are by his hand. At a later time he signed his gems, using commonly his surname in Greek capitals, ΠΙΧΛΑΡ. In 1763 he went to Rome. A head of the Emperor Joseph II. caused him to be ennobled and added greatly to his fame. He was recognized as the first gem-engraver of his time, and undertook the most difficult tasks in the line of his art. Among other subjects he took up the representation of Græco-Roman statues and busts. Besides his intaglio-gems he produced a few cameos. He also painted some pictures and began the engraving of a set of plates after the Raphael frescoes in the Vatican. D. at Rome, Jan. 25, 1791.

RUSSELL STURGIS.

Pichuric Acid: See LAURIC ACID.

Pich'urim Beans, or Sassafras Nuts: a name given to the seed-lobes of *Nectandra pichurum* (properly *Ocotea pichurum*), a South American humaceous tree. They are used by chocolate-makers and others for flavoring. They have a strong taste, resembling nutmeg as well as sassafras.

Pici [from Lat. *picus*, a woodpecker]: an order of birds containing the woodpeckers and wrynecks. The characteristics are a peculiar modification of the schizognathous palate, no basipterygoid processes, a Y-shaped mandibulum, no caeca, and a tufted oil-gland. The fourth toe is turned backward, the first in one genus lacking. Huxley placed the woodpeckers in a group called *Celeomorpha*, and Dr. Parker, from certain peculiarities in the palate, made them a distinct order, to which he gave the name *Saurognathæ*. Other authors have extended the limits of the group, though not always recognizing it as an order. Thus Fürbringer includes the barbets (*Caprimulgidae*), toucans (*Rhamphastidae*), and indicators (*Indicatoridae*), and Sharpe—in his *Pro-formæ*—includes the puff-birds (*Bucconidae*) and jacamars (*Galbulidae*). F. A. LUCAS.

Pic'idæ [Mod. Lat., named from *Picus*, the typical genus or group, from Lat. *picus*, woodpecker, whence Eng. *pie*, a bird]: a family of birds containing the woodpeckers (see WOODPECKER) and wrynecks, although these last are sometimes placed in a separate family (*Iungidæ*).

Pick, ARNOLD, M. D., Ph. D.: alienist; b. at Gross-Meseritsch, Moravia, July 20, 1851; educated at Igla, Moravia; became medical assistant in the Asylum for the Insane at Oldenburg in 1875; at Prague in 1877; privat docent at the University of Prague in 1880, and Professor of Psychiatry at the same university in 1886. His works are mainly monographs in psychiatry, neurology, physiological psychology, etc., besides his *Beiträge zur Pathologie u. Pathol. Anatomie des Centralnervensystems* (1879-80), written in collaboration with Otto Kohler. J. M. B.

Pick, BERNHARD, Ph. D.: author; b. at Kempen, Prussia, Dec. 19, 1842; educated at Breslau, Berlin, and Union Seminary, New York. After filling pastorates in the Presbyterian Church, entered the Lutheran ministry in 1884, serving a congregation in Allegheny, Pa. He is a contributor to many important publications (McClintock and Strong's *Cyclopædia*, Schaff-Herzog *Encyclopædia*, etc.); has indexed Lange's *Commentaries* and the Ante-Nicene Fathers, and has published a number of translations. H. E. J.

Pickens, ANDREW: soldier; b. at Paxton, Bucks co., Pa., Sept. 13, 1739, of Huguenot descent; went with his parents to the Waxhaw Settlement, S. C., in 1752; was a volunteer in Grant's expedition against the Cherokees 1761; was a captain of militia at the beginning of the Revolution; soon rose to the rank of brigadier-general, and shared with Marion and Sumter the honor of the heroic resistance made in South Carolina to the overwhelming numbers of the British and Tory forces. In Feb., 1779, with 400 men, he defeated Col. Boyd with 700 Tories at Kettle Creek, and at the battle of the Cowpens, Jan. 17, 1781, he commanded the militia, which he rallied and brought a second time into action after they had been broken and compelled to retreat; for this service Congress voted him a sword. After the war he was for many years a member of the Legislature; served in Congress 1793-95; was frequently commissioned to make treaties with the Indians; settled at Hopewell in the Pendleton district, which he had purchased from the Indians by the Hopewell treaty. D. there Aug. 17, 1817.

Pickens, FRANCIS WILKINSON: Governor of South Carolina; son of Gen. Andrew Pickens; b. at Togadoo, S. C., Apr. 7, 1805; was educated at South Carolina College, and in 1829 became a lawyer of Edgefield district; was prominent as a nullifier in the State Legislature in 1832; was in Congress 1834-43; opposed the Bluffton secession movement of 1844; U. S. minister to Russia 1858-60; Governor of South Carolina 1860-62, and as such had important connection with the early secession movements of his State. D. at Edgefield, S. C., Jan. 25, 1869.

Pickereel [Mod. Eng. *pikereel*, dimin. of *pike*, pike]: in England the young of the pike (*Esox lucius*); in the U. S. any one of various fishes; thus in many localities the name is given to the small *Esoxide* (*q. v.*), and in some places (e. g. the interior lakes of the Northwestern States) to the *Esox lucius*, the word being used as a synonym for pike, although sometimes incorrectly applied to other fishes of similar form. At the beginning of spring the pickereel leaves the

larger rivers and ascends the creeks and narrow ditches in order to deposit its spawn. The growth of the young pickereel is extremely rapid, and from its birth it exhibits remarkable voracity. See PIKE. Revised by D. S. JORDAN.

Pickering, EDWARD CHARLES: astronomer; great grandson of Col. Timothy Pickering; b. in Boston, Mass., July 19, 1846; graduated at the Lawrence Scientific School 1865; taught mathematics at Cambridge 1865-67; was shortly afterward elected Thayer Professor of Physics at the Massachusetts Institute of Technology; was a member of the *Nautical Almanac* party which observed the total eclipse of Aug. 7, 1869, in Iowa, and of the Coast Survey party sent to Spain with a similar object in 1870; has conducted extended observations in optics, and especially in regard to the polarization of glass and of the sky, on which subjects he has contributed papers to several scientific journals; and has successfully carried out the laboratory method of teaching physics upon a system exhibited in his work entitled *Physical Manipulation* (1874). His system has been largely adopted in other institutions. In 1873 he was elected a fellow of the National Academy of Sciences. He afterward became director of the Harvard Observatory at Cambridge, Mass., which he raised to be one of the most active in the world in the lines of spectroscopy and celestial photography. He received the gold medal of the Royal Astronomical Society of England in 1886. Revised by S. NEWCOMB.

Pickering, JOHN, LL. D.: philologist and archaeologist; son of Col. Timothy Pickering; b. at Salem, Mass., Feb. 7, 1777; accompanied his father in his visits to the Six Nations of Central New York, deriving from that circumstance his fondness for American philology; graduated at Harvard 1796; studied law in Philadelphia; was attached to the U. S. legations in Lisbon and London 1797-1801; a lawyer of Salem, Mass., 1801-27; city solicitor of Boston 1829-46; was much in the State Legislature, and assisted in revising the statutes; was a laborious philological student and familiar with many languages; president of the American Academy of Arts and Sciences; founder and first president of the American Oriental Society; maintained a correspondence for many years on philological topics with P. S. Duponceau and Wilhelm von Humboldt; author of valuable legal, archaeological, and philological papers, including an *Essay on a Uniform Orthography for the Indian Languages of North America* (1820), in which he proposed the alphabet adopted by American missionaries in reducing to writing not only Indian but Polynesian languages; *Remarks on the Indian Languages of North America* (Philadelphia, 1836); *Vocabulary or Collection of Words and Phrases supposed to be peculiar to the United States* (1816); *Greek and English Lexicon* (1826; 3d ed. revised and enlarged, 1846). D. at Boston, Mass., May 5, 1846. Revised by B. I. WHEELER.

Pickering, TIMOTHY, LL. D.: statesman; b. at Salem, Mass., July 6, 1745; graduated at Harvard 1763; was commissioned lieutenant of militia 1766; studied law while acting as selectman, assessor, and town clerk of Salem; admitted to the bar 1768; was prominent in resistance to British aggressions; in 1775 became judge of the maritime and common pleas courts, was elected colonel of militia, and published *An Easy Plan of Discipline for a Militia*, which was made the official text-book in Massachusetts and in the Continental army; joined the Continental army at Morristown, N. J., in 1776 at the head of a regiment raised in Essex County, Mass.; served through the Revolution as colonel with valor and disinterestedness; became in 1777 Washington's adjutant-general, serving as such at Brandywine and Germantown, and member of the board of war in the same year; quartermaster-general 1780-85; became a commission merchant at Philadelphia at the close of the war; was sent in 1786 by the Federal Government to settle the dispute between Pennsylvania and Connecticut over land titles in the valley of Wyoming, Pa.; acquired a large tract of land in that region, settled at Wilkesbarre, and strove with much wisdom to harmonize the conflicting elements, but was seized and imprisoned for twenty days; was a delegate from Luzerne County to the Pennsylvania constitutional conventions of 1787 and 1790; negotiated treaties with the Six Nations of New York in 1790, 1791, and 1794, and with the Ohio Indians in 1793; Postmaster-General 1791-95; appointed Secretary of War 1795, and was instrumental in founding West Point Academy; became U. S. Secretary of State 1795, and was retained by President Adams until 1800, when he was dismissed with the rest of the cabinet; returned to the forests of Pennsylvania and

built a log house for his family, when by sale of a portion of his lands to friends in Massachusetts, he was set free from heavy debts and returned to Massachusetts to settle at Danvers; was made a judge of common pleas 1802; was U. S. Senator 1803-11; made himself unpopular by opposing the Louisiana purchase and the embargo of 1807; also was opposed to the war of 1812, but served as commissioner for the defense of the Massachusetts coast; in Congress 1815-17; declined a re-election to the Senate 1816; was author of able political pamphlets; devoted much attention to agriculture, being president of the Essex Agricultural Society; was an ardent Federalist. (See ESSEX JUNTO, THE.) He published several occasional addresses and pamphlets: *Letter to Governor Sullivan on the Embargo*, *Addresses to the People*, *Political Essays*, and a severe *Review of the Correspondence between John Adams and W. Cunningham* (1824), etc. D. at Salem, Mass., Jan. 29, 1829. See his *Life*, begun by his son Octavius, and completed by Rev. Charles W. Upham (4 vols., 1867-73); Adams, *Documents Relating to New England Federalism* (Boston, 1877); and the article on Pickering by Lodge, *Atlantic Monthly*, vol. xli.

Pickett, GEORGE EDWARD: soldier; b. in Richmond, Va., Jan. 25, 1825; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of infantry July, 1846; engaged in the war with Mexico from Vera Cruz to the capture of the city of Mexico; brevet first lieutenant and captain for gallantry at Contreras, Churubusco, and Chapultepec; on frontier duty 1848-61, becoming captain of Ninth Infantry Mar. 3, 1855. He resigned June 25, 1861, and in September was appointed colonel in the Confederate army, and brigadier and major general in 1862. In the Virginia Peninsular campaign of 1862 he led a brigade, and was severely wounded at Gaines's Mill. Continuing thereafter with the army of Northern Virginia, he participated in the battles of that army, and was conspicuous for his bravery and intelligence. At Gettysburg his division led the assaulting column which suffered so severely July 3, 1863; he also commanded in North Carolina, at the capture of Plymouth. In the campaign of 1864-65 he made the final stand at Five Forks, where his division was surrounded and broken up after a desperate resistance. D. at Norfolk, Va., July 30, 1875. Revised by JAMES MERCUR.

Pickling and Pickles: See PRESERVATION OF FOOD.

Picknell, WILLIAM LAMB: landscape-painter; b. in Boston, Mass., in 1853; pupil of George Inness in Rome, of Gérôme in Paris, and of Robert Wylie in Brittany; member of the Society of American Artists 1880; member of the Society of British Artists; honorable mention, Paris Salon, 1880. His pictures of sunlight effects are remarkably luminous, and his methods are broad and vigorous. *The Carneau Road* (1880) is in the collection of T. B. Clarke, New York, and works by him are in the Metropolitan Museum, New York; Pennsylvania Academy, Philadelphia; Museum of Fine Arts, Boston; and the collection of the corporation of Liverpool, England. WILLIAM A. COFFIN.

Pico, pee'kō: one of the AZORES ISLANDS (*q. v.*); belonging to the central group; comprises an area of 143 sq. miles, and includes the volcanic mass of Pico Alto, 7,613 feet high, the highest mountain of the group. The island is fertile and well wooded, and produces an excellent wine, of which about 25,000 pipes are annually exported. Pop. 29,000.

Pico della Mirandola, GIOVANNI, Count of Mirandola and Prince of Concordia: philosopher and mystic; b. Feb. 24, 1463; studied at Bologna, and visited several schools in Italy and France; went to Florence 1484, and there became intimate with the group of Platonizing thinkers known as the "Academy." Seeking to reconcile the Platonic and the Aristotelian systems of philosophy, and, at the same time, to harmonize religion and philosophy, he fell into a vague and mystical method of interpretation. The wide range of his knowledge is illustrated by his offer in 1486 to defend against all comers 900 propositions *de omni re scibili*. They are drawn from theology, dialectics, ethics, physics, mathematics, natural magic, the Cabala, etc. As preparatory to the great debate, he prepared a discourse, *De hominis dignitate*, a splendid affirmation of man's capacity to take all wisdom and all truth for his promise. Influenced by Pico's enemies, Pope Innocent VIII. forbade the reading of the propositions, as in part heretical. Pico retired to France, but Alexander VI. in 1493 absolved him from all taint of heresy. D. in Florence, Nov. 17, 1494. By the great scholars of the time he was regarded as the wonder of the world, but posterity

has not confirmed their judgment. It is only too clear that his command of the twenty-two languages he was reputed to know (among them Greek, Arabic, and Chaldee) was very superficial; and that in philosophy he was one of those ardent but ineffectual spirits whose supposed discovery of the secret of the universe is but an affirmation of their own lack of clearness. The works of Pico that have come down to us are almost exclusively in Latin. In his extreme youth he had written verses in Italian, but later he foreswore such trifles and destroyed most of those he had already composed. His *Opera* have been printed in folio at Bologna (1496), Venice (1498), Strassburg (1504), Basel (1557, and often after that date). The most important are *Conclusiones philosophicae, cabalisticæ et theologicæ* (1486), containing the 900 propositions mentioned above; *Apologia G. Pici Mirandæ, Concordiæ Comitibus* (1489); *Disputationes adversus astralogiam divinatricem libri XII.* (1495); *Heptaplus, id est de Dei creatoris opere sex dierum libri VII.* (already in the hands of friends in 1489); *Aureæ ad familiares epistolæ* (1499). Of his great projected *Concordia Platonis et Aristotelis*, he had completed only the treatise *De ente et uno*, when death interrupted his labors. See Dreydorff, *Das System des Johannes Pico della Mirandola* (Marburg, 1888).

A. R. MARSH.

Picot, pee'kō', FRANÇOIS ÉDOUARD: historical and genre painter; b. in Paris, France, Oct. 17, 1786; d. there Mar. 15, 1868; pupil of Vincent; Grand Prix de Rome 1813; member of the Institute 1836; first-class medal, Salon, 1819; Legion of Honor 1852. He was the master of a large number of celebrated painters, including Pils, Cabanel, Bouguereau, and Henner. Among his works are *Meeting of Venus and Æneas* (1819), Brussels Museum; *Cephalus and Procris* (1824), Amiens Museum; several portraits in the Museum at Versailles, and ceilings in the Louvre. W. A. C.

Picotees: See CARNATION (the flower).

Pieric Acid, **Trinitrocarbol'ic Acid**, **Trinitrophenol**, **Trinitrophenic Acid**, or **Carbazotic Acid**: the acid whose symbol is $C_6H_3(NO_2)_3O$. It is produced by the action of hot nitric acid on phenol, salicylic acid, indigo, aloes, silk, etc.; it is usually prepared from pure crystallized phenol. It crystallizes in beautiful pale-yellow, scaly crystals, or needles; dissolves in eighty-six parts of water at 60° F., and in much less at 212° F.; and is soluble in alcohol, ether, and benzol, and in sulphuric and nitric acids. When heated it melts, and on cooling solidifies to a crystalline mass; at a higher temperature it sublimes; when quickly heated, it explodes. Its taste is very bitter. Its solution in water is yellow, and it imparts a yellow color to the skin and to silk and wool; hence it is used as a yellow dye. By mordanting with argol or alum before dyeing, the color is rendered more stable. It has been common to supply for this purpose the picrate of soda, which is very explosive, and has given rise to serious accidents. A beautiful green dye is made by mixing the pieric acid with indigo carmine. The Victoria yellow is trinitro-cresol, not pieric acid. Leather is dyed with pieric acid, particularly alum-tawed leather for belt lacings. Goods dyed with pieric acid resist light well, but are liable to suffer on washing with soap. As vegetable fibers do not take pieric acid, it affords a ready method for detecting cotton and flax when mixed with silk or wool. It is said to be used as a substitute for hops in making beer. Many of the salts of pieric acid are explosive. A mixture of fifty-four parts of ammonium picrate and forty-six of potassium nitrate has been used as a substitute for gunpowder. Other mixtures for gunpowder are formed of potassium picrate, niter, and carbon. For explosive powder for torpedoes the carbon is omitted. Melinite, one of the most powerful explosives, is said to consist only of compressed pieric acid. See EXPLOSIVES. Revised by IRA REMSEN.

Pierite: See PERIDOTITE.

Picrotoxin [Gr. *πικρός*, bitter + *τοξικόν*, arrow-poison, poison]: a poisonous bitter principle found in the *cocculus indicus* of commerce, the berries of the *Anamirta cocculus*. An infusion of the berries has been used against lice, and the alkaloid has been employed for the prevention of night sweats.

Picton: a port of entry; capital of Prince Edward co., Ontario, Canada; on the Bay of Quinté, 40 miles S. S. W. from Kingston; terminus of the Cent. Ont. Railway (see map of Ontario, ref. 4-G). It is the seat of Ontario College, has fruit-canning factories and a manufactory of fence-wire, and two weekly newspapers. Pop. (1891) 3,287.

Pictou: port of entry; capital of Pictou County, Nova Scotia; on a safe and commodious harbor at the terminus of a branch of the Intercolonial Railway; 114 miles by rail N. N. E. of Halifax (see map of Quebec, ref. 2-C). Steamers ply to Charlottetown, Quebec, and the ports of the Gulf of St. Lawrence. Bituminous coal is mined near by. There are considerable manufactures, also an academy, court-house, and a weekly newspaper. Pop. (1891) 2,398.

Picts: a Celtic tribe, the Caledonians of the Roman writers, inhabiting the lowlands and the eastern part of Scotland; are first mentioned under the name of the *Picti* in a speech addressed by the rhetorician Eumenius to the Emperor Constantius Chlorus on his return in 296 A. D. after the victory over Allectus. They were divided into the Southern and Northern Picts by the Grampian Mountains. The Southern Picts were converted to Christianity early in the fifth century by St. Ninian; the Northern by St. Columba, who began the work of conversion in 563. Their history is obscure, and its details have been the subject of much controversy. Nor are authorities agreed upon what languages they spoke. In the ninth century they were subdued by the Scots, a kindred tribe which invaded the country from Ireland. Kenneth II. conquered the whole of Scotland, made it one kingdom, and took up his residence in the old Pictish capital, Forteviot, in Strathern. Subsequently attacked on both sides—from the N. by the Scandinavian invaders, and from the S. by the Teutonic inhabitants of England—the Pictish language and nationality gradually disappeared. See Innes, *Civil and Ecclesiastical History of Scotland*; Pinkerton, *Inquiry into the History of Scotland*; Stokes, *On the Linguistic Value of the Irish Annals*; and Rhys, *Celtic Scotland* (1884).

F. M. COLBY.

Picture-gallery: a room especially prepared for the exhibition of pictures, the word *gallery* expressing the comparative length and narrowness of most of such rooms. (See GALLERY.) Many of the public museums of Europe are housed in ancient palaces whose long rooms are not very skillfully altered to suit the new purposes. New galleries also are often defective in respect to the light-openings. It is required to throw the light more upon the walls than upon the floor, and to have this light come at such an angle that there shall be no flash on the surface of the picture at any ordinary position of the spectator. Sunshine and even the reflection and glow of sunshine upon the glass of the light-openings are to be avoided. It is found in practice that the section of gallery and the position of the light which suits a room of certain dimensions is not suitable to galleries much wider or narrower; not only the height has to be changed, but the relative positions of the light-openings and the wall. See the *Handbuch der Architektur*, published at Darmstadt (part iv., sixth half-volume, fourth number).

RUSSELL STURGIS.

Pidgin- (or Pigeon-) English: an artificial dialect employed in Hongkong and the treaty-ports of China by foreigners of all nationalities who do not speak Chinese, in their dealings with native servants, merchants, coolies, etc. Its base is corrupted English, with a mixture of Chinese, Portuguese, and Malay words, arranged according to Chinese idiom. Owing to the difficulty the Chinese have in pronouncing consonantal terminations, vowel terminations -o and -ee abound, as *olo* for old, *wifo* for wife, *talkee* for talk, *catchee* for catch, *muchee* for much, etc. *Belong* takes the place of the verb *to be*; *my* = I, me, mine; *plenty* = very; *topside* = above, upstairs; *that side* = there; *this side* = here; *how fashion* = why; *savvy* = know; *man man* = slow, gently, quietly; *chop-chop* = quick; *maskee* = no matter, never mind; *chow-chow* = food, eat, etc. The word *pidgin* is itself a Chinese corruption of the English word "business."

R. LILLEY.

Piedmont (Ital. *Piemonte*): territory of Northern Italy; bounded S. by the Maritime Alps, W. by the Graian and Cottian, N. by the Pennine Alps, and E. by the river Ticino; area, 11,340 sq. miles. In the twelfth century it became a possession of the house of Savoy, and now it forms, with slightly altered boundaries, a large division of the kingdom of Italy, being subdivided into the four provinces of Turin, Cuneo, Alessandria, and Novara. The greater part of this country is mountainous, covered with spurs of the Alps, between which the numerous affluents of the Po, the Tanaro, Bormida, Clusone, Dora, Sesia, etc., form beautiful and fertile valleys; but toward the E. the country gradually opens into the plain of the Po. Rice, wheat, maize, wine, olive oil,

and many varieties of fruits are produced, and extensive dairy-farming and manufacturing industries are carried on. The method of the Piedmontese silk-culture is celebrated and very successful. Pop. (1892) 3,270,988. See ITALY, and SARDINIA, KINGDOM OF.

Piedmont Plain or Plateau: a term applied by geographers to that portion of the North American continent which lies W. of the COASTAL PLAIN (q. v.) and E. of the Appalachian Mountains. These portions are quite strongly contrasted. The dividing line between the two, known as the *fall line*, marks the localities where the streams from the W. leave the region of hard rocks adjacent to the Appalachians and enter the newer and more easily eroded terranes forming the coastal plain. In most instances the fall line also indicates where the streams lose their current and merge with the estuaries formed by the submergence of the lower portions of their channels. In New England the Piedmont plateau is broad but less clearly defined than in the Middle and Southern Atlantic States, where it is a broken, hilly country, composed principally of crystalline rocks, and deeply trenched by the rivers flowing across it. It broadens from New York southward, and reaches its greatest width in North Carolina, where it extends eastward some 300 miles from the Appalachians.

ISRAEL C. RUSSELL.

Pie'per, FRANZ AUGUSTUS OTTO: theologian; b. in Pomerania, June 27, 1852; educated at Watertown, Wis., and St. Louis, Mo. After a pastorate at Manitowoc, Wis., 1875-78, he became professor in Concordia Theological Seminary, first as the colleague and afterward as the successor of Dr. C. F. W. Walther. Besides numerous articles in the German language, Prof. Pieper has contributed in English to *The Distinctive Doctrines and Usages of the General Bodies of the Evangelical Lutheran Church* and to *The Presbyterian and Reformed Review*. He is the leader of the Missouri Lutherans.

H. E. JACOBS.

Pierce, FRANKLIN: the fourteenth President of the U. S.; b. at Hillsborough, N. H., Nov. 23, 1804; graduated in 1824 at Bowdoin College, where he was the intimate associate of Nathaniel Hawthorne, his lifelong friend; was the law-pupil of Levi Woodbury; admitted to the bar in 1827, and practiced law with success in Hillsborough and Concord, N. H.; represented the former town in the State Legislature 1827-33; was in Congress 1833-37; in the U. S. Senate 1837-42; was heartily in favor of the union of Texas with the U. S.; twice declined positions in the cabinet of Mr. Polk; served with distinction in the Mexican war, commanding a brigade; was president of the New Hampshire constitutional convention 1850-51; was chosen President of the U. S. in 1852 by 254 electoral votes to 42 for Gen. Scott, the Whig candidate. Mr. Pierce's administration was a period of great political excitement. In his inaugural address, Mar. 4, 1853, he strongly denounced the agitation of the slavery question then going on, and maintained that slavery was recognized by the Constitution, and that the Fugitive Slave law was constitutional and ought to be strictly enforced. Prominent among the events of his administration were the Gadsden Purchase, the repeal of the Missouri Compromise, and the beginning of the troubles in Kansas, during which the President opposed by every means in his power the organization of a Free-State government. He sought to justify the Kansas and Nebraska Act, and in his special message of Jan. 24, 1856, represented the formation of a Free-State government as an act of rebellion. Other important events of his administration were the negotiation of a treaty with Japan by Commodore Perry, the publication of the Ostend Manifesto, the settlement of the dispute over the boundary between the U. S. and Mexico, and Walker's filibustering expedition to Nicaragua. He was an ardent advocate of the State rights doctrine, and during the war of 1861-65 sympathized with the Southern States. D. at Concord, N. H., Oct. 8, 1869. His *Life*, down to his nomination, was written by Nathaniel Hawthorne (Boston, 1852).

Revised by F. M. COLBY.

Pierce, GEORGE FOSTER, D. D.: bishop; son of Lovick Pierce, D. D.; b. in Greene co., Ga., Feb. 3, 1811; studied law with his uncle, Hon. George Foster; in 1831 joined the Georgia conference of the Methodist Episcopal Church; performed important pastoral work in Georgia and South Carolina, and presided over literary institutions (Emory College for six years) till 1854, when he was made bishop; was a member of the General Conferences of 1844, 1846, 1850, and 1854; published *Incidents of Western Travel* (Nashville, 1857) and several sermons, addresses, etc. D. near Sparta, Ga., Sept. 3, 1884.

Revised by A. OSBORN.

Piero'la, NICOLAS, de: politician; b. at Camaná, Arequipa, Peru, Jan. 5, 1839; son of the director of the Lima museum; studied and practiced law in that city, and was a well-known journalist. Under President Balta (1868-72) he was Minister of the Treasury, and consequently was directly connected with the enormous outlays of that period. He led abortive revolts against Pardo 1872 and 1874, and Prado 1877. After the first reverses of the Chilian war, President Prado went to Europe; Pierola then headed another revolt, deposed the vice-president, and was declared supreme chief at Lima Dec. 23, 1879. Owing to the urgent need for a responsible head the republic generally accepted him. He showed great activity, especially in defending Lima; when that city was taken (Jan. 17, 1881) he fled into the interior, convoking a congress at Arequipa, but in the following November he resigned and went to Europe. He tried to seize the presidency again in 1885. Owing to his restless and revolutionary spirit he has several times been banished, but he has a considerable political following in Peru. He was a presidential candidate in 1894. HERBERT H. SMITH.

Pierre: city; capital of South Dakota and of Hughes County (for location, see map of South Dakota, ref. 6-D); on the Missouri river and the Chicago and N. W. Railway; 158 miles W. of Huron. It is in an agricultural and stock-raising region, and is the principal trading-point for the Black Hills section. It is the seat of Pierre University (Presbyterian, chartered in 1883), and of an Indian industrial school established by the U. S. Government, and contains 3 national banks, with combined capital of \$200,000, a State bank with capital of \$50,000, and a daily, 3 weekly, and 3 monthly periodicals. Pop. (1880) not reported; (1890) 3,236.

EDITOR OF "CAPITAL."

Pierrepoint, EDWARDS, LL. D., D. C. L.: jurist; b. in North Haven, Conn., Mar. 4, 1817; graduated at Yale College in 1837, and a year later was admitted to the bar; practiced law at Columbus, O., till 1845, when he removed to New York city; in 1857 was elected a judge of the superior court of New York, but resigned that position in 1860, and returned to the practice of law; was engaged by the National Government in 1867 to conduct its case against John H. Surratt, indicted for complicity in the murder of President Lincoln; in 1869 was appointed by President Grant U. S. district attorney for the southern district of New York, but resigned that office in May, 1870; was appointed minister to Russia but declined in 1873; was appointed attorney-general of the U. S. in 1875, minister to England in 1876, resigned in 1877. He received the degree of LL. D. from Columbian College, Washington, and from Yale College, and that of D. C. L. from Oxford University. D. in New York, Mar. 6, 1892.

Piers: See HARBORS.

Pierson, ARTHUR TAPPAN, D. D.: minister; b. in New York city, Mar. 6, 1837; educated at Hamilton College and Union Theological Seminary; was pastor of the Congregational churches, West Winsted, Conn., 1859-60; Binghamton, N. Y., 1860-63; Norwalk, Conn., 1863; of the Presbyterian churches, Waterford, N. Y., 1863-69; Fort Street, Detroit, Mich., 1869-82; Second, Indianapolis, Ind., 1882-83; Bethany, Philadelphia, 1883-91; supplied the Metropolitan Tabernacle, London, England, 1891-93; and was incumbent of the Duff lectureship in 1892. Besides frequent contributions to periodicals, Dr. Pierson has edited *The Missionary Review of the World* since its inception, 1888 (New York), and has published many evangelistic and missionary works, such as *Many Infallible Proofs* (1886; 2d ed. 1889); *The Crisis of Missions* (New York, 1886); *Evangelistic Work in Principle and Practice* (1887; 2d ed. 1888); *The Divine Enterprise of Missions* (1891); *The Miracles of Missions* (1891); *The Heart of the Gospel* (Sermons, 1891); *The Divine Art of Preaching* (New York and London, 1892); and *The New Acts of the Apostles* (1894). C. K. H.

Piers Plowman: See ENGLISH LITERATURE.

Pietermaritzburg, or **Maritzburg**: capital of NATAL (q. v.); at an altitude of over 2,000 feet above the sea; on a fertile plain watered by a tributary of the Umgeni; 73 miles by the main line of the Natal Government Railway System N. of Durban (see map of Africa, ref. 9-F). It is also connected by rail with the Orange Free State and the Transvaal. The chief buildings are the government-house and the office of the colonial secretary; and there is a military camp here which is occupied by the principal division of troops stationed in the colony. The town takes its name

from its Boer founders, Pieter Retief and Gert Maritz. Pop. (1891) 17,500, of whom two-thirds are whites, the rest being natives and coolies.

Pietists [from Lat. *pi'etas*, piety, deriv. of *pi'us*, observing what is proper toward parents or God, pious (often implying merely formal or outward observance)]: in Germany, Christians who never formed a sect nor professed distinctive doctrines, but were noted for their preference of practical religion. The movement took place wholly within the Lutheran Church, and may be characterized as an attempt to make even the least important every-day doings expressive of the religious spirit, and eliminate from human life anything—such as dancing, visiting the theater, etc.—which proves hostile to such a modification. The first writers of importance who assumed this ground were Johann Arndt (*Von wahren Christenthum*, 1605) and Johann V. Andreae (*Invitatio Fraternitatis Christi*, 1617). The term was first applied in derision to a number of teachers at Leipzig in 1689, chief among whom was A. H. Francke, and was soon afterward employed chiefly as a designation of the followers of Philipp Jakob SPENER (q. v.). The combined influence of Spener and Francke led to the foundation of the University of Halle, which became a center of the pietistic movement. The rationalism of the close of the eighteenth and beginning of the nineteenth century operated adversely to pietism, but since the overthrow of rationalism it has largely revived in Germany, especially in Berlin, Silesia, and Wurtemberg. The general history of Pietism has been written by H. Schmid (Nördlingen, 1863), H. Heppé (Leyden, 1879), and A. Ritschl (Bonn, 1880-86, 3 vols.). Revised by S. M. JACKSON.

Pie'tra Du'ra [Ital., liter., hard stone]: a name applied to the better kinds of cameo and mosaic work. See MOSAIC.

Piezom'eter [Gr. *πίεζειν*, press + *μέτρον*, a measure]: an instrument for measuring the compression of water and of other fluids under pressure. The first successful piezometer was that of Oersted, in which the pressure was gauged by the manometer, and the amount of compression of the water was indicated by the use of mercury in a glass tube. Regnault's piezometer is in principle the same, but it also takes into account the expansion of the tubes under pressure, and consequently gives more accurate results. Where the pressures to be used are beyond the crushing point for glass steel tubes are used and the encroachment of the mercury upon the manometer tube is recorded by gold plating the inner surface of the latter previous to the test, and afterward noting to what height the gold has been amalgamated.

Revised by E. L. NICHOLS.

Pig: See SWINE.

Pigafet'ta, ANTONIO: traveler; b. at Vicenza, Italy, in 1491. In 1510 he went to Spain in the suite of the papal nuncio; by special permission he accompanied the expedition of Magalhães in 1519, and was one of those who returned in the Victoria 1522, after the first circumnavigation of the globe. A letter which he wrote to Charles V., describing the voyage, was quickly published in several languages. He prepared a longer account, which was discovered and published at Milan in 1800 as *Primo Viaggio intorno al globo terraqueo*. Pigafetta is the principal authority on this important voyage. D., probably at Vicenza, about 1534. HERBERT H. SMITH.

Pigeon [= Fr. < Lat. *pi'pio*, a young piping or chirping bird, deriv. of *pipi're*, pipe, peep, chirp]: any member of the order COLUMBE, a group of birds typified by the familiar domestic pigeon. The characters of the order are given under COLUMBE, and although the members of the group present great variations in regard to size and color, yet, with one or two exceptions, they are all readily recognizable. There is popularly supposed to be a difference between doves and pigeons, but it has no existence in nature. Something like 500 species have been described, widely distributed throughout the temperate and warm parts of the globe, but most abundant in the Malay Archipelago, which has about 120 species. Wallace accounts for this abundance by the absence in this region of fruit-eating animals, like monkeys and squirrels. The most aberrant number of the order is the Samoan tooth-billed pigeon (*Didunculus strigirostris*), so named from the notches in the lower mandible. It is the nearest living relative of the extinct Dodo (q. v.), but the affinity between the two is not very close. The specific name is in allusion to the hooked upper mandible, which suggests that of a bird of prey. This bird is about a foot long; the head and greater portion of the un-

der parts are glossy greenish black: the larger share of the upper part of the body, including the tail, is chestnut brown, the feathers on the upper part of the mantle tipped with greenish black. It formerly nested on the ground, a fact which threatened to lead to its extermination, owing to the attacks of dogs, cats, and rats, but changed its habits and took to nesting in trees and thus prolonged its days.

The Nicobar pigeon (*Columba nicobarica*), from New Guinea and some of the adjacent islands, is another peculiar form, having a remarkable horn-like lining to its gizzard. The plumage, except the tail (which is white), is of various shades of green with metallic reflections, and the lower part of the neck is adorned with pointed feathers much like the hackles of a cock. The brilliantly colored fruit-pigeons, of the genus *Carpophaga* and allied genera, come from Australia, the Malay Archipelago, and the islands of the Pacific. Green is perhaps their predominant color, but some are almost as gay in plumage as any of the parrots. Some of the fruit-pigeons of the genus *Treron*, owing to the spicy fruits on which they feed, are said to surpass all other birds in flavor, and some present very interesting modifications of the gizzard.

The giants of the order are the crowned pigeons, GOURA (*q. v.*); the pygmies are found among the little ground-doves (*Columbigallina*, *Geopelia*, etc.), some of which are little larger than a sparrow. Finally we come to the pigeon (*Columba livia*) or rock-pigeon, which is found in a wild state over a great part of Europe, breeding upon rocky precipices, especially near the sea. The wings are black at their outer margin, and have a black bar on the secondaries, and a second on the great coverts; the rump is ash; the tail bluish ash, black for the terminal third, with the lateral feathers white externally for their basal third. This plumage may be seen almost feather for feather in some of the common domesticated pigeons. The blue rock-pigeon is by most authorities considered to be the parent stock of all breeds of domestic pigeons, of which there are at least 250 varieties, but other authorities consider that some of the eastern breeds sprang from *Columba intermedia*, a very similar bird. The domestic birds differ not only in color, markings, and size, but even in the number of their vertebrae and ribs, as well as in the shape and proportions of their skulls. Darwin, who made an extensive study of pigeons, divides them into four principal groups, Pouters, Carriers, Tumblers, and Trumpeters, with eleven sub-groups or races. There are at least 150 distinct breeds recognized by fanciers. For a full discussion of the question see Darwin's *Animals and Plants under Domestication*, vol. ii.

The carrier-pigeon is perhaps the best known by name of all domestic breeds, but it is *not* the bird used for carrying messages. Whatever may have been the case formerly, the modern carrier is a mere fancy breed distinguished by a large fleshy caruncle about the base of the bill and a smaller one around each eye. The bird used for carrying messages and for long-distance flying is the homer, which is not bred for "points" and is not essentially different from an ordinary dove-cote pigeon in appearance. By careful selection the pigeon's natural fondness for its own loft has been intensified, while by selection and training birds have been raised which will return home from distances of from 200 to 500 miles, and, very rarely, from 1,000 miles.

The fantail belongs to the short-billed tumbler group, and is characterized by the great number of tail feathers, which should be at least twenty-four, and may be as many as forty, and by having the tail carried more or less erect and open. The head should also be carried well over the back, toward the root of the tail, and breeding has gone so far in this direction that these birds are hollow-backed and some have great difficulty in picking up their food.

For domestic breeds, see Fulton's *Illustrated Book of Pigeons*. There is no modern monographic work on pigeons save the British Museum *Catalogue of Game Birds*, by Ogilvie Grant. See also EVOLUTION, DODO, GOURA, PASSENGER-PIGEON, JACOBIN, POUTER, and TRUMPETER.

F. A. LUCAS.

Pigeon-English: See PIGEON-ENGLISH.

Pigeon-pea: the pea-like pulse grown upon the leguminous shrubs *Cajanus flavus* and *bicolor*, which are extensively cultivated in many tropical countries, where they are highly valued. The better sorts are very palatable substitutes for the pea.

Pigmentation [from Lat. *pigmentum*, paint, color, deriv. of *pingere*, to paint, to decorate]: in physiology, a discolor-

ation produced by the deposition, especially to excess, of a pigment in the tissues. A certain amount of pigment is one of the normal constituents of the body. The great source of pigment is found in the coloring matter of the red blood-corpuscles, and it is probable that all of the pigments found in the tissues represent various modifications of this. Under normal circumstances the greatest amount of pigmentation is found in the epidermal appendages, especially in the hair. The varying color of this is due to the different amounts and possibly different physical relations to the tissue of the same pigment. The same is true of the eyes, which owe their color to the pigment contained in the iris. A varying amount of pigment is found in the skin. In a section of the Negro skin there is found a line of pigment in and between the cells of the deepest layer of epidermis. The formation of the pigment does not seem to be a function of the epidermic cells, but it is formed by certain cells of the connective tissue, and when formed is taken up by the epidermic cells. The color of different organs of the body is due to the presence of essentially the same pigment. An increased formation of the pigment plays an essential part in various pathological conditions of the body, and a diseased condition of the adrenal glands is associated with an increased formation of pigment. In the skin the greatest formation of pigment under pathological conditions is seen in the pigmented tumors. All these tumors spring from the mesoderm and usually originate in tissues where there is normally a formation of pigment, as in the choroid coat of the eye and in the skin. Another source of pigment is also given when organs are subjected to long-standing congestion, or when hæmorrhage takes place in organs. A number of red blood-corpuscles are then destroyed and their pigment is taken up in the tissues. The pigmentation of the skin which follows a bruise or an injury is due to changes following on a hæmorrhage.

W. T. COUNCILMAN.

Pigments: coloring matters which when mixed with oil, water, or gum, form paint. They are either mineral or extracted from organic matter. See PAINT.

Pigmy: See PYGMY TRIBES.

Pigmy Ape: See BARBARY APE.

Pig-nut: See HICKORY.

Pigres (in Gr. Πίγρης: Greek poet of the fifth century B. C., brother of ARTEMISIA (*q. v.*), and reputed author of the mock-heroic poem, *The Battle of the Frogs and Mice* (Βατραχομομαχία), once attributed to Homer. (See editions by Baumeister, 1852, and Brandt, 1888.) To him was ascribed also the *Margites* (Μαργίτης), the hero of which was a blundering Jack-of-all-trades and master-of-none, a phrase which goes back to the Greek original: πόλλ' ἡπίστατο ἔργα, κακῶς δ' ἡπίστατο πάντα.

B. L. G.

Pigweed: See CHENOPodium.

Pike [M. Eng. *pike*, appar. deriv. of *piki*, a sharp point, etc. Cf. Fr. *brochet*, pike, deriv. of *broche*, spit]: any one of various species of fishes. The English pike (*Esox lucius*) has been supposed to have been "so called either from the likeness of its nose to a pike or spear, or because it moves itself in the water like a spear thrown" (*Richardson*); or with greater probability because of the pointed or pike-like teeth. In the U. S. the name is applied to the same species, and in some places to the smaller species of the same genus — e. g. *Esox reticulatus*, *Esox niger*, etc. These are, however, generally called pickerel. The *Esox moshinongy* is in most sections distinguished under the name muskellunge. All the species agree in the form familiar to most persons from personal acquaintance with some one or other of the species, or from the illustrations in angling books, and differ chiefly in the comparative length of the snout, the



The pike

extension of scales on the cheeks and opercula, the number of rays in the dorsal and anal fins, and color. The name "pike," either alone or in combination, is also perverted to

species very different from those just considered. In some parts of the U. S., e. g. the species of *Lucioperca* (a genus closely related to *Perca* or the perches) are called walleyed pike, or simply pike. See **ESOCIDÆ** and **FISHES**.

Revised by F. A. LUCAS.

Pike: a spear with wooden handle and metal head, carried by foot soldiers. In the fifteenth century it was from 15 to 20 feet in length, but was gradually reduced to from 10 to 14 feet. It was designed for use as a thrusting, not as a missile weapon. Before the introduction of the musket, about 1525 A. D., the mass of the infantry was armed with the pike. Concurrently with the more general use of the musket the number of pikemen was reduced; but in the latter part of the sixteenth century they still constituted half of each battalion, being massed ten deep in the center, with the musketeers on the flanks. With the introduction of the bayonet in the seventeenth century the use of the pike was gradually given up, although, owing to lack of other arms, it has been used in comparatively recent times, as during the French Revolution.

JAMES MERCUR.

Pike, ALBERT: author; b. at Boston, Mass., Dec. 29, 1809; studied at Harvard University; went in 1831 to Santa Fé, N. M., by way of St. Louis, much of the way on foot; reached Fort Smith, Ark., in 1832 in a destitute state; was a journalist at Little Rock 1834-36, after which he became a successful lawyer and a prominent States-rights politician; served as a captain of Arkansas cavalry in the Mexican war; was brigadier-general in the Confederate service during the civil war; editor of *Memphis Appeal*, 1867-68; author of *Prose Sketches and Poems* (1834); 5 vols. of *Law Reports* (1840-45); *The Arkansas Form-book* (1845); *Nugæ* (poems, 1854); a romance (1835); a volume of Masonic statutes and regulations (1859); *Morals and Dogma of Freemasonry* (1870). His *Hymns to the Gods* were originally contributed to *Blackwood's Magazine* in 1839. Privately printed collections of his poems were issued in 1873 and 1881. He was the grand commander of Scottish Rite Masonry of the southern jurisdiction and the chief of the Royal Order of Scotland in the U. S. D. at Washington, D. C., Apr. 2, 1891.

Revised by H. A. BEERS.

Pike, ZEBULON MONTGOMERY: soldier; b. at Lamberton, N. J., Jan. 5, 1779; son of a captain in the U. S. army; became a cadet in his father's regiment 1799; was soon promoted to captain; headed an expedition which penetrated to the head-waters of the Mississippi in the autumn of 1805; in the following year was charged with an exploration of the interior of Louisiana territory, in the course of which he discovered Pike's Peak in the Rocky Mountains and reached the Rio Grande; was detained by Spanish authorities, taken to Santa Fé for examination, and his papers seized. Being ultimately released, he arrived at Natchitoches July 1, 1807, received the thanks of the Government for his services, was rapidly promoted, published in 1810 an account of his two expeditions, became brigadier-general 1813, and commanded the expedition sent against York (now Toronto), Canada, in the assault of which place he was killed Apr. 27, 1813. See his *Life*, by H. Whiting, in *Sparks's American Biography* (2d series, vol. v.).

Pike's Peak: a summit of the Rocky Mountains, named in honor of Gen. Zebulon M. Pike, who discovered it in 1806. Its altitude is 14,147 feet, and as it stands in the Front range it is visible from a wide area of the plains. From 1842 to 1888 it was occupied as a meteorological station by the U. S. Signal Service, and observations were resumed by the Weather Bureau in 1892. In 1890 it was connected by a cog railway with Manitou, and it is a popular resort for tourists. Its lower slopes are covered by a forest of pine and fir, the upper limit being at 11,500 feet, above which the rocks are bare.

G. K. GILBERT.

Pilas'ter [from Lat. *pila*, pillar]: a square pillar, attached to a wall, from which it projects but little. It sometimes has the taper of a column, and is sometimes of equal breadth from top to bottom. Its base and capital usually conform to those of the pillars or columns, though this was not the custom among the Greeks. The name pilaster is also given to a projecting pier of rough brick or stone standing on the inside of a wall, and designed to sustain the end of a sleeper for the floor above.

Pilate, Pontius: the fifth Roman procurator of Judæa and Samaria; entered his office in 26 A. D., residing partly in Cæsarea and partly in Jerusalem, where he inhabited the magnificent palace built by Herod the Great. In 36 he was

arraigned by the Samaritans before the Syrian proconsul, Vitellius, on account of his unjust and cruel government, and Vitellius sent him to Rome to answer the accusations before the emperor. The issue is not known with certainty. According to Eusebius, he was banished to Vienne in Gaul, and committed suicide soon after. According to a widely spread tradition, he was beheaded under Nero. A great number of legends, more or less fanciful, clustered naturally around his name. His singular behavior during the trial of Christ, as we read it in the Bible, excited from the earliest time a most vivid interest, and occasioned very different explanations. Tertullian calls him *jam pro sua conscientia Christianum*, and the Æthiopian Church declared him a martyr and a saint. Modern scholars, however, agree generally in considering him one of those frivolous characters which were the natural offspring of the Roman civilization in the Augustan period—capable of receiving a strong impression of the sublime, but utterly unable to act on such an impression. The cruel massacre of the Samaritans at Gerizim, the immediate cause of his downfall, is consistent with that kind of weakness of character which rises from moral indifference. The so-called *Acta Pilati* (of which an English translation is found in the Ante-Nicene Library) give an account of the trial of Jesus, but of course they are spurious, as are also numerous other works either attributed to him, as the *Epistola Pilati*, a letter purporting to be Pilate's description to Tiberius of the resurrection, or describing his subsequent life and punishment. His wife is generally called Procla or Claudia Procula by the Pilate legends, and represented as a proselyte of the gate. Origen, Chrysostom, and Hilary assert that she became a Christian. The Greek Church has made her a saint, and observes Oct. 27 as her day.

Revised by G. L. HENDRICKSON.

Pilat'ka, Fla.: See PALATKA, Fla.

Pilchard: See CLUPEIDÆ.

Pileomayo, pēel-kō-mī'yō: a river of South America; rises in Bolivia, N. W. of Potosi; flows S. E. through the Gran Chaco, where it separates the Argentine Republic from Paraguay, and joins the Paraguay by several mouths just below Asuncion. Length probably over 1,100 miles. Though most of its course is through a plain, it is so shallow and so much obstructed that it is nearly useless for navigation, at least in the dry season; in some places the channel is almost lost in marshes.

H. H. S.

Pile-driver: an apparatus for driving piles into the ground. The common pile-driver consists of a frame having two vertical timbers or guides between which an iron ram is drawn up by a rope passing over a pulley at the top, and then allowed to drop on the head of the pile; the ram weighs from 1,000 to 2,000 lb., its fall is from 10 to 20 feet, and the number of blows per minute is five or more. The steam pile-driver, invented by Nasmyth, has a steam cylinder which can be set at different elevations between vertical guides. The piston in this cylinder is lifted up by steam pressure, and thus the ram, which is attached to the lower end of the piston rod, is raised; the ram weighs from 2,000 to 4,000 lb., falls about 3 feet, and the number of blows per minute is about sixty. In the gunpowder pile-driver, invented by Shaw, a cartridge of powder is placed upon the head of the pile and exploded by the impact of the falling ram; the force of the explosion drives down the pile and throws up the ram, which is caught and held by an automatic device at its highest elevation. In soft soils piles should be driven until the penetration under a single blow of the ram is only 1 or 2 inches. MANSFIELD MERRIMAN.

Piles (in engineering): See FOUNDATION.

Piles, or Hemorrhoids [*piles* is from Mod. Lat. *pi'læ*, piles, liter., plur. of Lat. *pi'la*, ball]: vascular and fibro-vascular tumors of the lower bowel or rectum—termed *external* piles when below the sphincter muscle and upon the verge of the anus; *internal* piles when above the sphincter. In structure they are due to congestion or dilatation of the hemorrhoidal veins, which are connected with the portal venous circulation, returning blood from the intestines through the portal vein and liver to the vena cava and the heart. Piles when chronic are dilated veins of the anus and rectum, with fibrous thickening of the tissues and mucous membrane investing them. Hemorrhoids are caused in the first place by anything which obstructs the outflow of blood from the rectal veins, and in the second place by any local irritation tending to cause congestions or inflammatory processes. They seldom afflict persons who are robust, ab-

stemious, frugal, and engaged in active exercise. They result from excessive eating and drinking, congestion or cirrhosis of the liver, alcoholic excesses, and constipation. Sedentary occupation favors their development. Cavalry officers and railway travelers suffer from piles—in part from constipation, in part from the influence of incessant jarring and hypostatic congestion of the lower bowel. The abuse of harsh and powerful cathartics, drinking water impregnated with mineral substances, and too fine, non-laxative diet may develop piles. Pregnant women have piles from pressure of the gravid uterus upon the veins. Internal piles may increase in size, and in efforts of evacuation be protruded from the bowel. By this stretching the hemorrhoidal tumors in time become pedunculated, and are forced out with every act of defecation. They require to be constantly returned; failure to do this may result in their strangulation, ulceration, bleeding, and even removal by gangrene. External piles when inflamed may also ulcerate and bleed. Hemorrhoids when inflamed render evacuations of the bowels very painful, and cause suffering in sitting and walking. Patients with hemorrhoids usually discharge mucus from the anus, and sometimes shreds and patches of organized lymph. Piles are to be prevented, and also treated in their milder forms and stages, by regulated, laxative diet, active exercise, and mild saline cathartics. When pedunculated they may be removed by the knife, ligature, or galvano-cautery. When they are strangulated they must be reduced in size by ice or cold water, oiled, and returned. Ulcerated and inflamed piles are treated by cold applications, astringent and anodyne ointments, and free evacuation of watery stools by use of saline cathartics. Revised by W. PEPLER.

Pileus: See HEAD-DRESS.

Pilgrim Fathers: the name commonly applied to the earliest settlers in MASSACHUSETTS (*q. v.*). They had separated from the Church of England and sought refuge in Holland, whence they emigrated to Massachusetts in 1620, founding the Plymouth colony. In religion they were Independents, while the Massachusetts Bay colonists were PURITANS (*q. v.*).

Pillar: See COLUMN.

Pillar Saints or Stylites: in the Eastern Church, chiefly in Syria, a class of ascetics who dwelt each on the top of a lofty pillar, after the example of St. SIMEON STYLITES (*q. v.*). The practice began to prevail in the fourth century, and in the twelfth was not yet extinct. It never penetrated into the West.

Pillars of Hercules: See GIBRALTAR.

Pilling, JAMES CONSTANTINE: ethnologist; b. in Washington, D. C., Nov. 16, 1846. He attended the public schools and Gonzaga College. At the age of twenty was employed as stenographer in court work, in committee work in Congress, and in the various commissions established by Congress for the settlement of claims resulting from the civil war. In 1875 he joined the survey of the Rocky Mountain region under Maj. J. W. Powell; in 1880 was made chief clerk of the U. S. Geological Survey; in 1891 became ethnologist in the Bureau of Ethnology of the Smithsonian Institution. D. at Olney, Md., July 26, 1895. His publications, which are chiefly bibliographical, range from 1881 to the time of his death, and relate to the languages and literatures of the Eskimo (1887), Siouan (1887), Iroquoian (1888), Muskogean (1889), Algonquian (1891), Athapascan (1892), Chinookan (1893), Salishan (1893), Wakashan (1894), and other linguistic stocks of North American Indians. Among his earliest works was a *Catalogue of Linguistic Manuscripts in the Bureau of Ethnology* in Washington (1881). This was followed in 1885 by a general work on Indian bibliography entitled *Print-sheets of a Bibliography of the Languages of the North American Indians*. His latest work, as yet unpublished, was a bibliography of the ancient Mexican language.

Pillory [from O. Fr. *pilori*, pillory; cf. Portug. *pelourinho*, Provenc. *espillori*; Lat. *speculum*, deriv. of *speculum*, mirror. Fr. *pilori* has been influenced in form by *pilier*, pillar]: an instrument of punishment, consisting of a wooden frame in which the offender's head and arms were inserted, he standing, thus confined in a stooping posture, exposed to public ridicule. Something of the kind existed in England previous to the Norman Conquest, and was known as the *halstang*, or catch-neck. From the reign of Henry III., and especially during the sixteenth, seventeenth,

and eighteenth centuries, the pillory was a statute punishment for perjurers, forgers, users of false weights, etc. Its use was abolished by 56 Geo. III., c. 138 (1816), except for perjury and subornation, and was altogether abolished by 7 Wm. IV. and 1 Vict., c. 23 (1837). In France a similar implement, called the *carcan*, was in use until 1832. The pillory was in use in the American colonies, and provision for its use existed on the statute-books of the U. S. until 1839, but it seems not to have been employed after the Revolution. See Stephen's *Commentaries*, Andrews's *Punishment in the Olden Times*, *The Reliquary* for Apr., 1861, and *The Penny Magazine* (ii., 108.) Revised by F. STURGES ALLEN.

Pillow, GIDEON JOHNSON: soldier; b. in Williamson co., Tenn., June 8, 1806; graduated at the University of Nashville 1827; studied law; practiced successfully at Columbia; was a delegate to the national Democratic convention of 1844, where he was influential in securing the nomination of James K. Polk for the presidency; was appointed brigadier-general of Tennessee volunteers July 11, 1846, during the war with Mexico; took a prominent part in the siege of Vera Cruz; commanded the right wing at the battle of Cerro Gordo, where he was wounded; was made major-general Apr. 13, 1847; took part in the battles of Churubusco, Molino del Rey, and Chapultepec, being severely wounded in the latter; came into collision with Gen. Scott in regard to the convention of Tacubaya, which he disapproved, and at his own request was tried by a military court upon charges of insubordination preferred by Gen. Scott, but was honorably acquitted. He was honorably discharged July 20, 1848, and resumed the practice of law in Tennessee; was a member of the Nashville convention of 1850, where he opposed extreme measures; raised a large force of Tennessee volunteers for the Confederate service in 1861; was appointed brigadier-general; commanded at the battle of Belmont Nov. 7, 1861; was second in command at Fort Donelson in February; escaped before the surrender, and afterward served under Gen. Beauregard in the Southwest. D. in Lee co., Ark., Oct. 8, 1878. Revised by JAMES MERCUR.

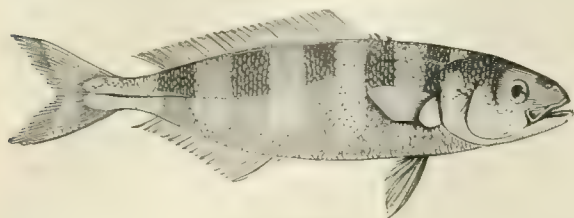
Pilot [from Fr. *pilote*: Ital., *pedolo*, *piloto*: Span. *piloto*, from a deriv. of Gr. *πηδών*, oar, *πηδάλιον*, rudder. The Dutch words *piloot*, etc., are probably borrowed from Romanic sources]: the steersman of a ship; the officer or person on board ship who has charge of the helm and of the ship's course; in the specific and more usual sense, the person appointed and authorized by law to conduct or steer a vessel through a river, road, channel, etc., or into or out of a harbor or port. *Pilotage* is the service rendered by a pilot; also the compensation received by a pilot.

Pilots of the description last mentioned are rendered necessary by the exigencies of modern commerce by water. In Great Britain the appointment and much of the regulation of pilots is placed in the hands of societies or corporations, either holding ancient charters or existing under statutory authority, and called Pilotage Authorities. The most important of these corporations is that of the Trinity House of Deptford Strand, which has the control of the pilots of the CINQUE PORTS (*q. v.*). The jurisdiction of pilotage authorities in Great Britain now depends for most purposes, independently of local statutes, upon the Merchant Shipping Act of 1854. In the U. S. the States and the Federal Government have concurrent jurisdiction to pass pilotage laws, the power of Congress being superior to that of the States, and exclusive when exercised (by virtue of Art. I., § 8, of the Federal Constitution). Pilots are licensed in the U. S. either by the Governor of a State, or by a commission, or under federal laws.

Vessels are required by statute to take a licensed pilot, and must pay pilotage to the first pilot offering himself. In Great Britain the Merchant Shipping Act of 1854 provides that no owner or master of any ship shall be answerable to any person whatever for any loss or damage occasioned by the fault or incapacity of any qualified pilot acting in charge of the ship where the employment of the pilot is compulsory by law. In the U. S. the owner is not exonerated from liability for damages resulting from gross mismanagement by the pilot by reason of the employment of the pilot being compulsory. The pilot's fees are regulated by statute, or in Great Britain by the pilotage authorities, or by custom. See Maude and Pollock's *Law of Merchant Ships and Shipping*, Abbott's *Law Relative to Merchant Ships and Seamen*, and Parson's *Maritime Law*. F. S. ALLEN.

Pilot-fish, or Pilot [so called because it was formerly supposed to act as a pilot to the mariner, and is still sup-

posed to act as such to sharks]: a carangoid fish (*Naucrates ductor*), rarely much more than a foot long, which is found in almost all tropical and temperate seas. These fishes often



The pilot fish.

follow in the wake of vessels, associating with sharks, and taking the refuse thrown from the ships. They are elongated, symmetrical, fusiform fishes, of graceful form and with seven cross-bands of black, which, however, in part disappear in after-life. They are remarkable for the changes which they undergo with age, which have led to the idea that the young pilot-fish was a species distinct from the adult.

Revised by D. S. JORDAN.

Pilot Mountain: See ARARAT.

Pilot-snake: a harmless snake (*Coluber obsoletus*) common in the Eastern and Southern U. S. It is dark brown or black above, mottled or clouded below, and is more heavily built and less active than the true black snake (*Bascanium constrictor*).

F. A. L.

Piloty, pœl'ô'tee, KARL, von: historical painter; b. in Munich, Oct. 1, 1826; d. there July 21, 1886; son of a lithographer, Ferdinand Piloty, from whom he received his first instruction; afterward pupil in Munich Academy. He visited Venice in 1847, painted portraits in Leipzig in 1849, went to Paris and Antwerp in 1852, and thereafter devoted himself to painting pictures of historical subjects. He was appointed a professor in the Munich Academy in 1856 and director in 1874, and had numerous Americans among his pupils. His style is academic. One of his most celebrated works, *Nero on the Ruins of Rome* (1861), is in the National Museum at Pesh; his *Galileo in Prison* is in the Cologne Museum; *The Entry of Godfrey de Bouillon into Jerusalem* (1862) is in the Maximilianeum, Munich; *Columbus Discovering Land* (1866) in the Shack Gallery, Munich; the *Triumph of Germanicus* (1873) in the New Pinakothek, Munich; and the *Death of Alexander the Great* (1886) in the National Gallery, Berlin. His *Wise and Foolish Virgins* (1881) was exhibited in the principal cities of the U. S. in 1887-88.

WILLIAM A. COFFIN.

Pilpay, Pilpai, or Bidpai: Oriental fabulist; lived several centuries B. C.; the reputed author of a collection of fables not now extant, but contained partially in the PANCHATANTRA (q. v.) and to a less extent in the MAHÂ-BHÂRATA (q. v.) and the *Histopadesa*.

Pils, peelz, ISIDORE ALEXANDRE AUGUSTE: historical and military painter; b. in Paris, Nov. 17, 1815; pupil of Picot; awarded Grand Prix de Rome 1838; medals Salons 1846, 1855, and 1857; first-class medal, Paris Exposition, 1867; medal of honor Salon 1861; became officer Legion of Honor 1867; member of the Institute 1868; d. at Douarnenez, France, Sept. 3, 1875. He first attracted attention in 1849 by the exhibition of his picture *Rouget de l'Isle Singing the Marseillaise*, and his battle pictures made his works very popular. They are open to criticism for technical faults, however. He was a Professor of Painting in the Ecole des Beaux-Arts for a number of years.

WILLIAM A. COFFIN.

Pilsen: town of Bohemia, Austria; at the confluence of the Mies and the Beraun; 67 miles by rail S. W. of Prague (see map of Austria-Hungary, ref. 3-D). It lies in a fertile valley, and is surrounded by promenades on the site of the old walls. Among the buildings are the Gothic church of St. Bartholomew (1292) and the Renaissance town-hall. There are large breweries producing annually 9,000,000 gal. of the beer known as Pilsener, and manufactures of leather, pottery, machinery, etc. In the neighborhood are mines of iron, coal, and alum. During the Hussite wars Pilsen was besieged several times, and was stormed by Count Mansfeld at the beginning of the Thirty Years' war. The first printing-press in Bohemia was set up here in 1468. Pop. (1891) 50,693, about equally divided between Germans and Czechs.

Piman Indians: a linguistic stock of North American Indians. The term Pima, which as a tribal name was first

used by Father Eusebio Kino as early as 1692, is said to mean "no," and was employed, as now used, through a misunderstanding. The aboriginal name of the Pima proper is *A'kemorl-Oohtam*, signifying river people. According to some authorities, the Piman Indians, as here recognized, form but part of a linguistic group embracing the Shoshonean, Piman, and Aztec or Nahuatl tribes. The relationship of these peoples, however, has yet to be demonstrated.

TRIBES.—With the exception of the Pima Alta or Pima proper, and part of the Papago, the tribes composing this stock inhabit a vast area in Northwestern Mexico, including the greater portions of the states of Sonora, Chihuahua, Sinaloa, and Durango, as well as parts of Jalisco and Zacatecas. Beside the tribes mentioned, the stock embraces the Pima Baja or Nevome, Opata, Tarahumar, Cahita, Cora, and Tepehuan, with their numerous ramifications.

Pima Alta.—According to tradition, the Pima Alta formerly lived in the Salado valley, Southern Arizona, whence they extended their settlements into the valley of the Gila. According to their mythology, a deluge came and left but a single survivor, a chief named Ci-ho, or So-ho, the progenitor of the present Pima tribe. One of his descendants, Sivano, erected as his residence the now ruined adobe structure called CASAS GRANDES (q. v.), and constructed numerous other pueblos in the Gila and Salado valleys. The Sobaipuri, an extinct branch of the Pima, attributed these now ruined pueblos to people who had come from Tusayan, or from the north, and this is strengthened by recent research, which tends to show that the culture of the inhabitants was quite similar to that of the ancient Pueblos of the north. Sivano's tribe became so populous that many of its members were forced to emigrate to the Salado valley, where they followed the example of their ancestors of the Gila by constructing extensive irrigating canals and reservoirs, and by building large defensive villages of adobe.

The Pima attribute their downfall to the destruction wrought by foreign tribes from the east. Prior to this, however, a part of the tribe seceded from the main body and settled in the valleys of Northern Sonora, where they became known as Pima Baja, or Nevome, and Opata. When the other natives descended from the mountains and resettled the valley of the Salado, they never rebuilt the substantial adobe dwellings, but constructed dome-shaped lodges of poles covered with thatch and earth, and in such habitations they have since dwelt. In early historic times the Pima were joined by the Maricopa, a Yuman tribe who left the Lower Gila owing to constant oppression by the Cuchan or Yuma. Although speaking distinct languages, the Maricopa and Pima intermarry, and their general habits and customs are similar.

It is probable that the teachings of Father Eusebio Kino and his followers, in the seventeenth and eighteenth centuries, influenced the primitive beliefs of the Pima Alta. They now believe in the existence of a supreme being, known as the "Prophet of the Earth," and also in a malevolent deity. Sickness, misfortune, and death are attributed to sorcery, and medicine-men are employed to overcome the evil influence of the sorcerers.

Marriage among the Pima is entered into with little ceremony, and is never considered binding, and the number of a man's wives is only a question of the husband's ability to support more than one wife. The women perform much of the labor, save the hunting, plowing, and sowing.

The agriculture of the Pima Alta is conducted by irrigation, and antedates the Columbian epoch. Each village possesses an irrigating canal, frequently several miles in length. They cultivate wheat, corn, barley, beans, pumpkins, squashes, melons, onions, and a small supply of inferior short cotton. One of the principal food products of their country is the bean of the mesquite, which is prepared and made into loaves. The fruit of the zaguara cactus (*Cereus giganteus*) is also gathered by the women and made into an intoxicating beverage. The Pima women are expert makers of water-tight basketry, prettily decorated. They also manufacture a coarse pottery, some of which also is decorated.

The Pima Alta, who numbered 4,464 in 1890, are confined, with the Maricopa, to reservations in the Salado and Gila valleys, Arizona.

Papago.—This tribe inhabits the territory S. and S. E. of the Gila river, on Gila Bend reservation, especially S. of Tucson, Ariz., and extending across the desert waste known as the Papagueria into Sonora, Mexico. Like the Pima, the Papago subsist by agriculture, and are frugal and peaceable. An extensive trade in salt, taken from the great in-

land-salt-lakes, is conducted by this tribe, and they also manufacture and sell a sirup extracted from the *putahaya*. They are tall and dark-complexioned; their dialect differs but little from that of the Pima, and their habits and customs, as well as their traditions, are quite similar. The tribe suffered much from the hostility of the Apache prior to the subjugation of the latter. Within the limits of the U. S. the Papago number about 5,000. There are possibly as many more in Sonora.

Sobaipuri.—Allied to the Pima and Papago were the Sobaipuri, a tribe now unknown by that name, but in the eighteenth century occupying the Santa Cruz and San Pedro valleys, and the valley of the Gila between the confluences of those intermittent streams. Probably this tribe was forced from its settlements by the depredating Apache, and compelled to join its nearest kindred, the Papago, by whom they have been absorbed.

Neveome.—This term is applied to the Lower Pima, or Pima Baja, and their subdivisions inhabiting the region of South Central Sonora. The social organization and religious system of beliefs and practices of the Neveome, prior to the teachings of Catholic missionaries, were analogous to those of the Yaqui, their southern neighbors, although the dialects of the two branches were so differentiated that intercourse was possible only through a sign-language. The Neveome were agriculturists; they dressed better than most of their kindred, and lived in flat-roofed adobe houses. The Neveome were divided geographically into a northern and a southern branch. These were autonomous, often at enmity with each other, and inhabited a number of independently governed villages. The population is estimated at about 8,000.

Oyata.—Adjoining the Papago and Pima Alta on the S. E. is a large body of Indians whose tribal name is Joyl-ra-wa, and who were formerly at enmity with their northern neighbors, hence the appellation Oyata, a Pima term derived from *oyap*, enemy, and *oyatam*, people, folk.

Physically the Oyata are fine specimens of the Indian race. They are generally below the medium size, but are well-proportioned; their complexion is not so dark as that of the Yaqui; their features are regular and agreeable, and their hair is unusually soft. They number about 5,500.

Prior to the advent of the Spanish missionaries the habits and customs of the Oyata were akin to those of the Pima and Papago N. and W.; now, however, they have become so thoroughly transformed as almost to have forgotten their native tongue. They are described as of a submissive disposition, with much regard for honesty and morality.

Tarahumár.—The name of this division is derived from *huma*, to run; *tala*, or *tara*, foot = foot-racers, in allusion to the custom of running and driving a wooden ball before them with their feet. Their habitat embraces the headwaters of the principal southern Sonora and Chihuahua streams in the Sierra Madre. They are still very primitive, living in hovels or in caves in the mountain fastnesses and barrancas, and subsisting by hunting deer and smaller game, and by the cultivation of maize, beans, pepper, and potatoes. They are robust, of medium height, and have swarthy complexions and scanty beards, but long, thick, black hair. They formerly tattooed the forehead, lips, and cheeks in various patterns. Their docile character contributed to their reduction by the Spanish settlers, notwithstanding their large number, which is said to reach about 15,000, and by some is even estimated at 40,000. The names of the settlements of the Tarahumar almost invariably terminate in the locative form *chic*.

Cahita.—This division inhabits the southwestern coast of Sonora and the northwestern coast of Sinaloa, extending from lat. 28° to 25° 30'. The Yaqui and Mayo tribes form the most important part of the Cahita division. The men are robust, but well formed; their complexion is dark bronze and their features, though somewhat coarse, are not unpleasant. The women are small and rather thick-set. Owing to the semi-tropical climate their dwellings are unsubstantially constructed of canes and boughs covered with palm-leaves. In the fertile valleys about the mouths of streams they engage in raising corn, cotton, calabashes, beans, and tobacco, and also in cultivating the mescal-producing agave.

The Mayo and the Yaqui have a tribal chief; both are divided into a number of autonomous villages, which combine only in case of warfare. In both groups a system of clans is found, and esoteric orders similar to those of the Pueblos exist. Their religious beliefs are characterized by fetichism, and they recognize no supreme being.

In the first half of the seventeenth century the Mayo and Yaqui probably numbered together about 60,000. There are now about 13,500 Yaqui and half as many Mayo. Like most of the southern tribes of the Piman stock these have largely become Hispanized, except in language. The Yaqui are described as naturally industrious, and are employed as cattlemen, teamsters, farmers, sailors, etc. They are also good miners, and are expert in pearl-diving. They exhibit an unusual talent for music.

Cora.—This division, which embraces the Cora, Nayarita, Tecualme, Muutzizti, Teacuacitzisti, Ateacari, and Colotlan, with their sub-tribes, inhabits mainly the territory contiguous to the Rio de San Pedro. Their country, therefore, lies chiefly within the state of Jalisco. They were warlike, living independently in the mountain glens and ravines until 1721-22, when they were subjugated by the Spanish and compelled to follow more civilized ways. The Cora language does not exist in its native purity, having been influenced by contact with civilization. Although hostile, they were agriculturists and manufacturers of coarse woolen blankets. The population is about 20,000.

Tepehuán.—The native name of this tribal division is derived from *tepehuani*, conqueror, victor. They inhabited mainly the state of Durango, but their domain extended also into Southern and Western Chihuahua, Northeastern and Southeastern Sinaloa, Northeastern Jalisco, Northern Zacatecas, and Southwestern Coahuila. Now, however, the tribe is confined to the eastern slope of the Sierra Madre, between lat. 25° and 26°. Their primitive condition resembled that of the Cahita tribes, locally varied through environment. While strictly an agricultural people (cotton and corn being their principal products), they were ever ready to defend the log and stone habitations they had constructed on almost inaccessible crags. In valor they were regarded as foremost among the tribes of Mexico, and chastity they held in high esteem. They wove their cotton into articles of clothing, which they dyed and bartered with neighboring tribes. The population is less than 1,000.

AUTHORITIES.—R. W. H. Hardy, *Travels in the Interior of Mexico* (London, 1829); J. A. de Escudero, *Noticias estadísticas de Chihuahua* (Mexico, 1834); and *Noticias estadísticas de Sonora y Sinaloa* (Mexico, 1849); C. A. Pajeken, *Reise-Erinnerungen* (Bremen, 1861); Manuel Orozco y Berra, *Geografía de las Lenguas de México* (Mexico, 1864); F. E. Grossman, *Pima Indians of Arizona* (in Smithsonian Report for 1871, Washington, 1873); Antonio García Cubas, *The Republic of Mexico in 1876* (Henderson's translation, Mexico, 1876); Hubert H. Bancroft, *Works*, vols. i., xv. (San Francisco, 1882, 1884); A. F. Bandelier, in *Papers of the Archaeological Institute of America*, American Series, iii., pt. 1; iv., pt. 2 (Boston, 1890, 1892), and works cited therein. See INDIANS OF NORTH AMERICA. J. W. POWELL.

Pimen'ta, or Pimento [from Span. *pimien'ta* and *pimi-ento* < Lat. *pigmen'tum*, paint, pigment, juice of plants]: a name given to the unripe berries of a handsome evergreen tree (*Pimenta officinalis*, family *Myrtaceæ*), growing throughout the West Indies and in Mexico and South America. The fruit is a small globular berry, rather less than a third of an inch in diameter; it is two-celled, each cell containing a single black kidney-shaped seed. The active principles are a volatile oil, contained in the proportion of from 3 to 4 per cent., and a green fixed oil. Both of these occur in largest proportion in the cortical portion of the fruit. Pimenta has a warm, pungent, aromatic taste, and may be used in medicine for the general purposes of the aromatic spices—namely, as stomachics, to improve digestive power, to allay nausea, and correct the nauseating and griping effects of other medicines. Its most common use, however, is as a spice in cookery, for which it is largely consumed under the name of allspice or Jamaica pepper. It is obtained in commerce from Jamaica. Revised by H. A. HARE.

Pimpernel, or Poor Man's Weather-glass: a cold-temperate herb of Europe (*Anagallis arvensis*), naturalized in North America, having rather handsome flowers, most commonly scarlet, but often white or blue. It is remarkable that it always closes upon the approach of bad weather. The water-pimpernel is *Sedum rubrandum*, found in the U. S. and most other countries. *S. floribundum* and *S. ebracteatum* are found in the Gulf States. The above plants all belong to the *Primulaceæ*. The first-mentioned was thought to have active medicinal powers, and the second was once looked upon as having magical qualities.

Pinacée: See CONIFERS.

Pinchbeck: a kind of brass formerly much used for making cheap watch-cases, and now used as a substitute for the more costly bronze. It contains over 80 per cent. of copper (the rest is zinc), and has when new a look quite like that of gold.

Pinckney, CHARLES, LL. D.: statesman; b. at Charleston, S. C., 1758; was bred a lawyer, and during a part of the Revolution was held a prisoner by the British, and after the peace represented South Carolina in Congress. He was a prominent member of the convention of 1787 which framed the U. S. Constitution, and one of the drafts submitted to that body was made by him. In 1788 he was president of the convention in which South Carolina ratified the U. S. Constitution, and in 1790 he presided over the convention which adopted the State constitution. He was Governor of the State 1789-92, 1796-98, 1806-08; U. S. Senator 1798-1801; minister to Spain 1802-05; and was again in Congress 1819-21; an ardent and eloquent anti-Federalist. D. at Charleston, Oct. 29, 1824.

Pinckney, CHARLES COTESWORTH, LL. D.: statesman; b. at Charleston, S. C., Feb. 25, 1746; was educated at Westminster, at Christ Church, Oxford, and the Middle Temple, London; studied military science at Caen, France; became a barrister at Charleston 1769; served as captain, and afterward as colonel of South Carolina troops in the Revolution; was aid to Washington in 1777; displayed great valor and skill in the Southern campaigns 1778-80; suffered much as a prisoner of war 1780-82; became a brigadier-general 1783, and later a major-general of the State, and still later of U. S. troops (1797); declined many important offices; assisted in framing the U. S. Constitution; was one of the special ministers to France 1796-97, when he was ordered to leave that country; was the author of the famous sentiment, "Millions for defense, but not one cent for tribute"; Federalist candidate for Vice-President 1800, and one of the ablest lawyers of his time. D. at Charleston, S. C., Aug. 16, 1825.

Pinckney, THOMAS: statesman; brother of C. C. Pinckney; b. at Charleston Oct. 23, 1750; graduated at Oxford, and was called to the bar at the Temple, London, 1770; entered the Revolutionary army, in which he served with much distinction, receiving a bad wound at Camden; Governor of South Carolina 1787-89; U. S. minister to London 1792-94, and to Madrid 1794-96, when he negotiated the important treaty of San Ildefonso; was in Congress 1799-1801; appointed major-general 1812, and served against the Creeks and Seminoles with success. D. at Charleston, Nov. 2, 1828.

Pindar (in Gr. Πύδαρος): the greatest of Greek lyric poets; b. about 522 B. C. of an ancient family of Cynoscephalæ near Thebes; was carefully trained in musical arts by the best masters; began his career at an early age, and before the Persian war (490 B. C.) had gained a national reputation. During the Persian war, however, he did not and could not espouse the national cause, for Thebes was on the side of the invader, and being a Theban and an aristocrat, he went with his state and his caste. Still he showed that he was too good a Greek not to sympathize with the great achievements of the war of liberation, and his praise of Athens is said to have brought on him a fine from his "Mother Thebes" and a rich reward from the "violet-wreath'd city." Pindar traveled far and wide in the exercise of his profession as a lyric poet whose office it was to adorn the great occasions of life, and he was everywhere honored and revered by the princes of earth. His character was as lofty as his verse. He was a priest as well as a poet, a favored guest of the Delphic god, and the last prophet of the old Doric creed. The date of his death is uncertain, but he can not have lived much beyond 450 B. C. His poetry covered the whole field of Greek lyric, and the fragments that remain show his poetical faculty in various ranges of composition, in banquet songs and in choruses for virgins, in dithyrambs and in dirges, but the height of his art reveals itself in the only poems that we have entire, his *Hymns of Victory* (ἑπινίκια), odes written in honor of victors in the four great national games of Greece, Olympian, Pythian, Nemean, and Isthmian. The opulence of these poems, their brilliancy of imagination and of diction, the swing of their movement, their elevation and their force, have been recognized by all critics and have excited the emulation of lyricists from the poet's day to this; but the springs of Pindar's art seem to have been hidden from critics and imitators alike for many generations. A "Pindaric ode" has been too often synonymous with rant and bombast, and it was not until the nineteenth century that a diligent study of Pindar showed that there is

profound art in the plan, as well as in the details, and that everything works together to produce a total effect. The myths which constitute so important a part of these *epinicia* are not mere idle or incidental adornments, but grow up out of the theme and form an organic part of the structure; they serve to idealize victory and victor and to make what might have been a mere occasional poem into an eternal type. The meters are not lawless, as they were once thought to be, but obey the rule of a refined and exacting system, and it is through the symmetry of the meters that scholars learned first to divine and then to prove the symmetry of the thought. Much that would have aided in the appreciation of Pindar has been lost, but though music and dance have perished, the rhythm that regulated both survives in the language and has proved itself a key to the inner life of the Pindaric poems. Renewed study only confirms the judgment that Pindar combines, in almost unique perfection, largeness of manner and elaborateness of detail.

His poems were edited by Böckh (Berlin, 1811-21) in three parts, still the great edition; Dissen-Schneidewin (1847); Mommsen (1864); Bergk in his *Poetæ Lyrici Græci* (4 ed. 1878). Text edition by Christ in the Teubner Library (1879); with English notes by Fennell (1879-83, new ed. of *Olympians and Pythians*, 1893); by Gildersleeve, *Olympians and Pythians* (New York, 1885); by Bury, *Nemeans and Isthmians* (1890-92). Translated into English prose by Ernest Myers (2 ed. 1884). The best book on Pindar and his art is by Alfred Croiset, *Pindare et les lois du lyrisme grec* (2 ed. Paris, 1886). See also the chapter on Pindar, in Jebb's *Classical Greek Poetry* (1893), and Fraccaroli's elaborate work, *Le Odi di Pindaro* (1894). B. L. GILDERSLEEVE.

Pindar, PETER: See WOLCOT, JOHN.

Pindemonte, IPPOLITO: poet; b. at Verona, Italy, Nov. 13, 1753. Of noble birth, he was entered by his family, as soon as he had completed his studies at Modena, among the Knights of the Order of Malta. After some years of service in Malta and Sicily his health gave out, and he was obliged to retire from active life. He settled at his country estate, Avesa, near Verona, and gave himself to letters. He tried his hand at tragedy, but with poor success. In 1785, however, he brought out *Poesie Campestri*, which had immediate recognition. These were delicate and tender praises of the country life, after the manner of the English poets of the eighteenth century. He had already begun to be intimate with the best Italian poets of his time, among them Monti and Foscolo, of whom the latter had dedicated to him his *Sepolcri*. In 1788 he went to Paris, where he remained for two years, becoming intimate with Alfieri, who deferred to his critical judgment. The French Revolution caused him to return to Italy in 1791. In 1795 he published a new edition of the *Poesie Campestri*, with the addition of *Prose Campestri*—essays of a contemplative and philosophic kind. In 1804 he published his tragedy *Arminto*—suitable for reading rather than for representation, and accompanied by three dissertations on the dramatic art. In 1805 appeared a volume of *Sermoni*—satires in the manner of Horace, and gay rather than angry castigations of the follies of his time. In 1809 he printed the first books of his delicate and graceful translation in blank verse of Homer's *Odyssey*, and in 1822 the remainder. His *Epistole in versi* (1819) are filled with sadness at the sufferings of Italy. His last work, a series of *Elogi di letterati* (1825-26), contains sympathetic notices of contemporary scholars and poets. D. at Verona, Italy, Nov. 18, 1828. See B. Montanari, *Della vita e delle opere d'Ippolito Pindemonte* (Venice, 1834) and *Le Poesie originali di Ipp. Pindemonte*, ed. by A. Torri, with *discorso* by P. Dal Ris (Florence, 1858).—His brother, Marquis GIOVANNI PINDEMONTÉ (b. at Verona in 1751; d. there Jan. 23, 1812) wrote a number of interesting plays, collected under the title *Componimenti teatrali* (4 vols., Milan, 1804).

A. R. MARSH.

Pine [O. Eng. *pīn*, from Lat. *pīnus*, pine]: gymnospermous trees belonging to the genus *Pinus* of the family *Pinaceæ* and order *Coniferae*. (See CONIFERS.) They are described as follows by Dr. George Engelmann:

"Their angular, two or three edged leaves (almost always serrulate or rough on the edges), in bunches of two to five, are inclosed in a sheath of membranaceous scales; one (Western American) species has a single rounded leaf in this sheath. Their sterile flowers develop abundantly at the base of the shoots of the same spring; the fertile clusters appear singly, or a few together higher up or near the top of such shoots. The young fruit remains almost sta-

tionary for a whole year, and only in the second summer the cone enlarges, maturing in the autumn. We distinguish two sections of true pines. The white pines have five mostly slender leaves in a bunch; scales of the cones rather thin; wood whiter, lighter, softer, and less resinous, and therefore highly prized for carpenter-work. Of these, the white pine of the Eastern and Northern U. S. (*P. strobus*) is the fairest representative, a tree of magnificent proportions and universal application, and highly prized as an ornamental tree. Similar, still more ornamental, but also more slender, is the Himalaya or Butan white pine. In the Western U. S. this group of pines is represented by the colossal sugar-pine (*P. lambertiana*), with its immense cones and large edible seeds, and by the mountain white pine (*P. monticola*) of the Pacific mountains; another species, with large squarrose cones (*P. ayacahuite*), is spread over the Mexican mountains. Similar to these, but distinguished by more rigid leaves, shorter, thicker cones, with thicker scales and large, edible, almost wingless seeds, is the small group of the Cembra pines, the principal species of which grows on the European and Siberian Alps, the similar *P. albaucalis* on the Pacific alps, and *P. flexilis* on the Rocky Mountains. *P. cembra* furnishes the red wood with the white sap from which particolored Swiss carvings are made.

"The second and by far the largest section of true pines comprises those with knobby scales, leaves from one to five in a bundle. The small group of the four Mexican and Western American nut-pines closely approaches to the last; they are small and scraggy trees that make excellent firewood, with globose cones, the scales thick with very prominent knobs, bearing large, edible, wingless seeds, like those of Cembra, and with leaves varying in the different species from a single one (*P. monophyllos*) to five in number.

"Next to these range the large-fruited nut-pines, with thick or hook-knobbed scales, and large short-winged seeds, of which *P. pinea* is the Mediterranean and *P. sabiniana*, *coulteri*, and *torreyana* the Western American representatives. Of the large number of pines remaining, some bear their cones just below the terminal bud of the same year's shoot; their scales are usually thinner, with less prominent prickles, and their wood whiter and less resinous. The Scotch and the Austrian pine of Europe, and the red pine of the Northern U. S., all of them with leaves in pairs, belong here, as also the long and five-leaved, large-coned, and variable Mexican pines of the alliance of *P. montezumæ*. Those pines that bear lateral cones have usually very knobby and prickly scales, and heavy, resinous, yellowish wood—the real yellow or pitch pines. Here range the seaside pine (*P. pinaster* of the Mediterranean regions), the Eastern pitch-pine, the Jersey pine, prickly pine, loblolly pine, the yellow pine, Elliott's pine, and, above all, that most important and magnificent of all pitch-pines in the U. S., the long-leaved pine of the South (*P. australis*), which furnishes a most highly prized naval timber and nearly all the resinous products of the country. To the yellow pines belong also a number of Western pines, the most important and widest spread of which is the heavy pine (*P. ponderosa*), *P. contorta*, the interesting but very local Monterey pine (*P. insignis*), and a few others."

In all, seventy species of pines are known, extending from the Arctic regions southward in both hemispheres to subtropical or tropical countries (Central America and the East Indies); and somewhat more than one-half of these occur in North America.

CHARLES E. BERRY.

Pineal Gland or Body: See PARIETAL EYE AND BRAIN.

Pineapple: the compound conical fruit of a plant of the family *Bromeliaceæ* (*Ananassa sativa*); a native of tropical America, naturalized in many hot countries, and cultivated also in hothouses. It is one of the best of fruits. The Bahamas and South Florida are finely adapted to pineapple culture. From the fibers of the leaves of this and allied plants a beautiful fabric called pina muslin is made.

Pine Bluff: city (settled in 1819, plotted in 1836); capital of Jefferson co., Ark. (for location, see map of Arkansas, ref. 4-D); on the Arkansas river at the head of low-water navigation, and on the St. L., Iron Mount, and South., and the St. L. S. West. railways; 42 miles S. S. E. of Little Rock. It is built on a bluff 228 feet above sea-level; is in the cotton-producing region of the State; has a large cotton-compress, extensive railway-car factory, the general shops of the St. Louis S. Western Railroad, flour-mill and grain-elevator, cottonseed-oil mill, 2 planing-mills, and ice-factory, and contains a branch of the State Normal College, 3 State

banks with combined capital of \$350,000, and 2 daily and 4 weekly papers. A large amount of cotton and lumber is handled annually. Pop. (1880) 3,203; (1890) 9,952; (1894) estimated, 17,000.

EDITOR OF "COMMERCIAL."

Pine, Cape: See CAPE PINE.

Pine-chaffer: any one of various coleopterous insects whose larvæ commit great ravages in pine forests, eating away the new material between the bark and the wood. These insects are *Pissodes strobi*, *Tomicus pini*, *T. xylographus*, and several species of *Hylurgus*.

Pine Family: See CONIFERS.

Pine-finch, or Goldfinch: a bird of the family *Fringillidæ*, the *Spinus pinus* of recent authors. It is a near relative of the common goldfinch of the U. S. (*Spinus tristis*), and occurs more or less abundantly throughout North America. It attains a length of about 4½ inches, is brownish olive above, and beneath whitish, streaked with dusky. It feeds chiefly on the seeds of hemlock and other trees, as well as those of grasses, etc.

Revised by F. A. LUCAS.

Pine-grosbeak: a bird of the family *Fringillidæ*, the *Pinicola enucleator* (Linn.), Cab. It is found throughout the northern regions of the Old as well as New World. Its average length is about 8½ inches; the bill and legs are black; the male is rosy colored (tinged, except on the head, with brownish) above, ashy below; the female brownish above, ashy (tinged with greenish yellow) below. As indicated by the name, this bird frequents pine and other evergreen forests; it feeds on spruce-seeds, etc. It is rare in the U. S., except near the northern border, although occasionally abundant even so far S. as Philadelphia.

Revised by F. A. LUCAS.

Pinel', PHILIPPE, M. D.: alienist; b. at St.-Paul, Tarn, France, Apr. 20, 1745; studied medicine at Toulouse and Montpellier, graduating M. D. from the former in 1773; removed in 1778 to Paris; obtained a prize in 1791 for his *Traité médico-philosophique sur l'Aliénation mentale*, and was appointed physician of the Bicêtre in 1792, and in 1795 of the Salpêtrière. He substituted compassion, kindness, and justice for the chains and cells that confined the insane, and, recognizing insanity as a disease, he inaugurated its scientific study. He was Professor of Hygiene and subsequently of Pathology in the School of Medicine at Paris until 1822, when the faculty was reorganized, and, owing to jealousies, his name was omitted save as an honorary professor. He was author of *La Nosographie philosophique* (1798) and *La Médecine clinique* (1802). D. in Paris, Oct. 26, 1826.

Revised by S. T. ARMSTRONG.

Pine'lo, ANTONIO DE LEON: jurist and author; b. at Córdoba (now in the Argentine Republic) about 1590. He studied law at Lima, and subsequently went to Spain, where he was judge of the Casa de Contratación at Seville, and historical secretary of the Council of the Indies. He was employed to codify the laws relating to the Spanish colonies, laboring for many years and examining more than 500,000 cédulas. The work was published under the title *Recopilación general de las Leyes de las Indias*, in four volumes, in Madrid, 1680; it was made authoritative, was for over a century the organic law of the colonies, and is, besides, a mine of historical information. There are several revisions. Pinelo also published a life of Toribio, Archbishop of Lima, several valuable works on the American colonies and their laws, and the first bibliography of the Spanish colonies, entitled *Bibliotecas occidentales y occidentales, minores y geográficas* (Madrid, 1629; revised ed. by Gonzalez de Barcia, 3 vols., 1737-38). D. at Seville about 1675. HERBERT H. SMITH.

Pinero'lo (in Fr. *Pignerol*): town of Northern Italy, in the province of Turin, on a hill 1,200 feet above the sea; on the left bank of the torrent Chisone; 23 miles S. W. of the city of Turin (see map of Italy, ref. 3-A). The cathedral stands near an ancient tower, once a prison, but at present serving as a campanile or belfry. The old Piazza d'Armi is now shaded with American elms. From the early part of the eleventh century it was a strong fortress, held for the most part by the house of Savoy, though France frequently, and often successfully, disputed its possession. In 1696 the fortifications of Pinerolo were, in accordance with a treaty, mostly destroyed. Since 1748 it has been an episcopal see. It is a place of considerable industry; its manufactures are silks, woollens, cottons, liqueurs, etc. Pop. 12,000.

Pines, Isle of: an island of the Spanish West Indies; 35 miles S. of the western end of Cuba. It is a dependency of

Cuba, contains 1,214 sq. miles of undulating or flat and marshy land, and has about 2,500 inhabitants. Capital and principal village, Nueva Gerona. The island contains marble quarries, and is a favorite health resort for sufferers from lung diseases.

H. H. S.

Pines, Isle of, or Huneá: an island in the southern Pacific Ocean, belonging to France; in lat. 22° 38' S., lon. 167° 25' E.; 30 miles from the southeastern extremity of New Caledonia. It was discovered in 1774 by Capt. Cook, and was selected in 1872 by the French Assembly for a penal station. The inhabitants belong to the same race as the population of New Caledonia. Exclusive of the convicts they number about 800.

Pine-snake: a large serpent (*Pituophis melanoleucus*), 6 feet long, 2 inches thick, of a shining white color with dark-brown spots. It receives its name from having its home in the pineries of Eastern North America, from New Jersey southward, though it is also sometimes called the "bull-snake," from the loud bellowing sound it produces. It emits a strong, disagreeable odor. It feeds on eggs and small birds and mammals, and is harmless to man.

Pingré, pān'grā, ALEXANDRE GUI: astronomer; b. in Paris, France, Sept. 4, 1711; studied theology, but adopted Jansenistic views, and devoted himself to astronomy; published 1754–57 a nautical almanac under the title of *Etat du Ciel*; greatly extended Lacaille's table of eclipses in the second edition of *L'Art de vérifier les Dates*; wrote in 1783 his *Cométographie, ou Traité historique des Comètes* (2 vols.), which is his principal work, and translated the poem by Manilius, *Astronomica* (1786). D. in Paris, May 1, 1796.

Pinguicula: See BUTTERWORT.

Pini, pee'née, GAETANO, M. D.: physician and hygienist; b. at Leghorn, Italy, Apr. 1, 1846; studied at the Universities of Pisa and Naples, graduating M. D. *summa cum laude* from the former in 1869. His medical studies were interrupted in 1866 by service as a private in the war between Italy and Austria, and again in 1867 under Garibaldi. In 1870 he was on the staff of the *Enciclopedia Medica Italiana*. He originated and secured the funds for the erection of the hospital for rachitic children in Milan in 1875. He originated and organized the Royal Italian Society of Hygiene in 1878. In 1876 he founded the Milan society for cremation, and was instrumental in originating a number of these societies in Italy. He was an earnest worker in philanthropy, originating the Brotherly Aid Society and the Night Asylums. He was a member of the Italian Pellagra commission. D. Sept. 25, 1886. S. T. ARMSTRONG.

Pink [cf. *pink*, prick, make jagged]: the name of various plants of the genus *Dianthus*, all natives of Asia and Europe, for the wild pinks of the U. S. are of the genus *Silene*, and are properly called campions or catchflies; although *D. armeria*, *D. prolifer*, and one or two others are sparingly naturalized. The most common pinks are beautiful garden and window flowers, often delightfully fragrant. There are thousands of fine varieties—carnations (comprising flakes, bizarres, picotees), pheasant's-eyes, monthlies, Chinese pinks, maidens, Carthusian pinks, etc. (See CARNATION.) They are somewhat doubtfully referred to some four or five original species (*D. plumarius*, *caryophyllus*, *chinensis*, *carthusianorum*, *superbus*, *deltoides*, etc.). The commonest pink of old gardens, once much used for borders, is *D. plumarius*.

Revised by L. H. BAILEY.

Pinkerton, ALLAN G.: founder of the Pinkerton detective agency; b. at Glasgow, Scotland, in 1819; took part in the Chartist outbreak in Birmingham, and to escape imprisonment emigrated to the U. S. in 1842. He settled in Illinois, where he became a deputy-sheriff, and in 1850 founded his detective agency in Chicago. During the U. S. civil war he was in charge of the secret-service division of the army, and both at that time and later showed unusual skill and courage in detecting and bringing to justice the authors of crime. He broke up several notorious gangs of thieves, recovered large amounts of stolen money, and did effective work against the Molly Maguires in Pennsylvania. Among his published writings are *The Molly Maguires and the Detective* (1877); *Criminal Reminiscences* (1878); *The Spy of the Rebellion* (1883); and *Thirty Years a Detective* (1884). D. in Chicago, 1884. F. M. COLBY.

Pinkerton, JOHN: author; b. at Edinburgh, Scotland, Feb. 13, 1758; passed an apprenticeship of five years to the law in his native city; settled in London 1780; devoted himself to literature under the patronage of Horace Wal-

pole, and produced an immense number of works, chiefly historical, none of which, however, were marked by any great talent. The best known is his *General Collection of Voyages and Travels* (17 vols. 4to, 1808–14), with maps and engravings, which is still useful for reference. He wrote some poems of merit, but his *Ancient Scottish Poems* (2 vols., 1786), purporting to be from the MS. collections of Sir Richard Maitland, has been pronounced a literary forgery, probably executed by himself. In 1804 he settled in Paris, where he died Mar. 10, 1826. See his *Literary Correspondence*, edited by Dawson Turner, 1830.

Pinkeye, or Influenza (Epizootic): an infectious disease of horses, characterized by high temperature, great prostration, redness, and swelling of the eyelids (whence its name), and other mucous membranes of the head, and swelling of the limbs. It is one of the oldest known diseases of horses, having been described by Rhusius, an Italian writer, in 1301; since then numerous outbreaks have been recorded at varying intervals. In 1872 and 1873 the disease spread over all of North America, and so many horses were attacked that commerce was seriously interfered with. An outbreak occurred in Europe in 1882 and 1883, when large numbers of horses were affected.

This disease always results from direct or indirect exposure to diseased animals or to their exhalations. The infectious material is sometimes carried long distances by the wind or by fomites. In outbreaks it is noticed that the disease spreads most rapidly along channels of commerce, and requires a long time to reach remote and thinly settled districts. The cause of pinkeye has not been discovered, although it has been determined by Pfeiffer that a short bacillus is the etiological factor in a similar disease—influenza of man. The period of incubation is from four to seven days, at the end of which time the disease begins suddenly with high fever and great depression. The onslaught and progress are so rapid that the height of the disease may be reached in twenty-four hours. The temperature sometimes advances from normal to 106° F. within a few hours. The pulse and respirations are quickened. The animal evidences depression by hanging the head, allowing the ears to droop, refusing food, refusing to move, but when forced to do so walking with an irregular, tottering gait. The eyelids are swollen, the legs and sheath become edematous, and sometimes the substernal region as well. The visible mucous membranes of the digestive tract are injected and red, and there is some constipation. A discharge from the nose and a cough indicate irritation of the respiratory mucous membrane. The eye is sometimes involved to the extent of an inflammation of the cornea and iris that may lead to blindness. Recovery usually takes place in from five to fourteen days, but complications, as exhaustion of the heart, catarrhal pneumonia, diarrhoea, laminitis, or paralysis of the brain, may prolong the case or cause death. Mortality results in from 2 to 10 per cent., depending largely on the type and virulence of the special outbreak.

In treating pinkeye good care and properly selected foods are of the greatest importance. The horse should be allowed a plentiful supply of pure air, an abundance of pure cold water, and soft laxative foods, as grass, green-corn fodder, roots, apples, bran mash, steamed grain, etc. The skin should be kept brushed and the swollen parts moistened frequently with cooling, astringent washes. The eyes should be washed at short intervals with boracic-acid solution, and, if painful, protected from the light. Constant stimulation of the heart is required. The bowels should be kept open with small doses of salts or with calomel. Clysters of cold water are useful to reduce the temperature. Antipyrine is frequently used with benefit, and nux vomica and quinine are usually administered freely.

LEONARD PEARSON.

Pink Family, or Pinkworts: the *Caryophyllaceæ*, a group of (mostly) herbaceous dicotyledons, with opposite entire leaves, and stems with swollen joints; flowers usually dichlamydeous, the petals separate; ovary superior, compound, one- to five-celled, the ovules axial, or on a central column. There are about 1,100 known species, mostly natives of temperate and cold countries. Many species are cultivated for their beautiful flowers, as the pinks (species of *Dianthus*, especially *D. caryophyllus*, the carnation; *D. chinensis*, the Chinese pink; *D. barbatus*, the sweet-william; *D. superbus*, etc.), rose-campions (species of *Lychnis*), catchfly (*Silene*), soapwort (*Saponaria*), etc.

CHARLES E. BESSEY.

Pinkney, EDWARD COATE: poet; son of William Pinkney, statesman; b. in London, England, Oct. 1, 1802; educated at St. Mary's College, Baltimore; was in the naval service 1816-24; practiced law at Baltimore with little success, but was appointed Professor of Rhetoric and Belles-Lettres in the University of Maryland; published *Rodolph and other Poems* (1825), and edited for a short time a political journal, *The Marylander* (1827). D. at Baltimore, Apr. 11, 1828. Some of his lyrics have much grace and spirit. "The best known of them, *A Health*—"I fill this cup to one made up of loveliness alone," was enthusiastically praised by Edgar Allan Poe. Revised by H. A. BEERS.

Pinkney, WILLIAM, LL.D.: statesman; b. at Annapolis, Md., Mar. 17, 1764; was the son of an English loyalist; studied medicine and law; was admitted to the bar 1786, and rapidly rose to eminence. He was a member of the State convention that ratified the U. S. Constitution in 1788, and was elected in the same year to the State Legislature. He was a U. S. commissioner in England under the Jay Treaty 1796-1804; attorney-general of his native State 1805; minister extraordinary, with Monroe, to Great Britain 1806; minister resident there 1807-11; U. S. attorney-general 1811-14; served as a volunteer officer in the war of 1812, and was wounded at Bladensburg; was in Congress 1815-1816; was appointed minister to Russia, and special envoy to Naples in 1816, but resigned in 1818. He was U. S. Senator 1820-22. D. Feb. 25, 1822. See *Life*, by H. Wheaton (1826); by W. Pinkney, D. D. (1853).

Pinkroot: the root of a showy herb of the U. S. (*Spigelia marilandica*), found from New Jersey to Wisconsin and Texas. The infusion of this root is much used as an anesthetic; it has also some narcotic qualities. In use it should be combined with a cathartic, such as senna. Four other species occur in the U. S. *S. anthelmia* is a similar plant of South America. They belong to the *Loganiaceae*.

Pinkworts: See PINK FAMILY.

Pin-money: in law, an annual sum of money, sometimes provided for in a marriage settlement, to be paid by the husband to the wife for the purpose of defraying her own personal expenses for dress and the like. When the wife dies, her representatives can not claim any arrears that may be unpaid at the time, nor can the husband ever be compelled to pay more than the arrears of a single year; for the allowance is intended to be fully expended in each current year, and is designed to keep up the family dignity and appearance, and not to furnish the wife a means of accumulation. Both the name and the provision for the wife which it designates are practically unknown in the U. S., being nearly confined to the English law and social customs, though the term sometimes occurs in Scotch marriage contracts. The origin of the term is uncertain; by some it is traced to an ancient tax in France for supplying the queen with pins. See Frazer on *Husband and Wife*.

Revised by F. STURGIS ALLEN.

Pinnated Grouse: a name given to the prairie-hen (*Tympanuchus americanus*) on account of the pointed tufts of feathers on either side of the neck. See PRAIRIE-HEN.

Pin'nidæ [Mod. Lat., named from *Pin'na*, the typical genus, from Gr. *πίνα*, a kind of mussel]: a family of bivalve molluscs occurring in warm seas. They have an elongate triangular shell of delicate texture and moor themselves, like the mussels, by a silken "byssus." About fifty living species are known.

Pinnipedes [Lat. *pin'na*, feather, fin + *pes, pe'dis*, foot]: a sub-order of carnivorous mammals containing the seals, sea-lions, walruses, and their relatives; so called from the fact that the feet are so modified as to form paddles for swimming, the toes being united by a web or fold of skin. The group is differentiated into three well-defined families: (1) *Otariidæ*, or sea-lions and sea-bears; (2) *Phocidæ*, or typical seals, and (3) *Odobenidæ*, or walruses, each of which is noticed under its own name. Revised by F. A. LUCAS.

Pins [M. Eng. *pinne* < O. Eng. *pinn*, pin, peg, from Lat. *pin'na*, feather, fin, pen]: pieces of wire pointed at one end and provided with a head at the other, designed for fastening together various articles or for ornament. The pins which have been found in Egyptian, Etruscan, and old Scandinavian tombs, or in other ways have come down to us from antiquity, are mostly very elaborate and expensive instruments, made of iron, bronze, brass, silver, or gold, sometimes 12 inches long, with artistically executed heads of wood, bone, ivory, amber, metal, or precious stones; and it

is evident that in many cases in which we now use pins the ancients used clasps, laces, and other contrivances. In England pins came into common use in the fifteenth century, but were at first imported from the Continent. Soon, however, the manufacture was introduced into England, and in the latter part of the seventeenth century Birmingham became the center of this branch of industry. In the U. S. it was attempted in 1820, and again in 1824, but not firmly established until the invention of the Howe machine in 1832. The original process of the manufacture by hand, from the straightening of the wire to the spinning and hammering of the head, was long and tedious, and required no less than fourteen distinctly different operations. At present, all these processes, from the cutting of the wire to the sticking of the pins into papers, are performed by machinery, which needs only to be fed by the proper materials at each stage of its operation. The manufacture of safety pins (in which the point rests in and is covered by a loop) has also reached large proportions both in Birmingham and the U. S.

Pinsk: town; in the government of Minsk, Russia: 172 miles S. W. of Minsk (see map of Russia, ref. 8-B). It has a considerable trade carried on by means of the navigable river Pina, which connects it with the fertile regions on the Dnieper. Pop. (1890) 32,480, mostly Jews.

Pint: a measure of capacity, the eighth part of a gallon. See WEIGHTS AND MEASURES.

Pinto: See MENDEZ-PINTO.

Pinto: See SERPA PINTO.

Pinto, FRANCISCO ANTONIO: soldier and politician; b. at Santiago, Chili, 1785. He studied law at Santiago; supported the patriot cause in 1810, and represented the first republic in Buenos Ayres and England; returned in 1817, entered the patriot army, and served with distinction in Chacras and Peru. In 1824 he was foreign minister; was elected vice-president of Chili at the beginning of 1827, and soon after, by the resignation of Freire, became president, holding the post until July, 1829, when he resigned. Two months later he was again made president by election, but the republic was on the eve of a revolution, and he was forced to resign Nov. 2, 1829. He was the liberal candidate for president in 1841. D. at Santiago, July 18, 1858. —His son, ANÍBAL PINTO, was b. at Santiago in 1825; was Minister of War and Marine 1871-76 and president Sept. 18, 1876-Sept. 18, 1881; he was a moderate liberal in politics, and was the first of his party elected to the presidency after 1830. The war with Bolivia and Peru began in 1879 and continued through President Pinto's term. D. at Valparaíso, 1884. HERBERT H. SMITH.

Pinturicchio, pin-too-ree'kē-ō, BERNARDINO DI BETTO: painter; b. at Perugia, Italy, in 1454. Fiorenzo di Lorenzo was his first master. He afterward entered into partnership with Pietro Perugino. He is considered the greatest decorative artist of his time. He painted some frescoes in the Sistine chapel and the Borgia apartments in the Vatican, some frescoes in Castel St. Angelo, which have entirely been effaced, the library of the Duomo of Siena, the vault of the choir of Santa Maria del Popolo in Rome, and the Buffalini chapel in the Church of Aracoeli in Rome. At Spello there is much of his work, but it is sadly decayed. His altar-pieces are numerous. Pinturicchio always painted in tempera. D. at Siena, 1513. W. J. STILLMAN.

Pin-worm: a name given to a parasitic nematode worm, *Oxyuris vermicularis*, in allusion to the pricking sensation it produces in the perianal region of infected persons. It is thread-like, rarely more than half an inch in length, and occurs, often in numbers, in the rectum of human beings, especially children. It comes to the exterior to lay its eggs in the region around the vent. The eggs or young must be again taken into the alimentary canal before going through their development, and infection takes place through the mouth. The trouble usually disappears in a short time spontaneously, but medical treatment, and, above all, cleanliness, will mitigate the attacks. J. S. KINGSLEY.

Pinzon': the name of three brothers, ship-builders and navigators, of Palos, Spain, who were connected with some of the first voyages to America. The eldest, MARTIN ALONSO, aided Columbus in preparing for his first voyage in 1492. He sailed with the expedition, in command of the *Pinta*; parted company with Columbus on the coast of Cuba Nov. 1492; was the first to discover Haiti, where he rejoined the admiral Jan. 6, 1493; and during the return voyage was again sepa-

rated by a storm, Feb. 14, reaching Bayona, a port of Galicia. Thence he sent an account of the discovery to the Spanish sovereigns, but they paid little attention to it, giving all the honor to Columbus. Pinzon returned to Palos, where he died shortly after of chagrin, as was asserted. Columbus and his friends charged Pinzon with willful desertion on the coast of Cuba, and with attempting to appropriate the honor of the discovery. On the other hand, it was asserted later that Columbus had been incited to the voyage by information received from Pinzon, and there is a generally discredited story that Pinzon had already been on the coast of Brazil in a French ship.—Another brother, VICENTE YANEZ, commanded the Niña under Columbus in 1492, but he is better known for his voyage of 1500, when he crossed the equator, reached the coast of Brazil near Cape St. Augustine, coasted northward, discovered the mouth of the Amazon, passed between Trinidad and the mainland, and returned to Spain by way of Española. This was the first discovery of the Brazilian coast, but as the country was in the hemisphere assigned to Portugal by the convention of Tordesillas, Spain derived no benefit from it. Pinzon was associated with Juan Diaz de Solis in two voyages—an exploration of the Gulf of Honduras in 1506, and one of the eastern coast of South America, probably to lat. 40° S., in 1508. D. at Palos about 1524.—A third brother, FRANCISCO MARTIN, was pilot of the Pinta in 1492–93, but is not otherwise known. The family was ennobled by Charles V., and has had some distinguished modern representatives. HERBERT H. SMITH.

Piombo, pē-om'bō, Fra SEBASTIANO, del (his real name was Luciani, but he signed himself *Sebastiano Veneziano*, that is, the Venetian): painter; b. at Venice in 1485. He was a pupil of Giovanni Bellini at first, and afterward of Giorgione, whose style he adopted in his great altar-piece in the Church of San Giovanni Crisostomo. In 1512 he went to Rome to paint some frescoes in the Farnesina, at the invitation of Agostino Chigi. Michelangelo then became his friend, and employed him in some of his important work. He became second to none as a painter of altar-pieces, and was also very successful in portraiture. Clement VII. appointed him Frate del Piombo (that is, the monk, keeper of the seal) in 1531, and he held this office also under Paul III. till his death at Rome in 1547. The National Gallery in London possesses Sebastiano's masterpiece, *The Raising of Lazarus*. At Viterbo there is a *Pietà* of great beauty. The *Scourging of our Lord*, in San Pietro in Montorio, Rome, is also a great work. His portrait of Andrea Doria in the Doria Palace, Rome, and his portrait of a lady in the Uffizi Gallery, Florence, are excellent examples of his skill.

W. J. STILLMAN.

Piorry, pē-ō'ree', PIERRE ADOLPHE, M. D.: clinician; b. at Poitiers, France, Dec. 31, 1794; studied medicine; took his degree in 1816; became professor of pathology at Paris in 1840, changing this for the chair of clinical medicine in 1850, and retired into private life in 1866. He invented the pleximeter, described in his *Traité sur la Percussion médiate*, for which he received the Montyon prize in 1828. He also wrote *De l'Hérédité dans les Maladies* (1840); *Traité de Médecine pratique et de Pathologie iatrique ou médicale* (9 vols., 1841–51); *Traité de Plessimétrisme et d'Organographie* (1866). D. in Paris, May 29, 1879.

Revised by S. T. ARMSTRONG.

Piozzi, pē-ot'sē, Mrs. HESTER LYNCH SALUSBURY: author; b. at Bodvel, Carnarvonshire, Wales, Jan. 16, 1740; married, in 1763, Henry Thrale, a wealthy brewer, subsequently a member of Parliament; made in 1764 the acquaintance of Dr. Samuel Johnson, who became in 1766 an inmate of her family at Southwark, and remained such until Mr. Thrale's death in 1781; contributed several poems to Mrs. Anna Williams's volume of *Miscellanies* (1766), among which was the celebrated *Three Warnings*, often supposed to be the composition of Dr. Johnson; married, in 1784, Gabriel Piozzi, a native of Florence, then a music-teacher at Bath; resided a year or two at Florence, where she edited a volume entitled *The Florence Miscellany* (1785) under the signature of "Anna Matilda," thereby attracting the relentless criticism of Gifford against the Della Crusca school; published *Anecdotes of Dr. Johnson* (1786); *Letters to and from Dr. Johnson* (1788); a book of travels on the Continent (1789); *British Synonymy* (1794); and *Retrospection* (1801). D. at Clifton, near Bristol, May 2, 1821. See her *Autobiography, Letters, and Literary Remains* (2 vols., 1861), edited by Abraham Hayward.

Pipefish: a name given to various fishes with a tubular or pipe-like snout, chiefly belonging to the order *Lophobranchiata* and family SYNGNATHIDÆ (q. v.).

Pipe-line: See PETROLEUM.

Piperaceæ: the pepper family; dicotyledonous herbs, shrubs, or rarely trees, with naked, usually small, and often imperfect flowers which are commonly spicate; stamens usually two to six; ovary superior, simple, or compound; ovules one or few in each carpel; seeds with small endosperm and large perisperm; embryo very small. There are 1,025 known species, nearly all tropical. Many possess acrid, astringent, or narcotic properties, which have given them economic value, as *Piper nigrum*, a climbing shrubby species of the East Indies, whose dried fruits constitute the well-known black pepper of commerce. Other products are cubebs, obtained from *P. cubeba* of the East Indies, and betel-leaves used from *P. betle*. Species of *Peperomia* are cultivated, and many are known as pepper-elders. CHARLES E. BESSEY.

Piperno: town of Italy, province of Rome; about 50 miles S. E. of the city of Rome (see map of Italy, ref. 6–E). It stands on an elevation in the midst of an amphitheater of lofty hills near the site of the ancient Volscian town of *Priverum*, from which it takes its name. It is almost entirely surrounded by castellated walls with towers, and stones and inscriptions, taken from the ruined temples and palaces of the ancient city just below it, serve to adorn the more modern town. Here Thomas Aquinas died in 1272. Piperno is very unhealthy, owing to its nearness to the Pontine marshes. Pop. about 4,500.

Pipette [= Fr., dimin. of *pipe*, pipe]: a chemical laboratory instrument of glass which is used for sucking up quantities of liquids by the application of mouth-suction. The pipette has therefore a long stem with a contracted orifice for introduction into deep or narrow-mouthed vessels, with a bulbous or elongated expanded portion above to contain the liquid. Sometimes pipettes are graduated, so that known quantities of liquids may be taken up.

Pipit: See TITLARK.

Pippi: See GIULIO ROMANO.

Piqua: city; Miami co., O.; on the Miami river, the Miami and Erie Canal, and the Cin., Hamil. and Dayton, Pitts., Cin., Chi. and St. L., and the Miami Valley railways; 28 miles N. by W. of Dayton, 73 miles W. by N. of Columbus (for location, see map of Ohio, ref. 5–C). It is the second largest linseed-oil center in the U. S., and contains linseed-oil works, straw-board mills, bent-wood works, rolling-mills, tin-plate works, stove-foundry, corrugated iron-works, woolen-mills, hosiery and wagon works, and school-desk and furniture factories. There are 7 public-school buildings, public-school property valued at over \$300,000, the Schmidlapp Free School, public library, 3 national banks with combined capital of \$500,000, and 3 daily and 4 weekly newspapers. Pop. (1880) 6,031; (1890) 9,090; (1894) estimated, 13,000. J. W. MORRIS, EDITOR OF "DAILY CALL."

Piquet [Fr.]: a game of cards in which the ace, king, queen, knave, ten, nine, eight, and seven of each suit are employed, ranking in the order given. After shuffling and dealing, two by two, to each of the two players, until each holds twelve cards, the rest are laid on the table, and constitute a talon of eight cards. Next, the non-dealer discards from one to five of his poorest cards, and draws as many more from the talon. The opponent next discards. The first player now reckons points, as follows: For *carte blanche* (twelve plain cards), 10 points; for *point* (the hand fullest of any one suit, or, if both hands are alike, the best hand of the two high suits, calling aces eleven, face-cards each ten, and counting pips on the plain cards) the highest hand scores the number of cards in his fullest suit; for *sequence* (the greatest number of consecutive cards in any suit, or, if both hands are alike in this respect, the one whose highest sequence begins with the higher card; but no two cards make a sequence) the better hand scores as follows: If the best sequence is three cards, count 3; for four cards, 4; for five, 15; for six, 16; for seven, 17, etc. Sometimes all sequences are scored. For the *quatorze*, of four equal honor-cards, the highest scores 14, or if there are no sets of four, the highest set of three equal honor-cards counts 3, etc. The first player now plays a card. The opponent now scores his *carte blanche* if he has any, adds what other points he has, and then follows suit. Each player counts 1 for each lead; and if the second player takes a trick, he counts 1 for that. The one who takes the larger number of

tricks counts 10 for *cards*; if he takes all, he counts 40 more for *capot*. If the first hand makes 29 by preliminary scores, and 1 by first lead, he counts 30 more by *puja*; but if his first score comes up to 30 before his lead, he scores 60 more by *repique*; 100 or 101 points make the game, but there are several ways of scoring besides the above.

Piracicaba, pē-rā-sē-kaa-bā, or **Constituição**, kōn-stē-tū-sē-sōw: a city of the state of São Paulo, Brazil; on a river of the same name, a branch of the Tieté; 97 miles N. W. of São Paulo, with which it is connected by rail. It is the center of a rich coffee and sugar district, and has a thriving trade; a water-fall on the river is utilized for several mills. Pop. (1894) about 15,000. H. H. S.

Piracy [from Gr. *πειρατεία*, deriv. of *πειράς*, pirate, liter., one who makes attacks, deriv. of *πείρα*, trial, attempt, attack, deriv. of *πειράω*, try]: robbery on the high seas; depredations committed by persons without the commission or authority of any state. In the law of nations the essential element of the crime is the intention of preying indiscriminately on the human race, rather than a desire to inflict damage upon some particular nationality. As the high seas are not under the jurisdiction of any state, piracy is justiciable in any court. A pirate is a sea-rover who preys on the vessels and goods of any nation that he falls in with, or makes descents on the land for a similar purpose of plunder. A privateer exceeding its commission might not be accounted as a piratical vessel, but one with a commission from two *opposite* belligerents would be piratical, since the only motive for such a double commission is plunder of both parties and of vessels bound to the ports of either. The vessel of a part of a state, organized for rebellion and independence, has been held to be piratical, because, although it may have received a commission from the rebel government, it carries a flag unknown to international law, and offers no guaranty of legal belligerent behavior; but the better opinion is that as such a vessel does not scour the sea for the purpose of plunder, and wages war with but one nation, it wants two important characteristics of piracy. Piracy, in the international sense of the word, is a crime against all nations, but each nation in its own criminal code may class other crimes under this head; thus the U. S. made the slave-trade to be piracy for all its citizens on any ship, and for persons not citizens on its vessels; yet, for all that, the slave-trade, though it might be made criminal by the laws of all civilized nations, is not piratical in an international sense. A slave-trading vessel from the U. S. could not be captured by the cruisers of any other country without special treaty to that effect; but an act of strict piracy could be tried everywhere, for a piratical ship, as being at war with the world, could be captured by the vessel of any nation. As a rule, the search of one vessel by a public ship of another state is a war right only, but search on suspicion of piracy exists in time of peace. The usual penalty for piracy is the confiscation of the piratical ship and hanging of its crew. This shows the wide difference between piracy and privateering, since the penalty for the latter is at most imprisonment. Revised by T. S. WOOLSEY.

Piræus [= Lat. = Gr. *Πειραιεύς*]: a town situated about the chief harbor of **ATHENS** (*q. v.*), and connected with Athens by the celebrated long walls (see map of Greece, ref. 17 L.). It is a town of great commercial importance. Pop. (1889) 34,237.

Piranesi, pē-rā-nā-sē, GIAMBATTISTA: etcher and line-engraver and architect; b. at Venice in 1720. He first studied drawing with his mother's brother, but perfected himself in this art in Rome under Giuseppe Vasi, who taught him engraving also. He became an excellent architect. Clement XIII. employed him to restore the Church of the Knights of Malta near the Aventine. He is best known for his engravings of the monuments of Rome, ancient and modern, a work in sixteen volumes.—His son FRANCESCO, b. in 1748, was also an engraver, and continued this series after his father's death. Their works are scarcely distinguishable. W. J. SULLIVAN.

Piro: See **PUEBLO INDIANS** and **TAOAN INDIANS**.

Piron, pē-rōn', ALEXIS: author; b. at Dijon, France, July 9, 1689; studied law, but did not practice; left his native town chiefly on account of an improper ode he wrote; lived in Paris for a long time in obscurity; began to write for the minor theaters, and obtained admission to literary and elegant society by his brilliant sarcasm and ready wit; entered into a rather ludicrous rivalry with Voltaire as a

tragedian, but wrote an excellent comedy, *La Métromanie* (1738). When proposed as a member of the Academy he was rejected on account of his ode, not by the Academy, but by Louis XV. D. in Paris, Jan. 21, 1773. There is a collected edition of his works by Rigoley de Juvigny (7 vols., Paris, 1776).

Pisa, pee-zā, or pee-sā: capital of the province of Pisa, Italy; on the Arno; 49 miles W. by rail of Florence (see map of Italy, ref. 4-C). It is still a walled town, and is entered by six gates. The bridges are very fine, especially the Ponte del Mezzo, which spans the center of the semicircle formed by the Arno within the town. An aqueduct 4 miles in length supplies the town with water. The Duomo (or cathedral), founded probably in 1063, on the site of a palace of Hadrian, has a fine dome, and possesses several paintings by Cimabue, Andrea del Sarto, and others. The Baptistery (1154) and the Leaning Tower (1174) are both circular structures, the former 180 feet in height and 160 in diameter; the latter, 179 feet in height and 50 in diameter, with an inclination of 13 ft. 8 in. (the cornices being included), from the perpendicular. This position, it seems probable, was not due to the design of the architects, but was assumed during the progress of the work. The Campo Santo is adorned with frescoes by Benozzo Gozzoli, Orcagna, and others. The University of Pisa (1338) counts Galileo among its former pupils and professors. It has a natural history museum, a library of 120,000 volumes, and (1891) 64 teachers and 728 students. The town possesses an academy of fine arts and a botanical garden. Pisa is of very remote and uncertain origin. Under the first Roman emperors it rose to great prosperity, which lasted till the middle of the fifth century, after which time it shared in the common calamities of barbarian invasion. In 1003 the pope invited Pisa, then an independent republic, to assist in expelling the Saracens from the Roman territory. After wresting Sardinia, Corsica, and other places from the infidels, Pisa gave herself to commerce and the arts of peace, but her rapidly increasing power and wealth excited the jealousy of Genoa and of the other neighboring republics. Several Guelphic cities, instigated by Ugolino Gherardesca, a traitor noble of Pisa, united in a league against this Ghibelline commonwealth. The Pisans finally suffered a great naval defeat at Meloria in 1284. Henceforth, rival families and rival parties disputed the government of the city, but the commonwealth sustained itself, both against France and its own sister republics, until 1509, when it was forced to submit to Florence. From this time the history of Pisa is one with that of Tuscany. It was formerly a seaport, but, owing to the accumulation of deposits at the mouth of the Arno, is now about 6 miles distant from the sea, and its once important commerce has been transferred to Leghorn. There are manufactures of cottons and silks and coral and alabaster ornaments. Pop. (1893), with the suburbs, 61,500.

Revised by R. A. ROBERTS.

Pisa, Council of: a council called to heal the schism which had distracted the Church since 1378. It was considered oecumenical by Gallican theologians, but not by the Roman Catholic Church. Bellarmine says it was "neither clearly approved nor clearly rejected." It was summoned neither by pope nor emperor, but by fourteen cardinals (seven in each obedience) of the two rival popes. It met in the cathedral of Pisa, Mar. 25, 1409, and held its twenty-third and last session Aug. 7, 1409. It was composed of 24 cardinals, 4 patriarchs, 80 bishops in person and 102 by proxy, 87 abbots in person and 200 by proxy, the ambassadors of several governments, the representatives of 13 universities, and more than 300 professors and doctors of canon law. On June 5, 1409, the council deposed Gregory XII. of the Roman line and Benedict XIII. of the Avignon line, declaring them both to be schismatics, heretics, perjurers, and vow-breakers. On June 26, the 24 (some say only 22) cardinals elected Peter Philargi, who took the name of Alexander V. The reforms talked of were then adjourned for the consideration of a general council to meet in Apr., 1412. The Church now had three rival popes instead of two. F. M. C.

Pisagua: a town and port of the province of Tarapacá, Chili (formerly in Peru); 45 miles N. of Iquique; lat. 19° 36' 30" S. (see map of South America, ref. 6-C). A partial shelter is here afforded to ships by a projecting point. The town is built on a narrow space between the shore and a line of high cliffs; the whole surrounding country is a desert. Next to Iquique, it is the principal center of the

nitrate-trade; the product is brought down from the interior by rail. At the breaking out of the Chilian war this was a point of great importance; it was bombarded Apr. 18, 1879, and taken by the Chilians Nov. 2. During the civil war of 1891 it was the scene of severe fighting, changing hands several times. Pop. 8,000. H. H. S.

Pisan, CHRISTINE, de; poet; b. in Venice in 1364; d. about 1431. Her father, Thomas de Pisan (or Pezano), famous in his time for his knowledge of the speculative sciences and especially astrology, held a public position of influence. Hence he was drawn, soon after the daughter's birth, by a tempting offer of King Charles V. of France. Four years later, probably in 1368, he removed his family also to Paris, where they were received into the society of the court. In 1379 Christine was married to a Picard gentleman, by name Estienne du Castel, who died in 1389. Left with three children to a life of care and pecuniary difficulties, and tormented with lawsuits by unscrupulous persons, who had had business relations with her husband, she seems to have turned to writing almost of necessity. The example and care of her father had made her an excellent scholar, perhaps the best Latinist of her period in France. Her opinions were original, and she was able to estimate critically the ideas and tendencies she saw about her. Her acquaintance with great people enabled her to obtain an income from her works by dedications and similar means, and speedily her fame spread even beyond the borders of France. Her poetical manner seems to owe much to Guillaume de Machault and to Eustache Deschamps; but her prose, perhaps owing to her reading of classic models, has an amplitude and power all its own. In her earlier years she seems to have composed many of those light but gracious verses so popular at the time—ballades, lais, virelais, rondeaux, jeux à vendre, etc. Later she wrote a number of longer and more serious poems, including *Épître au Dieu d'Amours* (1399) and *Les sept Seauimes* (1410). Her prose works fall into several groups. The first deals with the dignity of woman, which had been maligned in the famous *Roman de la Rose* and other works. Here belong *La Cité des Dames* (1405 ?); *Le Livre des trois Vertus* (1406 ?); *Épîtres sur le Roman de la Rose* (1407). Another group contains works of a moral or didactic character designed primarily for men: *Épître d'Othéa à Hector* (1386 ?, in mingled verse and prose); *Le Corps de Policie* (1407 ?); *Faits d'armes et de Chevalerie* (1404-07), based largely on Vegetius. Finally we have works of an historical or patriotic kind: *La Vie et les bonnes Meurs du sage Roy Charles V.* (1404); *Lamentations sur les maux de la guerre civile* (1410); *Le Livre de la Paix* (1412-13). Besides the above works, we have a quaint biographical piece, *La Vision de Christine* (1405), and two versions from the Latin, which show Christine's love of moralizing. These are the *Dits Moraux*, in verse, based on the distiches of the so-called Dionysius Cato, and the *Livre de Prudence et l'Enseignement de bien vivre*, in prose, based on the treatise *De quatuor virtutibus*, attributed to Martin of Braga. In 1418 the poet entered a convent, and her voice was stilled until 1429, when the appearance of Jeanne d'Arc as the savior of France elicited from her the last and most beautiful of her poems. She seems not to have been living when her heroine met her sad fate.

There is no complete edition of the works of Christine de Pisan. The earlier poems are edited by M. Roy, 2 vols., Paris, 1886-91 (Soc. des anciens textes franç.); *Le Chemin du long Estude*, by R. Püschel (Berlin and Paris, 1881); *Le Dit de la Rose*, by F. Heuhenkamp (Halle, 1891). See also R. Thomassy, *Essai sur les écrits politiques de Christine de Pisan* (Paris, 1838); and F. Koch, *Leben u. Werke der Christine de Pisan* (Goslar, 1885), and *Ueber die Werke der Christine de Pisan* (in *Zeitsch. f. neufranz. Sprache u. Litt.*, 1886). A. R. MARSH.

Pisan'der (in Gr. Πελανδρος) OF RHODES: Greek epic poet who flourished, according to Suidas, about the middle of the seventh century B. C., but probably much later. Pisan-der is noteworthy for having first endowed Hercules with the club and the lion's skin, suggestive of sun-worship. It has been conjectured that he too fixed the number of labors at twelve, corresponding to the signs of the zodiac.

B. L. G.

Pisano, ANDREA: See ANDREA PISANO.

Pisano, GIOVANNI: See GIOVANNI DA PISA.

Pisano, GIUNTA: painter; b. at Pisa, Italy, 1190. He was the first who attempted to free himself from the By-

zantine traditions. One of his earliest works is in the Cathedral of Pisa, a *Crucifixion*. Examples of his art exist in Santa Maria degli Angeli at Assisi, as also in the upper church of St. Francis there. He may be considered to have prepared the way for Cimabue. D. in 1236. W. J. S.

Pisano, VITTORE, known also as **Pisanello**: Italian painter and medalist; b. at San Vigilio, in Veronese territory, in 1380. He studied painting under Altichieri da Zevio, and painted both in tempera and fresco. He worked in Venice in 1421-22 together with Gentile da Fabriano. Most of his works in fresco at Verona and elsewhere have disappeared. Of his easel-pictures only three exist, one of which, *St. Anthony and St. George*, is in the National Gallery, London. It is as a medalist that he is best known. D. in 1455 or 1456. W. J. S.

Piscary: See HEREDITAMENTS.

Piscary, Common of: See FISHERY LAWS.

Piscat'aqua River: a river which is for a few miles the boundary between Maine and New Hampshire; formed by the junction of Salmon Falls and Cochecho rivers, both of which furnish extensive and well-utilized water-power. Its lower course is tidal, and constitutes the harbor of Portsmouth, N. H. Drainage area, 550 sq. miles.

Piscataquis River: a stream which rises in Somerset co., Me., flows E., and reaches the Penobscot at Howland. Length, 71 miles. Drainage area, 1,276 sq. miles.

Pisces: the twelfth sign of the zodiac, which the sun enters Feb. 20. It formerly corresponded to the constellation of that name. Owing to the precession of the equinoxes, the constellation Pisces is now mostly in the sign Aries. It contains no prominent stars.

Pis'ciculture [Lat. *piscis*, fish + *cultura*, culture, care]: the artificial cultivation of aquatic animals, as described under the synonymous term FISH-CULTURE (q. v.). Resting upon the basis of scientific study and associated with adequate protective legislation, it is capable of maintaining the sources of supply utilized by the fishery industries. Piscicultural operations are extensively carried on by private individuals for profit and by governments for the public benefit.

European Fish-culture.—In Europe Dr. Nicolas Borodine reported 416 fish-hatcheries in 1891, all of which except 82 were private establishments occupied chiefly with trout and salmon culture. Governmental aid was extended in Norway, Switzerland, France, Italy, Great Britain, Austria, and Russia, named in the order of the number of hatcheries supported by them. Norway entered upon the work in 1850 and now takes first rank in the number of its establishments, the amount of its annual grant for fish-culture, and the results accomplished, having produced 200,000,000 cod in 1891 at its station at Flødevigen. Germany supports the once famous but now unimportant hatchery at Hünningen; France subsidizes a small private shad-hatchery at St.-Pierre-les-Elbeuf on the Seine, and contemplates the establishment of a piscicultural school at Gremaz, where M. Luginr invented a method of artificially propagating live food for young fish; Italy has hatching stations at Brescia and Rome; the Netherlands appropriates a small sum for planting salmon fry in the Rhine; Russia has a station principally for whitefish-culture at Nicholsk; and Scotland sustains a small marine hatchery at Dunbar. The Governments of New Zealand, Australia, and Japan also aid in restocking their public waters, their operations relating almost exclusively to the acclimatization of exotic salmon and trout.

Fish and Fishery Commissions.—Public fish-culture in many countries is conducted through the agency of scientific bureaux and associations. Thus in Norway operations are carried on by the Society for the Development of Norwegian Fisheries; the Netherlands has its commission for the sea fisheries, to which the Government refers all matters relating to fishery interests; in Germany the Deutscher Fischerei Verein (German Fishery Union) and the Commission for the Investigation of the German Seas are partly supported by public funds in their piscicultural work and scientific investigations; Scotland has a fishery board, chiefly for the inquiry into the proper basis of fishery legislation, but partly engaged in marine fish-culture at its Dunbar station. For the extent to which the Government promotes pisciculture in the U. S. see FISH-CULTURE. Newfoundland also maintains a superintendent of the fisheries, and is especially active in the propagation of the cod and the lobster.

Artificial Propagation.—Modern pisciculture includes

artificial as well as natural propagation and rearing of useful and ornamental water-animals, and the acclimatization of species in waters to which they are not native. The necessity of artificial propagation has become most manifest in interior waters where fishing operations and artificial obstructions have interfered with natural reproduction; also in shallow seas to which the shoals of gravid fish resort for spawning, just as the need of regulation has become evident to protect the seals on their shore breeding-grounds and the approaches thereto, the oyster on its flats, and the whale in its arctic nursery shallows.

Artificial propagation forms the basis of successful pisciculture, and has arrived at such a point of development that it affords many advantages over natural reproduction. Under natural conditions only a small percentage of the eggs cast by the female are impregnated. A. N. Cheney found by actual counting of eggs in a Canadian salmon river that only 2 per cent. had been fertilized. By the artificial method nearly all the eggs can be impregnated and hatched; it is common to hatch 97 per cent. of them. In a state of nature eggs are devoured by insects, fishes, birds, mammals, and other enemies; they are destroyed by freshets, crushed by logs, or smothered in mud and mill refuse. The young fish escaping these dangers are attacked incessantly by hosts of predatory animals as well as by larger individuals of their own kind. In a hatchery or pond station both eggs and young are protected almost entirely from all these destructive agencies, the growing fish are assorted according to size, and are regularly and properly fed.

Classification of Eggs.—The fish egg, like that of other animals, consists of the germ-cell, the yolk, and the yolk-membrane, and varies greatly in size according to the amount of its yolk element. After leaving the yolk-membrane, or shell, the young fish is nourished by the yolk for a period varying from a few days, as in the case of the pike-perch, shad, and bass, to several weeks, as in the case of salmon and trout. The eggs differ greatly not only in size and toughness of the shell, but also in their specific gravity, and they have been classified with reference to the latter property into: 1, heavy eggs, like those of salmon, trout, pike-perch, yellow perch, black bass, sea-herring, and smelt; 2, semi-buoyant eggs, as in the shad, whitefish, and sucker; 3, buoyant eggs, as found in the cod, haddock, mackerel, tautog, and cunner. Heavy eggs are again divided into adhesive and non-adhesive, according to the presence or absence of a glutinous covering on the yolk-membrane.

Hatching Apparatus.—Salmon and trout eggs were first hatched on gravel in perforated boxes placed in running water. Next in order came the Coste parallel glass tubes or grilles as a substitute for the gravel. In 1873 Holton invented a box intended to utilize an upward current of water passing through a number of egg-trays placed one above another, and escaping at the top. The Clark hatching-trough, also intended to economize space, is divided by watertight partitions into ten or twenty compartments, each containing a series of egg-trays. Water is introduced into the top of the first compartment, escapes at the bottom, passes over the top of the partition into the next compartment, and so on. The Williamson box resembles Clark's, but utilizes an upward current of water produced by a double partition. Livingston Stone substituted wire-trays or baskets for the egg-trays used in the Williamson box, placing in each basket numerous layers of salmon eggs. This form of apparatus was among those successfully employed by the U. S. Fish Commission at the Columbian Exposition at Chicago.

Heavy eggs are developed also in cylindrical glass jars, either open or closed at the top, the water being admitted near the bottom, directly or by means of a tube, and escaping at the top. Types of such devices are the Chase, the Wilmot, the Ferguson, and the McDonald jars. The upward current not only buoys up the eggs, but also facilitates the removal of dead eggs and other injurious substances. As the embryos developed from heavy eggs are unable to swim when first hatched, they must be removed to rearing troughs, where they are usually kept on gravel.

Adhesive eggs were formerly, and to some extent still are, collected on grass roots, twigs, panes of glass, or other surfaces to which they adhere during the incubation period. The apparatus was placed in running water or in an alternating upward and downward current, the water passing over one partition, under the next, and so on. The box used by Christian Lund in 1761, the smelt-hatching box of James Ricardo, employed in 1876, and the box devised at Gloucester,

Mass., by F. N. Clark in 1878, are among the early types. At the present time glutinous eggs—those of the pike-perch for example—are freed from their adhesive envelope by manipulation in a solution of starch or muck, and are afterward hatched like free heavy eggs.

Among semi-buoyant eggs those of the shad were formerly hatched successfully, but inconveniently, in a rectangular box invented by Seth Green. The box had a wire-cloth bottom, and was caused to float at a small angle to the current by means of long wooden cleats on the sides. This arrangement was intended to intensify the action of the current in buoying up the eggs. The boxes were placed in a stream, and required constant supervision to prevent injury to their contents. Variations of the Green box were made by Brackett, of Massachusetts, and by Stilwell and Atkins, of Maine. Semi-buoyant eggs are now developed in the jars used for heavy eggs with greater comfort and safety and an increased percentage of fry.

Buoyant eggs were first successfully hatched in large numbers in the U. S. by Capt. H. C. Chester in 1885 by means of the McDonald cod-hatching box modified by substituting large glass jars for the inner box of McDonald. That box was supplied with water through the center of the bottom, and had an intermittent siphon at each end, so arranged as to give a rise and fall of 5 inches, imitating tidal motion. The improved cod-hatching box of Marshall McDonald resembles the original pattern devised in 1880, but the inner wooden box has a slightly oval bottom covered with cheese-cloth, and a small additional current of water is introduced from the water-chamber through an opening near the bottom of the box, and this gives the eggs a rotary motion which is highly advantageous. The flow of water is from below upward.

Lobsters.—The hatching period of lobster eggs in 1892 varied from two days to thirty-five days, according to temperature of the water. The eggs did not begin to hatch until the water reached 54° F. The largest lobster brought to the Wood's Hole, Mass., station that year measured 12½ inches and had 24,300 eggs. The average number obtained was 12,000. The eggs are readily hatched in the cod boxes above referred to and in the jars used for heavy fish eggs.

Transportation of Eggs.—Fish eggs are usually shipped after the eye-spots are present between layers of damp moss or cotton, or on flannel or zinc bottom-trays lined with moss, and sometimes with a covering of clean snow. The temperature of the inside of the shipping-box is kept low by means of ice. Eggs are frequently sent before they have reached the eyed stage, notably pike-perch and whitefish eggs. The method of shipping shad eggs in bulk on flannel trays, introduced by U. S. Fish Commissioner McDonald, revolutionized the movement of such eggs from the field stations to distant hatching establishments.

Care of the Young.—No attempt is made to feed the young of marine fishes or of the fresh-water shad and pike-perch, the fry being released soon after hatching. Shad, however, have been successfully reared on natural food in ponds to the age of six months, when they are allowed to migrate seaward. The yolk-sac of salmon and trout sustains the fry during a period of thirty to fifty days after leaving the egg, but feeding usually begins a week or ten days before the absorption of the sac is completed. Raw liver ground very fine and passed through a sieve is used. This is diluted with water to the consistence of cream, and the fry are fed just enough to satisfy their hunger several times a day, care being taken to remove all refuse remaining on the bottom after feeding. The larvæ of gnats, mosquitoes, flies, and various small crustaceans, are employed at different stages of the growth of the young, and the flesh of domestic animals constitutes the principal food of older fish.

A series of rearing ponds is one of the most important adjuncts to a fish-hatchery. These should have an adequate supply of brook or river water, which for trout or salmon water should not exceed 70° in temperature in midsummer. The shape, size, and depths of ponds vary with the purpose for which they are intended, but each should have an independent supply and drainage to provide for complete isolation from the remainder of the series. A prime requisite is a bountiful supply of pure water under perfect control.

LITERATURE.—Among the numerous works upon piscicultural methods are the following: *Fischzucht*, by Max von dem Borne and others (Berlin, 1881); Hubrecht, *Oyster-culture and Oyster-fisheries in the North Sea* (1888); Huxley, *De la fécondation artificielle et* (Épinal, 1853); Coste, *Instructions sur la pisciculture* (Paris,

1856); Koltz, *Multiplication artificielle des poissons* (Brussels, 1858); Buckland, *Fish-hatching* (London, 1863); Francis, *Fish-culture* (London, 1863); Bertram, *Harvest of the Sea* (London, 1865; New York, 1866); Day, *Fish-culture* (London, 1883); Home, *Salmon and Salmon-fisheries* (London, 1883); Marston, *Coarse Fish-culture* (London, 1883); Maitland, *On the Culture of Salmonidae and the Acclimatization of Fish* (London, 1883); Maitland, *The History of Howietoun*; Kent, *Artificial Culture of Lobsters* (London, 1883); Day, *British and Irish Salmonidae* (London, 1887); Fry, *A Complete Treatise on Artificial Fish-breeding* (New York, 1854); Garlick, *A Treatise on the Artificial Propagation of Certain Kinds of Fish* (Cleveland, 1857); Marsh, *Artificial Propagation of Fish* (Burlington, Vt., 1857); Norris, *American Fish-culture* (Philadelphia, 1868); Green, *Trout-culture* (Caledonia, N. Y., 1870); Slack, *Practical Trout-culture* (New York, 1872); Klippart, *An Essay on Fish-culture* (Columbus, O., 1873); Stone, *Domesticated Trout* (Boston, 1873); Green and Roosevelt, *Fish-hatching and Fish-catching* (Rochester, N. Y., 1879); Hessel, *Carp-culture*, U. S. Fish Comm. Report, part iv.; Logan, *Carp-culture* (Youngstown, O., 1888); Mulerdt, *The Gold-fish and its Culture* (Cincinnati). Much varied information can also be obtained from the annual reports and bulletins of the U. S. Fish Commission, the reports of State fish commissions and of the Department of Marine and Fisheries of Canada, the journals of the Society of Acclimatization and the Society of Agriculture of France, the Transactions of the American Fisheries Society, the publications of the Deutscher Fischerei Verein, and of the fisheries departments of Norway and Finland, *The Field, Land and Water*, and *The Fishing Gazette* (London). TARLETON H. BEAN.

Piscidia erythria: a leguminous tree growing in the West Indies, popularly known as Jamaica dogwood. The wood of this tree is largely sold in commerce, and the bark has been employed for catching fish, as when placed in the water it stupefies them. It is supposed to possess considerable narcotic power, and to be a useful substitute for opium in some cases of insomnia due to pain. H. A. HARE.

Pisemskii, ALEKSEI TEOFIKTOVICH; author; b. in the village of Ramene, in the government of Kostroma, Russia, Mar. 20, 1820; d. Jan., 1881. During his youth he became familiar with the life of the people, and also saw something of the Freemasons, whom he afterward described in a poor novel, *The Freemasons* (1881). After studying mathematics four years in the University of Moscow, he entered the Government service (1844) in the town of Kostroma, but resigned (1853) and moved to St. Petersburg in order to devote himself exclusively to literature. After 1862 he lived in Moscow. His first novel, *Trufiak* (The Jester) appeared in 1850, his second, *A Love Match*, in 1853. The same year witnessed his best drama, *Gorkaia Sudbina* (A Bitter Lot), a powerful and painful piece that is still played. His greatest novel, *A Thousand Souls*, came out in 1858. Among his later books, which were especially attacks on the liberal tendencies of the time, *The Stormy Sea* (1863), *The Men of 1849* (1868), and *In the Whirlpool* (1871) are noteworthy. Some of his short stories, such as *Leshii* (The Wood Demon) and *Piterchik*, are masterpieces. Most of his dramas (*Veteran and Recruit*, *Baal*, *The Hypochondriac*, etc.) were less successful. He was an unsparing realist who painted with great force and fidelity low and repulsive characters, or the miseries of everyday life. His weakness lay in his utter absence of ideals. A complete edition of the novels and tales he had then written appeared in 1861-65; of his plays in 1874. Most of his best work has been translated into French and German. A. C. COOLIDGE.

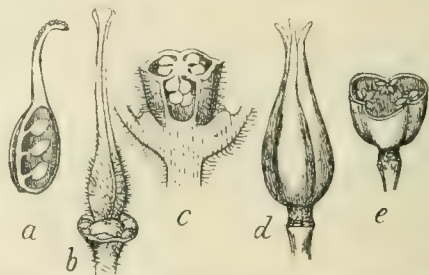
Pis'gah: a mountain of Palestine, E. of the Jordan, mentioned several times in the Pentateuch. It was the summit from which Moses obtained his view of the Promised Land (Deut. xxxiv. 1). In 1873 it was identified by Prof. John A. Paine, of the American Palestine Exploration Society, with *Siaghah*, 2,360 feet above the sea. Though not the highest summit of the range, it reaches out toward the valley so as to command a very wide prospect.

Pisidia: an ancient territory of Asia Minor, with varying and ill-defined boundaries, situated between Phrygia, Isauria, Cilicia, Pamphylia, Lycia, and Caria. It was inhabited by wild and predatory tribes, ruled by petty chiefs. The Romans never wholly subdued Pisidia, though they held possession of its chief towns—Antioch, its capital, Salagassus, and Selge. It is now included in the Ottoman vilayet of Konieh. E. A. G.

Pisistratus [= Lat. = Gr. Πεισίστρατος]: a tyrant of Athens, a son of Hippocrates, and a kinsman of Solon. When in 571 B. C. Solon left Athens for ten years in order to test the working of his laws, Pisistratus entered politics as an advocate of the cause of the lower classes, whose confidence he won. By a ruse he persuaded the people to give him a body-guard, which he gradually increased, until in 560 B. C. he felt himself strong enough to assume the rôle of tyrant. Later he had to flee the country, and lived in exile for five years, when, with the help of Megacles, he was restored to power. A second time he was banished, and remained in exile eleven years. The dates of his exile are variously given by chronologers. By the help of Thebans, Argives, and Naxians, he was again restored to power, and died on the throne in 527 B. C. Between 560 and 527 he was tyrant seventeen years and an exile sixteen years. As tyrant he was distinguished for his mildness and reverence for the laws of Solon, which in the main he left undisturbed. He was the patron of agriculture, the arts, and sciences. He built many public edifices, and caused the poems of Homer to be collected and edited. He was succeeded in the tyranny by his eldest son HIPPIAS (q. v.). J. R. S. S.

Pistachio-nut, or **Green Almond** [*pistachio* is from Span. *pistacho* < Lat. *pista'cium* = Gr. πισταχίον, pistachio-nut, deriv. of πιστάχ, pistachio-tree, from Pers. *pistah*. Cf. Arab. *fistag*]: the fruit of the pistachio-tree, *Pistacia vera* (family *Anacardiaceae*), which is common in the S. of Europe and in Asia and Africa. The nut is delicious for dessert. The kernel is somewhat like that of the almond, but is green. The nut yields a good table oil. To the same genus belong the mastich, the terebinth, and other valuable trees. Lamb fattened upon pistachio-nuts is a famous delicacy.

Pistil [from Lat. *pistillum*, pestle, so called from its shape]: the part of a flower which produces ovules. It normally occupies the center of the flower, the stamens, petals, and sepals, when present, surrounding it. It is a leaf-structure (phyllome), and in its simplest form consists of a single phyllome (technically a "carpel"), folded upward so



Pistils: a, simple of *Isopyrum*; b and c, compound of *Staphylea*; d and e, compound of *Ascyrum*; enlarged.

that its edges meet (a). Here the ovules normally grow upon the infolded edges (placentæ). In many cases two or more pistils (carpels) grow more or less perfectly into a compound structure (b c d e). Here the ovules still grow upon the phyllome edges, but these may be the edges of the same or of different phyllomes, according as each phyllome is fully infolded (b c), or only partially so, its edges joining with those of other phyllomes (d e). In the pistils of many plants the placenta undergoes some displacement; thus the ovules may be on the surface or the midrib of the carpel.

In every pistil, whether simple or compound, the enlarged, ovule-bearing part is called the ovary, the more or less slender portion above it is the style, and this is terminated by the stigma. The style may be very long, as in Indian corn, where it is known as the "silk," or very short, or even wanting, as in the barberry. The stigma is composed of a soft, specialized tissue, commonly exuding a sticky substance, and designed for the reception of the pollen. It may be a cap on the summit of the style, a surface extending downward for some distance, or it may be more or less branched.

A flower may have many simple pistils, and this appears to have been the condition in primitive flowers, now illustrated by the crowfoots (*Ranunculaceae*) and water-plantains (*Alismaceae*); more commonly, however, the pistils have united into a single compound pistil, as in the great majority of flowering plants. Moreover, many compound

pistils have undergone such structural simplification that they often appear to be simple, as in the composites, where the bicarpellary pistil has but a single ovule, and appears at first sight to be monocarpellary.

Although the pistil normally occupies the inner and upper part of the flower (then said to be *superior* to the other organs), it may seem to be below the other parts by the growth of the latter above it (when it is said to be *inferior* to the other organs), as in the composites, irises, and orchids. As the seeds form, the pistil (now called the *pericarp*) undergoes certain modifications, sometimes becoming fleshy, sometimes wholly or in part hard and stony, while sometimes it simply dries into a brittle pod.

CHARLES E. BESSEY.

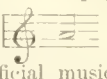
Pistoja, *pīstō-yā* (anc. *Pistoria*); town in the province of Florence, Italy; 21 miles N. W. of the city of Florence (see map of Italy, ref. 4-D). It lies in a fertile valley between two spurs of the Apennines, one of which separates the valley of the lower Arno from that of the Ombrone, a torrent flowing a little to the E. of this town. A wall, rhomboidal in outline, surrounds the town, which is entered by four gates besides the railway barrier. The streets are wide and well paved, and the squares large. The cathedral, in form an ancient basilica, was built in the twelfth century, rebuilt by Niccolò da Pisa, and since modernized. It contains a famous silver altar and the cenotaph of Cino da Pistoja. San Bartolomeo, San Giovanni, and Sant' Andrea are all churches of very ancient dates; the last named contains a pulpit of white marble (1301) exquisitely wrought in alto-rilievo; also a marble group by Niccolò da Pisa. The bishop's palace is an imposing edifice. The façade of the hospital is decorated with remarkable terracottas by the younger members of the Della Robbia family, representing the seven works of mercy. In 62 B. C. Catiline was defeated here. Gregory the Great sent Pistoja its first bishop in 594. After a long period of prosperity the town fell under the dominion of Florence early in the fourteenth century. The manufactures of Pistoja consist chiefly of linens, glass, needles, and especially firearms. Pistols are said to have been first made here, a fact which is thought by many to explain their name. Pop. (1892) 20,190.

Pitaval, *pē tā vāl'*, FRANÇOIS GAYOT, de; legal writer; b. at Lyons, France, in 1673; d. in Paris in 1743. After serving for a time in the army he studied law, and, being admitted as an advocate in 1713, practiced in Paris, and acquired a name by his publication of *Causes célèbres et intéressantes* (20 vols., Paris, 1734-43), which was a collection of celebrated law cases and their decisions. It was continued after the death of Pitaval by François Richer (22 vols., Amsterdam, 1772-88). In 1842 Hitzig and Häring began a similar collection at Leipzig, under the title of *Der neue Pitaval*, which was afterward continued by Vollert. He undertook a number of collections similar to *Causes célèbres*, some of which were of a more frivolous character. Among the most celebrated are the *Bibliothèque des Gens de Cour, ou Mélanges curieux, des bons mots de Henri IV., de Louis XIV., etc.* (2 vols., Paris, 1772, and 8 vols., 1746); *L'art d'orner l'esprit ou l'amusant* (2 vols., Paris, 1748); *Esprit des Conversations agréables* (3 vols., Paris, 1731); *Saillies d'esprit* (2 vols., 1732). Revised by F. STURGES ALLEN.

Pitcairn Island: island in the Pacific Ocean; in lat. 25° 3' S., lon. 130° 6' W. Area, 1½ sq. miles. It is the only place on the route from South America to Otaheite in which fresh water can be procured. It was discovered in 1767 and colonized in 1790 by nine mutineers from H. M. S. *Bounty* and eighteen Tahitians—six men and twelve women. After successive murders there were left on the island in 1800 one Englishman who called himself John Adams, together with eight or nine women and several children. From these the present inhabitants, about 150, are descended. They came under British control in 1839. See NORFOLK ISLAND and T. B. MURRAY'S *Pitcairn Island* (new ed. 1885).

Pitch: in music, the degree of acuteness or gravity of a sound, as distinguished from its other qualities, as loudness, harshness, or smoothness, etc. The fixing of some invariable standard of pitch, whereby any given note of the scale shall represent a sound of one and the same degree of acuteness in all written music, has been an object of interest and importance from the first rise of musical science. It is improbable that in early times, when music was in its rudest state, there was any standard corresponding to what we now call *concert-pitch*; for though the ancient Greeks had a certain familiarity with the relations and or-

der of intervals, yet the very imperfect nature of their instruments seems to forbid the conclusion that the adjustment of such instruments to a strictly accurate pitch was an object of much practical importance. There is much room for conjecture in regard to the mode in which the pitch of the scale came to be settled by common consent as it stood, for instance, in the fifteenth or sixteenth century. It is probable that the organ-builders of that period contributed as much to the settlement of the question of pitch as those who found its solution in the doctrine of vibrations. The organ-builder knew that an open pipe about 2 feet long and of moderate diameter would give the sound which we now call "middle C"; and the theorist knew that the column of air in such a pipe would make 512 vibrations in a second of time; but in all such cases the practical issue would prove of more immediate consequence than the theoretical; and the fixing of any one sound by a pipe of a certain length would be, in fact, the fixing of the whole scale above and below, whether that sound were taken as tonic, dominant, or any other term in the octave. When by this or any other means a standard of pitch was once established, conformity to it would almost necessarily follow in vocal exercises and in the construction and tuning of instruments generally. This conformity, however, has never been strictly exact, either in time or place. From the seventeenth century down to the death of Beethoven evidence shows that the pitch was practically the same in various countries. From this date, however, the orchestral wind instruments began to be much improved in construction, and their manufacturers and players alike discovered that a slightly higher pitch much enhanced the quality and brilliancy of the instruments. As the strings were obliged to tune to the wind instruments, a gradual rise of pitch necessarily ensued, affecting voices as well whenever orchestral accompaniment was employed. In 1878 it was stated that the pitch at the Italian opera in London (not the pitch of Italy) was a semitone above that of Beethoven's day. All attempts to better this state of things in England have failed. The vocalist singing with orchestra must either have the piece transposed downward or tax his throat. Unfortunately this is not always a mere question of compass or endurance, but of a changed quality as compared with the composer's design.

In 1858 the French Government appointed a joint commission of distinguished musicians and physicists to examine and determine the question.  They reported in Feb., 1859, fixing the standard A at 435 double vibrations per second. This was confirmed by law, and has had a most beneficial musical influence in France and elsewhere. In the U. S. more or less discrepancy has existed, principally through the desire of piano-manufacturers to retain a high pitch for the sake of greater brilliancy. The orchestral pitch has not been so high as the English, although a trifle higher than the French. It was agreed, however, by the principal piano-manufacturers in convention at New York that the trade should adopt the French standard pitch (A = 435 double vibrations per second) for all musical instruments manufactured in the U. S., and that the change be accomplished on the part of all manufacturers by July 1, 1892. In view of the above the well-chosen title of "international pitch" was adopted as agreeing with that of France, Italy, and Germany. D. B.

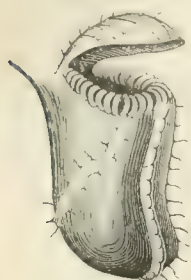
Pitch: See TAIL.

Pitchblende: See URANINITE.

Pitcher, THOMAS GAMBLE: soldier; b. at Rockport, Ind., Oct. 23, 1824; graduated at the U. S. Military Academy, and entered the army as brevet second lieutenant of infantry July, 1845; served with his company in Texas throughout the Mexican war, receiving brevet of first lieutenant at Contreras and Churubusco; attained a captaincy 1858; served on the frontier till 1861; was severely wounded at the battle of Cedar Mountain, Aug. 9, 1862; was appointed brigadier-general of volunteers Nov., 1862, and on recovery from his wound served as assistant provost-marshal-general. He was appointed colonel Forty-fourth Infantry in 1866; transferred to First Infantry 1870; superintendent U. S. Military Academy 1866-70; governor of Soldiers' Home 1870-78; retired June, 1878; superintendent of New York State Soldiers' and Sailors' Home 1880-87. D. at Fort Bayard, N. M., Oct. 21, 1895. J. M.

Pitcher-plants: plants which have their leaves, or some considerable portion of the leaf, in the form of a pitcher,

urn, trumpet-shaped tube, or other hollow vessel (technically called an *ascidium*) capable of holding water. The principal kinds belong to five different genera of plants in three families, which have no near relationship or resemblance except in the pitchers. All, or nearly all, are insectivorous. One, of a single species, peculiar to Southwestern Australia, is thought to belong to the Saxifrage family, where it stands alone. It is named *Cephalotus follicularis*. The leaves are all in a cluster next the ground; some are flat and of ordinary conformation; others are oval pitchers, hanging from a short stalk near the top on one side, and

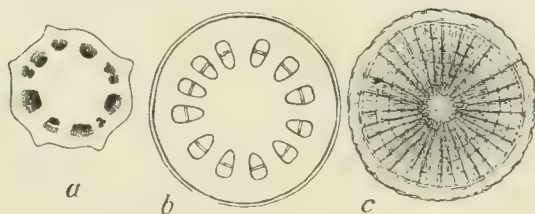


Cephalotus.

fitted with a lid, which neatly covers the mouth, resting at first upon a thickened and crested ring which surrounds and strengthens the orifice, but opening on its hinge as soon as the pitcher is full grown. It has long been observed that this pitcher secretes a watery fluid and entraps many insects. Little more is yet known as to its action, although the plant has long been in conservatories; but it is difficult of cultivation. The other pitcher-plants belong to two families, which so far as known contain only pitcher-bearing plants. One of them, *Nepentaceae*, consists of numerous species of one genus, chiefly inhabiting the Indian Archipelago; the other, *Sarraceniacae*, is wholly American, mainly North American, and consists of three genera—one, of a single species in the mountains of California; another, of one species, in the mountains of British Guiana; the third, of several species, confined to Atlantic North America. This is *Sarracenia*. The pitchers are all at the root, and appear to rise from the ground in a cluster. Instead of a lid, they have a sort of hood at the top, and a projecting wing runs down the inner or upper side from top to bottom. See INSECTIVOROUS PLANTS and NEPENTHES. Revised by CHARLES E. BESSEY.

Pitchstone: See OBSIDIAN.

Pith: the central, usually soft, tissue in the stems of dicotyledonous plants. When the stem is young it consists throughout of uniform tissue, in which fibro-vascular bundles arise by a differentiation of the cells in certain columns equidistant from the center (*a*). The tissue inside of the



Cross-sections of dicotyledonous stems.

ring of bundles is the pith, and it is evident that that lying outside of the ring, the primary bark, is a part of the same tissue-mass. As the bundles become larger the pith and bark become more widely separated (*b*), and here the connecting radiating portions are known as "medullary rays." In woody stems the fibro-vascular bundles crowd so closely against one another that the connecting medullary rays are very thin, now known as the "silver grain" of wood (*c*).

The pith is continuous from the main stem into all its branches and branchlets. During the first year or two (rarely longer) the pith-cells are active, and are used for the storage of starch and other foodstuff; after this they die and are functionless.

CHARLES E. BESSEY.

Pithom [Egypt. *Pa-Tum*, dwelling of Tum or Atum; Copt. *Pethom*; Gr. Πάτρουμος]; the Hebrew name of one of the "store-cities" of Egypt, built by the Israelites (Ex. i. 11) for Ramses II., at the east end of the Wadi Tumilat, just W. of the line of the Suez Canal, and at the present railway station, Ramses. The site was discovered by Naville in 1883 (*Store-city of Pithom*, 3d ed. 1888, first *Memoir* of the Egyptian Exploration Fund). The civil name of the place was Theku-t (Succoth), the second station mentioned in the Exodus itinerary. The discovery was particularly important, because it tended to fix both the date and the route of the Exodus. The general view is that the Exodus occurred under Menepthah, the follower of Ramses II. See also HEROÖPOLIS.

CHARLES R. GILLET.

Pitman, Sir ISAAC: founder of the Pitman system of shorthand; b. at Trowbridge, Wiltshire, England, Jan. 4, 1813; was educated in the normal college of the British and Foreign School Society at London; was appointed master of the British School at Barton-on-Humber 1832; established a similar school at Wotton-under-Edge 1836; published *Stenographic Shorthand* (1837) and *Phonography, or Writing of Sound* (1840), giving the principles of his invention of a superior method of shorthand called phonography, since so widely diffused as almost to have extinguished the earlier systems; removed to Bath, where he conducted a school 1839-43; devoted himself to the perfection and propagation of phonography and its complement phonetics; founded in 1843 the Phonetic Society, and established the Phonetic Institute, a printing-office from which he has brought out for many years *The Phonetic Journal* (weekly, with a lithographed *Supplement*); issued several revised manuals of phonography and a considerable number of standard works in phonetic printing. His most complete professional work is the *Phonographic Reporter's Companion* (1853). His system was introduced into the U. S. by S. P. Andrews and A. F. Boyle in their *Complete Phonographic Class-book* (1847), soon followed by many similar works. He was knighted in 1894. D. Jan. 22, 1897. See Reed's *Biography of Isaac Pitman* (1890).—His brother, BENN PITMAN, b. at Trowbridge, July 22, 1822, lectured on phonography in Great Britain 1843-52, and aided his brother in compiling text-books; removed to the U. S., settling at Cincinnati, where he devoted himself to phonography; published a *Manual of Phonography* (New York, 1855); reported the treason trials at Indianapolis (1865) and the trial of the assassins of President Lincoln (New York, 1865). In 1873 he abandoned reporting and became connected with the school of design, now the art academy of the University of Cincinnati, as lecturer and teacher. With Jerome B. Howard he published *The Phonographic Dictionary* (1883). His present system differs slightly from that of his brother.

Pito: See CHICA.

Piton Bark: See CARIBBEE BARK.

Pitra, pē'tra', JEAN BAPTISTE: ecclesiastic and author; b. at Champforgeuil, Saône-et-Loire, France, Aug. 31, 1812; took holy orders; became a member of the Benedictine congregation of Solesmes; published *Spicilegium Solesmense* (5 vols., Paris, 1852-60); was commissioned in 1858 by Pius IX. to write a history of Oriental rites and canon law, of which the first volume appeared in 1864, second in 1868, under the title of *Juris Ecclesiastici Græcorum Historia et Monumenta*. He became a cardinal Mar. 16, 1863; librarian of the Vatican in 1869, and cardinal-bishop of Frascati 1879. D. Feb. 3, 1889.

Pit River Indians: See PALAIHNIHAN INDIANS.

Pitt, WILLIAM: See CHATHAM, EARL OF.

Pitt, WILLIAM, generally called the YOUNGER PITT: statesman; second son of the Earl of Chatham; b. at Hayes, near Bromley, Kent, England, May 28, 1759; being of delicate constitution, he was educated by private tutor until he entered the University of Cambridge, in 1773; was called to the bar in 1780. He was elected M. P. for the pocket borough of Appleby in Jan., 1781, and allied himself to the opposition party under the leadership of Shelburne, and by brilliant speech at once won a position as a leader. Although he opposed the ministry on many occasions and denounced the war with the American colonies, he did not unreservedly ally himself to the opposition. He refused office under the Whig ministry of Rockingham, and at this time began the only partially successful advocacy of parliamentary reform which marked his political career. On the death of Rockingham he was given the great place of Chancellor of the Exchequer by Shelburne, who was made First Lord of the Treasury, in July, 1782. In 1783 Pitt resigned office with Shelburne, who was driven from power by the coalition of North (who had been leader of the Tories) with Rockingham and Fox, who had been Whig leaders. In the next session a cabinet was formed by North and Fox, who were made Secretaries of State with ostensibly equal power, and peace was made with the American colonies on terms practically the same as those of the treaty the negotiation of which had contributed to the downfall of the Shelburne ministry; but Fox's bill for transferring the government of India from the East India Company to seven commissioners was defeated, and the coalition cabinet compelled to retire. Pitt, in Dec., 1783, was called upon to form a new cabinet, be-



ing made First Lord of the Treasury and Chancellor of the Exchequer, and HENRY DUNDAS (*q. v.*) became his chief counselor and adviser. Although Pitt had a good majority in the House of Lords, in the Commons he was opposed by practically all the great parliamentary debaters of his day, including Fox, Burke, North, and Sheridan. Although met with repeated adverse votes in the Commons he refused to resign or dissolve Parliament until, in 1784, he had succeeded in obtaining a majority, and then dissolved Parliament. At the general election he obtained a large majority and was established in the position of leader of the ministry, which he maintained for fourteen years. His administration was marked by parliamentary reforms, the establishment of the right of Parliament to provide for the exercise of supreme power during the incapacity of the king, the putting down of direct parliamentary corruption, and the abolition of many sinecures; reform in the system of collecting revenues and making loans, the reorganization of the Indian government upon the basis which continued until the abolition of the East Indian Company in 1858, the revision of the system of trade duties, and the making of an enlightened commercial treaty with France. He remained strictly neutral with regard to the opposing parties in the French Revolution, but in response to the pressure of public opinion he declared a war against the French Jacobins, which was weakly and unskillfully conducted, and marked by many disasters. His lack of success in this war, and the severity of his suppressive measures for putting down Jacobinism at home, weakened his position, and in Mar., 1801, on the failure to carry out his plan for uniting England and Ireland and removing the disabilities of the Roman Catholics, he resigned office. A new ministry was formed which concluded the Peace of Amiens in May, 1801, but in 1804 the ministry was defeated and Pitt was recalled. He formed a new ministry, made up, with the exception of Henry Dundas, of men of inferior talents, the king refusing to allow Fox to be summoned and Fox's friends refusing to accept positions without him. In 1805 he was driven from office and, embittered by England's reverses, he died at Putney, Jan. 23, 1806. F. STURGES ALLEN.

Pitta: a generic name, adopted as a common name for any bird of the family PITUIDE (*q. v.*).

Pit'tacus (in Gr. Πίττακος): one of the Seven Wise Men of Greece; b. at Mytilene in Lesbos 652 B. C.; as a leader of the democratic party participated very actively in all the feuds and embroilments of his native city, and in 589 B. C. was chosen *æsymetes* (ruler with absolute power), which office he filled to 579 B. C. D. 569 B. C. Of his acts as a ruler nothing is known; of his elegiac poems Diogenes Laertius has preserved a few lines. Revised by J. R. S. STERRETT.

Pit'tidæ [Mod. Lat., named from *Pit'ta*, the typical genus, from Gr. πίττα, pitch]: a family of passerine birds popularly known under the name ant-thrushes. They are larger than the thrush, with a large head, plump body, short, even tail, and, for a passerine bird, remarkably long legs. They are strikingly or showily colored with black, white, red, and peculiar metallic blues. They are inhabitants of India and the contiguous regions, as well as Western Africa, Australia, and Madagascar, where alone the species of *Philopitta* are found. The family embraces only two genera—i. e. *Pit'ta* and *Philopitta*. F. A. LUGAS.

Pittosporum Family: the *Pittosporaceæ*; dicotyledonous shrubs and trees, with alternate leaves; flowers perfect, dichlamydeous; sepals and petals five each, free or coherent; stamens five, free; superior ovary, mostly bicarpellary, one-celled, many-ovuled. About ninety species are known, all natives of the region S. of the Equator (exclusive of South America). The largest genus, *Pittosporum*, is represented by many shrubby species which are commonly grown in conservatories, notably *P. tobira*, *P. viridiflorum*, *P. eugenioides*, etc. Species of *Sollya*, *Banksiana*, and *Marianthus*, all natives of Australia, are grown, also, in conservatories. CHARLES E. BESSEY.

Pittsburg: city; Crawford co., Kan.; on the Atch., Top. and S. Fé. the Kan. City, Ft. Scott and Mem., the Kan. City, Pitts. and Gulf, the Mo. Pac., and the St. L. and San Fran. railways; 10 miles S. E. of Girard, the county-seat (for location, see map of Kansas, ref. 7-K). It is in a coal-mining region, and contains zinc-works, a public high school, 3 national banks with combined capital of \$250,000, a State bank with capital of \$10,000, and 2 daily and 5 weekly newspapers. Pop. (1880) 624; (1890) 6,697; (1895) 8,982.

Pittsburg, or Pittsburgh (*Pittsburg* is the spelling adopted by the U. S. postal authorities; *Pittsburgh* is that of the municipal authorities): city; capital of Allegheny co., Pa.; at the confluence of the Allegheny and Monongahela rivers, which here form the Ohio river; on eight main and several branch lines of railway; 148 miles S. of Erie, 354 miles W. by N. of Philadelphia (for location, see map of Pennsylvania, ref. 5-A). It is 698 feet above tide-level at Philadelphia, is picturesque in its location and surroundings, has a length of 8 miles and an extreme width of 5 miles, and has an area of 27½ sq. miles. It is the second city in the State in population, manufactures, and wealth. The town originally occupied a very limited plateau between the Allegheny and Monongahela rivers, and was closely environed by lofty hills. As the city enlarged its borders these hills were at first either cut down or greatly reduced, but afterward they were left undisturbed as to size, and the city now spreads for miles over the hilltops, Herron Hill, 535 feet above the city datum line, being the highest, and Highland Avenue, 372 feet, being one of the most beautifully improved portions of the city. There are 405 miles of streets, of which 175 miles are paved and 105 miles sewered, and they are lighted by 1,600 arc-lights of 200-candle power, and by over 2,400 gasoline and 150 incandescent lamps. The city is connected with Allegheny and other suburbs by seventeen bridges, twelve for general traffic and five for railways. The principal lines of railways centering in Pittsburg are the Pennsylvania system, the Baltimore and Ohio, and the Vanderbilt system. The Allegheny, Monongahela, and Ohio rivers form a waterway for an enormous freight and passenger traffic, extending 100 miles N. by the Allegheny, 100 miles S. into West Virginia by the Monongahela, and by way of the Ohio river S. to the Gulf of Mexico, W. to the foot of the Rocky Mountains, and N. to the Canadian border. During 1892 the river tonnage of freight originating in Pittsburg was 4,804,855 tons; railway tonnage, 37,999,392 tons—a total of 42,804,247 tons, which was larger than that of any other city in the U. S., and was claimed to be the largest in the world. Navigation on the three rivers has been greatly facilitated by the construction of dams principally on the movable plan. The greatest achievement in the way of river improvement is the Davis island dam, 5 miles below the city, on the Ohio river; this is the first of a series of movable dams for the permanent improvement of the river. The lock is 600 feet long and 110 feet wide; length of dam and width of lock, 1,333 feet. The dam creates a lake or pool of navigable water 8 miles long, throwing around Pittsburg a fine harbor unaffected by drought or low water in the rivers. Over seven years were spent in its construction. During periods of high water no dam or obstruction of any kind appears in the river, but as soon as the water begins to recede the wickets are raised and a uniform depth of water is preserved. The cost was about \$1,000,000.

Pittsburg is the center of the greatest natural-gas field in the U. S. It is estimated that \$30,000,000 are invested in the production and distribution of this smokeless fuel for domestic purposes and light manufacturing. The city is also the center of the petroleum-producing territory. Within a radius of 30 miles the production averages 40,000 barrels daily, three-fifths of the output of the U. S. The total annual value is \$10,000,000.

The bituminous coal-field by which Pittsburg is surrounded is estimated at 10,000 sq. miles in extent; 126 mines are operated, all owned by Pittsburg firms, employing 15,000 persons, whose wages reach about \$6,500,000 per annum. The production in 1890 was 10,085,085 tons. The output of coke in the Pittsburg region in 1892 from 17,327 ovens aggregated 6,300,691 tons; value, \$11,971,232. The region contains a total area of 87,776 acres, 11,219 of which have been mined and 683 reserved for buildings. All the plants are owned and operated by Pittsburg firms, and the output was 65 per cent. of all coke made in the U. S.

Pittsburg produced in 1892 one-fifth of the entire amount of iron and steel manufactured in the U. S. The 26 blast furnaces and 62 rolling-mills in the territory produced 1,775,257 tons of pig-iron, 55,722 tons of crucible steel ingots, 1,550,252 tons of all other kinds of steel, 1,188,727 tons of rails, bars, bolts, rods, shapes, and skelp-iron, and 248,369 tons of sheets and plates. More than half of the Bessemer steel, rolled iron and steel, rails, and plates and sheets made in the U. S. is manufactured here, making a total product of steel and iron of 4,818,327 tons. The several plants of a great corporation, capitalized at \$25,000,000, produced in one month 100,000 tons of pig-iron from spiegel

and ferro-manganese ores, 100,000 of coke, and 50,000 of limestone. In addition there was made and shipped a finished product of over 100,000 tons, consisting of open-hearth and Bessemer steel blooms, billets, slabs, plates for boilers, bridges, tanks, and various structural shapes, Bessemer steel rails from 16 to 85 lb. per yard, car-forgings, and wire nails. The capacity of one plant for the manufacture of steel rails exceeds 16 miles of single track per day. Pittsburg is the leading plate-glass center of the world, having within a radius of 40 miles seven immense factories, with a yearly capacity of 13,500,000 sq. feet. These factories represent a direct investment of more than \$10,000,000, and give employment to 5,000 people, and indirectly to many more in the immediate vicinity. Twenty-three firms are engaged in the manufacture of flint and lime glass. The annual production of tableware alone is about 24,000 tons; of bottles upward of 60,000,000; of lamp-chimneys upward of 40,000,000; and one firm alone has produced 18,552,000 tumblers in a year. The product of window glass in 1893 was 1,414,000 boxes, equal to 70,720,000 feet, or about 25 per cent. of the total product of the U. S.

The locomotive-works turned out 231 standard and narrow gauge engines during 1893, ranging in weight from 5 to 65 tons; capacity of the works, 400 locomotives per annum; capital invested, \$551,000; persons employed, 1,025; wages paid, \$558,000. Other industries include the manufacture of artistic brass goods, fire-brick, salt, stoves, building-brick, chemicals, white lead, and paper. There are 23 large wholesale grocery houses in the city whose operations exceed \$25,000,000 a year; 6 houses engaged in the dry-goods and carpet trade whose yearly sales approximate \$15,000,000; and 4 clothing houses whose annual sales exceed \$4,600,000.

Conspicuous among the public buildings of the city are the county buildings, cost \$2,500,000; Carnegie Library, at the entrance to Schenley Park, cost \$1,100,000; U. S. custom-house and post-office, cost \$1,500,000; and the exposition structure on the site of Fort Duquesne, notable for its unusual size and beauty. The city contains 187 churches, with a membership of 103,757, of which 147, with 48,841 members, are Protestant, and 40, with 56,916 members, are Roman Catholic. The Protestant Church property is valued at \$5,539,950, and the Roman Catholic at \$1,373,000. The latter Church maintains 14 religious houses. In 1894 there were 68 public-school buildings, which cost \$3,917,000, including a new High School building, which cost \$250,000; 36,000 pupils, and 727 teachers. The High School building is used exclusively for normal and commercial classes. Among the charitable institutions are seven hospitals: the Western Pennsylvania, the Homœopathic, the Mercy, the Pittsburg Infirmary, the Home for Incurables, and St. Francis's and St. Mary's hospitals. There are two public parks: Schenley, the gift of Mrs. Schenley, of England, formerly of Pittsburg, a tract of 500 acres endowed by nature with rare beauty, and Highland, a tract of about 150 acres, which connects the East End with the Highland reservoir. The city in July, 1894, contained 30 national banks with a combined capital and surplus of \$20,841,625, and 24 State banks with capital and surplus of \$7,589,241. There were 50 newspapers of all kinds, of which 9 were dailies, and the remainder weekly, religious, and social papers.

The territory occupied by the city of Pittsburg and Allegheny County was originally claimed by the French, on the grounds of discovery and explorations by La Salle in 1669. Traders and Indians followed soon after and made a lodgment in what promised to be a valuable acquisition of territory. The French resolved to expel the traders, and sent Capt. Celeron de Bienville with a company of soldiers and Indians in 1749 to take military possession of the land, claimed as far as the mouth of the Wabash river. On Nov. 23, 1753, George Washington arrived, under orders from Gov. Dinwiddie of Virginia, to establish a fort at the junction of the Alleghany and Monongahela rivers. While the erection of this work was in progress the French, led by Gen. Contrecoeur with a large force of soldiers and Indians, fell upon the little band under command of Ensign Ward and compelled it to surrender. This was the beginning of the French war. The expulsion of the traders was followed by the erection of Fort Duquesne, named in honor of the governor of Canada. The English Government determined to regain the territory, and to this end sent Gen. Braddock with a large force of English and Virginian troops to drive out the French. The expedition met with a disastrous defeat in the famous battle of Braddock's Fields, July 9, 1755, at the

hands of the French and Indians. Fort Duquesne was abandoned and burned Nov. 24, 1758. Gen. Forbes at once took possession, rebuilt the fort, and named it Fort Pitt in honor of the great English statesman. Pop. (1880) 156,389; (1890) 238,617. GEORGE H. ANDERSON.

Pittsburg Landing: See SHILOH.

Pittsfield: city (site granted to Boston in 1735, known as Boston Plantation till its incorporation as a village under its present name in 1761, chartered as a city in 1890); county-seat of Berkshire co., Mass. (for location, see map of Massachusetts, ref. 2-C); between two branches of the Housatonic river; on the Boston and Albany, and the Berkshire division of the N. Y., N. H. and Hart. railways; 50 miles E. S. E. of Albany, N. Y., 53 miles W. N. W. of Springfield. It is on a plateau nearly 1,200 feet above sea-level, in a beautiful valley between the Hoosac Mountains on the E. and the Taconic Mountains on the W., through which flow the Hoosac and Housatonic rivers, and is partly surrounded by hills some 600 feet higher than the plateau. There are several lakes which discharge into the Housatonic river, from one of which, Ashley, is derived the supply of water for domestic purposes. The lakes and branches of the river afford fine power for manufacturing. The city has gas and electric light plants, 3 public parks, county court-house of white marble that cost nearly \$400,000, Athenæum building that cost \$100,000 and contains an art gallery, a museum, and a free library; Hospital of the House of Mercy, Old Woman's Home, Training-school for Nurses, 3 national banks with combined capital of \$825,000, 2 savings-banks with deposits of \$3,212,619; and 2 daily and 5 weekly periodicals. There are 11 churches, 24 public-school buildings, public-school property valued at over \$215,000, and 15 cotton and woolen mills, 3 shoe-factories, 2 machine-shops, a paper-mill, and other industrial works. The Berkshire Agricultural Society (1810) has large exhibition-grounds. Pop. (1880) 13,364; (1890) 17,281; (1895) 20,461. EDITOR OF "JOURNAL."

Pittston: city; Luzerne co., Pa.; on the Susquehanna river, near the mouth of the Lackawanna, and the Del., Lack. and West., the Del. and Hudson, the Lehigh Valley, the Cent. of N. J., the Erie and Wyo. Valley, and the Wilkesbarre and East. railways; 8 miles N. E. of Wilkesbarre, the county-seat, and 10 miles S. E. of Scranton (for location, see map of Pennsylvania, ref. 3-H). It is the geographical center of the Wyoming anthracite coal-field, which is about 50 miles long and 5 miles wide, and is in an almost continuous chain of cities and villages containing a population of 270,000 in 1890 and about 325,000 in 1894. The city is $\frac{1}{4}$ miles long, with an average width of half a mile. It is connected by a belt-line electric railway, running on both sides of the Susquehanna, with Wilkesbarre, Nanticoke, and Plymouth, and by four bridges across the river with the boroughs of West Pittston and Exeter, and, including the boroughs of West Pittston, Exeter, and Hughestown, and other contiguous territory, is the trade, postal, telegraph, and express center of a region which contains a population of more than 30,000 within a radius of 2 miles. Pittston is lighted by gas and electricity, and has a well-equipped volunteer fire department. There are English, German, Slavonian and Polish Roman Catholic, English and Welsh Baptist, Presbyterian, Methodist Episcopal, Methodist Protestant, Protestant Episcopal, Congregational, and Lutheran churches, a high school, 5 other public schools, public-school property valued at over \$80,000, a hospital erected in 1893, a national bank (First) with capital of \$250,000, 2 savings-banks (Miners' and People's) with capital of \$60,000 and \$75,000 respectively, and a daily, a weekly, and a monthly periodical. Manufacturing is promoted by cheap fuel, superior railway facilities, and natural advantages. The establishments include 3 machine-shops, 3 planing-mills, 3 breweries, 2 knitting-mills, 2 pork-packing houses, stove-works, ladies' underwear factory, steam flour-mills, paper-mill, terra-cotta works, steel-range works, pressed-brick works, and dye-works. In 1894 the city had an assessed valuation of \$750,000 and a debt of \$32,000, and was about to increase the debt to the constitutional limit to aid local improvements. Pittston was named after William Pitt; was formerly a part of Pittston township, which was laid out in 1768; was settled about 1770; became a post-office station under the name of Pittston Ferry in 1811; was incorporated as a borough in 1853, and as a city of the third class in 1894. Pop. (1880) 7,472; (1890) 13,302.—WEST PITTS-
TON, on the opposite side of the river, is largely a village of homes; has 5 Protestant churches and high school; in 1894 had an assessed valuation of \$581,774, public-school

property valued at \$63,000, and a debt of \$16,000, about to be increased to constitutional limit for local improvements. The Luzerne County fair-grounds are immediately S. of the borough line. Pop. (1880) 2,544; (1890) 3,906.

THEO. HART, EDITOR OF "EVENING GAZETTE."

Pituitary Body: See HYPOPHYSIS.

Piu'ra: a maritime department in the extreme north-western part of Peru, bordering on Ecuador. Area, 27,201 sq. miles. The western or coast region consists mainly of deserts, which, however, afford a scanty pasturage at certain seasons; they are varied by rocky hills and headlands, and are divided by the fertile valley of the river Chira. The eastern part lies in the Cordillera, which here is of no great height, and is interspersed with valleys of tropical luxuriance. Grazing and cotton-growing are the principal rural industries; coal-beds exist; silver and to some extent gold are mined; a rich petroleum basin has been discovered, and several borings have been made. Pop., by census of 1876, 155,502; in 1891, nearly 200,000. Pura, the capital and largest town (pop. 1889, 8,000), lies on the river Pura in a fertile valley (see map of South America, ref. 4-B). It is connected by rail with its port of Paita. H. H. S.

Pius [Lat., liter., pious, religious, dutiful]: the name of nine popes. **PIUS I.**, about the middle of the second century, of whom very little is accurately known.—**PIUS II.** (*Æneas Sylvius Piccolomini*), 1457-64: a native of Siena; humanist; secretary to the Council of Basel, friend and counselor of Frederick III.; brought about the Concordats "of the princes" (1446) and of Aschaffenburg (1448); made Bishop of Trent and afterward of Siena; proclaimed cardinal (1456) by Calixtus III., and succeeded the latter as pope (1457). The great object of his pontificate was a crusade against the Turks, but it proved abortive. As pope he rejected several principles and utterances of his earlier life, and labored hard to restore the Roman see to its ancient glory. As a writer he is known by his letters, his *History of Frederick III.*, his *Description of Germany*, and *Commentaries* on events of his own time.—**PIUS III.** (1503), a nephew of Pius II., reigned only twenty-six days.—**PIUS IV.** (*Giovanni Angelo de' Medici*), 1559-65; reopened the sessions of the Council of Trent, issued the profession of faith actually taken by all who hold any ecclesiastical office, either in the pastoral care or in seminaries and universities; conceded, by request of civil authorities, communion under both species to the laity of the German states; this was afterward withdrawn. **PIUS V.** (*Michele Ghislerio*), 1566-72; published (1566) the *Roman Catechism*, and later on corrected editions of the Breviary and Missal; was very active against the spread of Protestantism; excommunicated Queen Elizabeth; and contributed much to the victory of Lepanto (1571). He died in the odor of sanctity, and was canonized by Clement XI. (1712).—**PIUS VI.** (*Giovanni Angelo de' Braschi*), 1775-99; improved the administration of the papal state; dried the Pontine marshes; built the Museo Clementino-Pio; visited Vienna 1782; condemned (1794) eighty-five propositions of the Synod of Pistoia (1786) as contrary to Catholic faith and discipline; rejected the principles and acts of the Congress of Ems in his *Reply to the Metropolitans* of Mayence, Treves, Cologne, and Salzburg, on the Apostolic Nunciatures (1789); refused to sanction the civil constitution of the French clergy; lost Avignon and the Venaissin to France (1790), and (1796-97) the northern part of the papal state to the new Cisalpine Republic, with a heavy indemnity in money, manuscripts, and art-works; signed the Treaty of Tolentino (1797), by which the dismemberment of his state was confirmed; and was carried off to France in Feb., 1798, by Gen. Berthier. He died, aged eighty-one, at Valence, Aug. 29, 1799, after suffering much cruelty and persecution from Napoleon.—**PIUS VII.** (*Gregorio Barnaba Chiaramonte*), 1800-23; a relative of Pius VI., elected at Venice; signed the concordat of 1801 with Napoleon, by which the French Church was divided anew into ten metropolitan and fifty suffragan sees; the resignation of the actual bishops requested; the presentations of the new ones accorded to Napoleon; the Roman Catholic religion acknowledged as that of the state; and the salaries of the clergy paid by the latter, as a reparation for the confiscated estates. This concordat underwent various modifications. In 1821 a division into eighty dioceses was adopted, which has been further modified, until now there are in France eighty-four sees. The Roman Church has never recognized the Organic Articles which Napoleon added to the original concordat for political purposes. Pius visited Paris for the coronation of Napoleon

(Dec. 2, 1804); refused to declare null the marriage of the emperor's brother, Jerome, with Miss Patterson; was seized by Napoleon's orders July 6, 1809, and imprisoned at Savona, while his cardinals were summoned to Paris, and the papal state abolished (Feb. 7, 1810); confirmed unwillingly the decrees of the National Council (1811); was brought (1812) from Savona to Fontainebleau, in order to terrify him into submission to the emperor's will; signed a new concordat (Jan. 25, 1813), which sacrificed many important rights of the pope; soon regretted his step, and by the advice of the black cardinals, notably Pietro and Pacea, recalled it in a document wherein he declared he would rather die than persevere in his sinful act. He was set free by Napoleon after the battle of Leipzig (Jan. 23, 1814), and saw Napoleon resign his throne in the very castle of Fontainebleau; returned to Rome (May 24, 1814); had several provinces of the papal state restored to him by the Congress of Vienna (1815); fled to Genoa on occasion of the escape of Napoleon from Elba; signed concordats with several European nations, and restored the Jesuits 1814. (See Wiseman, *The Last Four Popes*, London, 1859.—**PIUS VIII.** (*Francesco Saverio Castiglione*), 1829-30; denounced indifferentism, Bible societies, and Freemasonry; obtained the erection of an Armenian archbishopric at Constantinople, and condemned the slave-trade.—**PIUS IX.** (*Giovanni Maria Mastai-Ferretti*), 1846-78; began his pontificate by an amnesty and liberal reforms; fled from Rome on an outbreak of revolution (1848); restored by France (1850); deprived of the legations (1860) by Victor Emmanuel, in spite of the spirited defense of the papal zouaves; maintained his independence against Garibaldi (1867), but was entirely dispossessed of the temporal power (Sept. 20, 1870) by the army of Victor Emmanuel; refused to accept the "guarantees" of May 15, 1871, as implying an indirect recognition of the "accomplished facts"; confined himself thenceforth to the precincts of the Vatican. The pontificate of Pius IX. is notable for many acts of importance. He declared the Immaculate Conception of the Blessed Virgin Mary to be a dogma, or ancient belief of the Church (Dec. 8, 1854); published the *Syllabus* of (80) *Errors*, extracted from previous documents of his pontificate (1864); convoked the Vatican Council (1868), in which the papal infallibility was declared by the constitution *Pastor Æternus* (July 18, 1870); restored the hierarchy in England (1850) and Holland (1853); canonized the Japanese martyrs (1867) on the occasion of the eighteenth century of the martyrdom of SS. Peter and Paul; established national colleges at Rome; encouraged the missions, protected learning, and elevated many distinguished scholars to places of influence. As a man, he was remarkable for his gentle and humane character, his geniality and affability, which never deserted him. He died Feb. 7, 1878, aged eighty-six, after a reign of over thirty-one years, the only one that surpasses the traditional twenty-five of St. Peter. He is buried at San Lorenzo fuori le Mura. See O'Reilly, *Life of Pius IX.*; the *Acta Pii IX.*; Cardinal Manning, *History of the Vatican Council*.

JOHN J. KEANE.

Piute or Paiute Indians: See SHOSHONEAN INDIANS.

Pizar'ro, FRANCISCO: conqueror of Peru; b. at Truxillo, Estremadura, Spain, about 1471. He was the illegitimate son of a Spanish officer; received no regular education, but served with his father in Italy; and ultimately drifted to America, where he first appears at Darien as a soldier under Ojeda (1509); the latter left the colony in his charge during its period of greatest suffering. (See **DARIEN**.) He was connected with various raids against the Indians, was with Balboa in the discovery of the Pacific 1513, and about 1519 settled at Panama. Rumors of a rich country to the S. had reached the isthmus, and in 1522 Pizarro joined with Diego de Almagro and a priest named Luque in a scheme for its discovery and conquest by way of the Pacific coast. The first attempt, in 1524, failed. In a second they were aided financially by Gaspar de Espinosa; great sufferings were endured, but Pizarro overcame them by his dogged pertinacity, and in 1528 saw and visited Tumbez and other towns of the Peruvian coast, where he was well received. With certain proof of the riches of the country he hastened to Spain, where he was empowered to conquer and settle Peru (at his own expense), and was appointed its governor, Almagro receiving the title of marshal. Espinosa continued to aid the enterprise, and Pizarro was able to leave Panama in Jan., 1531, with three vessels and 185 men; Hernando de Soto joined him in the Gulf of Guayaquil with re-enforcements; Almagro and others followed too late to share in

the first plunder. Pizarro landed at Tumbez; at Caxamarca, Nov. 15, 1532, he met the Inca Atahualpa, who had just conquered his brother Huascar, and was going to receive the crown at Cuzco. Atahualpa, while on a peaceful visit to Pizarro, was treacherously seized and his unarmed escort was massacred. To obtain his liberty he promised to fill a room with gold, and he actually collected, through his officers, a sum equal to 4,605,670 ducats, equivalent to \$17,500,000 of modern money. Though this was appropriated by Pizarro and his band, the Inca was basely killed on a false charge of conspiracy. Pizarro now marched to Cuzco; he met with some resistance from Atahualpa's generals, but at Cuzco the legitimate Inca, Manco, swore fealty to the sovereign of Spain, and was allowed to reign as a puppet monarch under surveillance. Pizarro received the title of marquis, and founded Lima (Jan., 1535) as his capital. Manco escaped in Apr., 1536, and headed an Indian uprising, which, for a time, threatened to drive the Spaniards from the country; but aid flocked in from the other colonies, and the Indians were subdued. Almagro had frequently quarreled with Pizarro, whom he accused of appropriating all the benefits of the conquest, though the enterprise had been a joint one. He was quieted for a time by being made governor of Chili, but in 1537 he returned disappointed from that country and seized Cuzco, claiming that it lay within his domain. War with Pizarro followed; Almagro was defeated at Las Salinas Apr. 26, 1538, and was soon after captured and executed. Pizarro allowed many of Almagro's followers to live at Lima, where they conspired and murdered him in his palace June 26, 1541. He was an ignorant and often brutal soldier, though with a natural genius for command, and no worse than other leaders of the time.

HERBERT H. SMITH.

Pizarro, GONZALO: half-brother (also illegitimate) of Francisco Pizarro; b. at Truxillo about 1506. He followed his brother in the conquest of Peru 1531-34; took part in the defense of Cuzco against Manco Inca 1536; was captured by Almagro, but escaped and led the infantry against him at Las Salinas; and subsequently conquered Charcas or Bolivia, where he received a grant of the rich mining region around Potosí, and acquired great wealth. In 1540 he was made governor of Quito; thence, in 1541, he led an unsuccessful expedition over the mountains to the forests of the Napo, where ORELLANA (*q. v.*) deserted him and became the first explorer of the Amazon. In 1544 the viceroy Nuñez Vela arrived to enforce the "new laws" against Indian slavery. Pizarro headed a rebellion against him, seized Lima Oct., 1544, drove the viceroy into New Granada, and ultimately defeated and killed him at the battle of Añaquito, near Quito, Jan. 18, 1546. Pizarro's officers took possession of Panama, and for a year he ruled Peru undisturbed. Pedro de la Gasca, sent from Spain to subdue the rebellion, gained possession of the Isthmus by politic means and landed in Peru. Pizarro retreated southward, and near Lake Titicaca defeated the royalist force of Centeno, Oct. 26, 1547. Elated with his success, he returned and met Gasca's army near Cuzco, but his forces deserted him without fighting, he surrendered, and was executed at Cuzco Apr. 12 (?), 1548. Other brothers of the Pizarro family were JUAN, who was killed during the defense of Cuzco, July, 1536; and HERNANDO (legitimate), who was prominent in the conquest and commanded the army against Almagro 1538; he returned to Spain, where he was imprisoned for many years.—PEDRO PIZARRO, a cousin of the conqueror and his page, wrote an account of the conquest which has been published in modern times.—FERNANDO PIZARRO Y ORELLANA, grandson of Hernando and great-grandson of the conqueror, published, in 1639, *Varones ilustres del Nuevo Mundo*, which includes lives of the Pizarros and other conquerors of the New World. Descendants of the family have been prominent in Spanish America and in Brazil.

HERBERT H. SMITH.

Placenta [from Lat. *placenta*, flat cake, from Gr. *πλακοῦς*, *πλακοῦντος*, flat cake, deriv. of *πλάξ*, *πλακός*, anything flat and broad]: a special organ developed in the higher mammals (hence *Mammalia placentalia*) for the nourishment of the embryo while it remains in the uterus. Referring the reader to the articles FETUS and EMBRYOLOGY, where the human placenta is described, for a description of the parts concerned, we may here mention some of the modifications of this organ in the different orders of mammals. The chorion of the embryo may be regarded as the central structure in the formation of the placenta. Upon its surface are devel-

oped numerous small branching outgrowths (villi), into which ramifications of the embryonic blood-vessels extend. These villi enter into more or less intimate connection with the mucous uterine walls of the mother, and through them nourishment is brought to the young. Accordingly as the villi are arranged the character of the placenta varies. Thus in the pig, horse, etc., they are evenly distributed over the surface of the chorion, giving rise to a diffuse placenta. In most other forms they are restricted to certain regions, and the rest of the chorion is smooth and contains but few blood-vessels. Among the ruminants (cow, sheep, deer) the villi are aggregated in patches (cotyledons) varying from 5 to 100 or more (cotyledonary placenta). In the carnivores the villi are arranged in a ring (zonary placenta), while in the primates, bats, insectivores, and rodents they take the shape of a disk (*placenta discoides*). The degree of union between the villi and the maternal tissues varies considerably. In those forms with diffuse and cotyledonary placenta the villi extend into corresponding pits in the uterine walls, but the union is not intimate, and a little pulling is sufficient to effect a separation. In these forms at birth the embryonic placenta becomes separated from the maternal portion, and the latter remains behind (*placenta non decidua*). In the other types the union is more intimate, the parts so growing together that separation is no longer possible without injury to the uterine mucosa. In these forms (*placenta decidua*) a portion of the uterine mucous membrane is cast as a part of the after-birth. Among the edentates almost every type of placenta is said to occur.

The attempt has been made to use placental characters as an aid in classification, but not with perfect success. The literature is large. Prominent works are Turner's *Anatomy of the Placenta* (Edinburgh, 1876); Minot, *Uterus and Embryo, Journal of Morphology* (ii., 1889; contains bibliography); and papers by Hubrecht (*Quarterly Journal of Micros. Science*, 1889-94).

J. S. KINGSLEY.

Placenta'lia [deriv. of *placenta*]: a name given by Owen to those mammals provided with a placenta. It is equivalent to the Monodelphia of recent authors. See MAMMALS.

Placencia: See PIACENZA.

Plac'idus, LUCTATIUS: a grammarian of the fifth century; author of a valuable glossary of obsolete and difficult words largely drawn from Plautus. He also composed scholia to the poet Statius. The best editions of the *Glossæ* are by A. Deuerling (Leipzig, 1875) and G. Goetz in *Corpus Glossariorum Latinorum*, vol. v., pp. 1-158 (Leipzig, 1894). M. W.

Placoph'ora [Mod. Lat., from Gr. *πλάξ*, plate + *φέρειν*, bear, in allusion to the several plate-like shells]: the order of MOLLUSCA (*q. v.*) which contains the chitons.

Plague [from Lat. *plaga*, stroke, blow, deriv. of *plan'gere*, strike (cf. Gr. *πληγή*, blow, deriv. of *πλήσσειν*, strike): a malignant and fatal contagious fever, also called *bubonic plague*, from the frequency of suppurating lymphatic glands, so-called *buboes*. It is now little known, but was formerly endemic in Egypt and the Levant, and spread in devastating epidemics throughout Europe. By its mortality it was an obstacle to the growth of countries and the advance of civilization. It was termed "the pest," the "black death," and the "great mortality." Its first appearance in Europe was at Constantinople in A. D. 544. Since that time epidemics have occurred at variable intervals; there were forty-five in the seventeenth century. The Great Plague of London was in 1665, and was supposed to have been brought from Holland. It is estimated that in Europe 25,000,000 have died of plague. The disease has prevailed in brief and local epidemics during the eighteenth and first half of the nineteenth centuries—at Copenhagen in 1712, Marseilles 1720, Moscow 1771, Malta 1813, Silesia 1819, Bulgaria (in the Russian army) in 1828-29. Its last appearance in Egypt was in 1844. In 1857-58 it occurred among the Arabs of North Africa, in 1857 in Mesopotamia, and in 1871 in Persian Kurdistan. An epidemic in the provinces bordering the Volga in 1878 attracted considerable attention among scientific men. The plague is now regarded as a zymotic disease, dependent upon insalubrious and poisonous atmospheric or telluric conditions, a *materies morbi* gaining access to the blood, and rapidly multiplying in it and destroying its nutritive elements. In malignity and nature it resembles typhus fever. The propagation of the disease occurs by direct or indirect contagion. In Egypt the overflow of the Nile was considered its pestilential source. Overcrowding, bad ventilation, uncleanness, deficient food, and

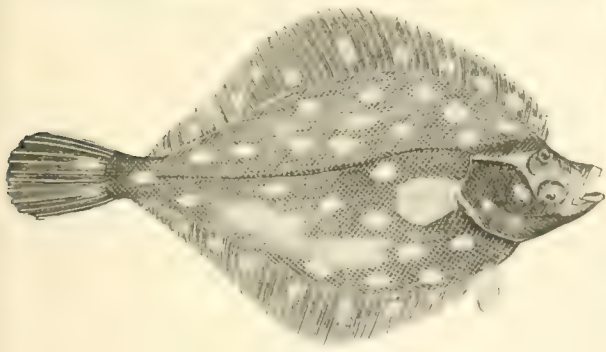
residence in damp, marshy soils have been considered the predisposing causes of local epidemics. After exposure there is a period of latency or incubation of from two to seven days. The disease has four stages, yet all may occur in rapid succession and brief time: (1) invasion, (2) fever, (3) local phlegmons, and (4) collapse or convalescence. It is preceded by lassitude and enfeeblement of mind and body; its definite onset is announced by shivering, headache, vertigo, vomiting, high fever-heat, great prostration, stupor or unconsciousness, blood in the urine or from the bowels, the appearance of buboes or suppurative enlargement of lymphatic glands, or of carbuncles; or, again, in fatal cases, of petechiæ or purple spots and mottling of the skin. Hæmorrhage into the lungs and from the lungs was a frequent symptom of the "black death" of the Middle Ages. Its duration is from two to ten days, and convalescence is slow. It is prevented by hygienic measures and public quarantine, but its treatment, beyond general measures of stimulation and nutritive support, avails little.

Revised by WILLIAM PLEPPER.

Plagues of Egypt: a series of calamities, ten in number, which befel the Egyptians (Ex. vii. 14, ff.); due to the refusal of King Pharaoh to let the Israelites depart from his country. They have been explained upon a natural basis somewhat as follows. The red (blood) color of the Nile is alleged to have been witnessed in historic times, and is explained by the presence of infusoria from the swamps whose waters run into the Nile. During high Nile the frogs, the Egyptian symbol of "multitude," sought the higher ground and, dying when the water rapidly fell, were gathered into heaps, there to rot. The drying pools engendered multitudes of gnats and flies, whose part consisted in causing cutaneous irritation and in spreading the contagion of the murrain, which is regarded as anthrax, a disease due to the dead frogs. This disease principally attacks cattle, but may be communicated to men. Its outward manifestation would be in "boils," while inwardly it would prove fatal, particularly when re-enforced by the meat diet necessitated by the destruction of vegetable life after the plagues of the hail and locusts. Hail, thunder, and the east wind, the agents of other plagues, were usual phenomena except as to intensity. There are, nevertheless, other features of the plagues recorded in Exodus which are not capable of so easy an explanation, and even if the theory outlined above be granted there would remain the miracles of providence, if not of power.

CHARLES R. GILLET.

Plaice: a flat-fish, *Pleuronectes platessa*, weighing from 6 to 12 lb. It feeds on mollusca, crustacea, and young fish,



The plaice.

and inhabits sandy banks and muddy grounds in the sea. It is highly esteemed for food, and is common on the European coasts. See *PLEURONECTIDÆ*.

Plain: a broad expanse of level or nearly level land. Plains are here considered with respect to the origin of their strata; to their altitude, whereby they are associated with plateaus; to the degree of development of valleys across their surface; and to their distribution, climate, fertility, and resources.

Marine Plains.—The largest plains of the world consist of horizontal strata, deposited when the region was the bed of a lake or the floor of the shallow ocean margin. For example, the COASTAL PLAIN (q. v.) of the Eastern U. S. is a surface of small relief, formerly part of the continental shelf. (See OCEAN.) When the land stood lower than now, it received sediments borne down by rivers or worn by

waves; at present it is revealed in consequence of an even uplift, although a considerable extent of the shelf still remains under the sea. Its marine origin is indicated not only by its bedded structure, but also by its numerous fossils. Close study of this region demonstrates that it is geologically in a debatable state, oscillating up and down in the course of geological periods; at present exposing less surface as land than in a recently past period (see COAST), but more than in a still earlier period. The great plains of the U. S. are of a more complex history. Their sediments, as indicated by fossils, are in part marine, in part lacustrine. It is evident from their present slight incline that the region must have been uplifted and inclined since the strata were deposited.

Lacustrine Plains.—The plain of Hungary may be taken as the type of a lacustrine plain; its basin is inclosed by the Carpathian Mountains on the E., and the Danube has now cut a deep outlet-valley through them; but at an earlier time, before the outlet was cut so deep, a lake existed behind the mountains, and the present plain is composed chiefly of sediments brought into the lake from the inclosing slopes. The plain of the middle Rhine, between the Vosges and the Black Forest Mountains, and the Vale of Kashmir in Northwest India have a similar history; all these examples being more or less strewn over by river flood-plain deposits since their lakes disappeared. Plains, partly of lacustrine origin, partly of surface stream-wash, are well exhibited in the interior basins of Utah and Nevada (see BOXNEVILLE LAKE and LAHONTAN LAKE), as well as in other basins of interior drainage, such as the inner plateau of Mexico, and presumably the great central depression of Asia. Basins of this kind are formed by the uneven uplift of mountain ranges and plateaus around their borders, while other ranges diversify their interior. The waste from the crests and shoulders of the mountains accumulates in the intermediate hollows, burying the mountains even up to their waists, and producing broad even plains. The process of degrading the mountains and filling the depressions proceeds in the dry climate of to-day, when streams spread out detritus as they wither after leaving the mountains, as well as in the former more humid climate of the region, when the wash from the mountains ran into lakes; but the most extensive plains of Utah and Nevada are old lake-bottoms revealed by desiccation, and not yet covered by the stream-wash of a dry climate. Sometimes the disappearance of former lakes leaves a broad central depression covered with a level sheet of salt, such as are known in Tibet, in Persia, and in the intermontane depression to which the southward discharge of Lake Titicaca flows in Bolivia. Broad saliferous marshes of this kind occur on the Argentine pampas, there called *salinas*. In regions of extreme dryness even the wind-borne dust from the uplands aids in filling up the depressions. Much importance has been attributed to this process in forming extended plains in inner China, their fine soil being generally given the German name *loess*. Peculiar examples of lacustrine plains are found in those regions where the retreating ice-sheet of the glacial period obstructed the flow of rivers whose basins sloped against it. Smooth sheets of fine silt were deposited in the lakes thus formed; but with the further retreat of the ice, the lakes were discharged and the lake-bottom plains laid bare. Many of the northern prairies of the U. S. are of this origin. See PRAIRIE and AGASSIZ, LAKE.

Fluvial Plains.—Large rivers build broad flood-plains (see FLOOD-PLAIN) in their valleys, and delta plains (see DELTA) at their mouths. The Mississippi gives an example of a flood-plain with delta front, well inclosed between bluffs of the slightly higher marine coastal plain. Here must be included also various extensive areas over which wandering rivers have spread out their detritus. The plain of the "valley" of California, the plain of the "valley" of the Po, the Indo-Gangetic plain of Northern India, and the plain of Eastern China are all of this character, having received their materials from adjacent mountains. Along the margin of the sea, in shallow bays and lagoons protected by bars from the outer waves, tidal marshes are built up to high-tide level. These plains attain a considerable area along the coast of the U. S.

Loess plains; lo-plains.—Extensive areas of loess have occurred in various parts of the world, flooding the lower lands and thus forming broad plains of remarkably level surface. These are exceptionally well illustrated in the basin of the Shoshone river in Southern Idaho. The river has transected the plain in its canyon, revealing the

bedded structure of the lavas. The vast plains of ice and snow that cover Greenland, and that presumably exist inland from the Antarctic ice-wall, as seen by Ross, should not be forgotten. Nansen's journey across Greenland demonstrates that the interior of that land is a vast desert plain of ice and snow. The Malaspina glacier at the foot of Mt. St. Elias, in Canada, may be regarded as a glacial delta plain, being supplied by valley glaciers from the mountains, and spreading out over a surface of 15 by 40 miles on the coastal lowland. (See GLACIERS.) During the glacial period, ice-plains like those of Greenland had great extension in Northeastern America and Northwestern Europe. It was during the presence of these creeping ice-sheets that many of the smooth plains of unstratified glacial drift (till) were spread out in Ohio and the adjacent northern central States; for while glacial action has ordinarily been looked on as chiefly destructive, it was chiefly constructive in these regions, where the ice-sheet was relatively thin, its motion reduced, and the quantity of loose material beneath it excessive. Its action in Ohio may therefore be contrasted with its more destructive action in Canada, much in the same way that the constructive action of a river in its delta may be contrasted with the destructive action of its head-waters. Many fertile prairies in the northern central States are till-plains.

Dissection of Plains.—River flood-plains, being built at a slope suitable to the grade of their rivers, do not suffer dissection, unless the volume of the river is altered or the slope of the land is changed by tilting. The latter seems to have been the case with those former flood-plains, remnants of which are now seen in upper terrace-plains of many of the northern valleys of the U. S.

Marine plains, when rising above sea-level, may acquire a greater or less altitude, the loftier areas being called plateaus. (See PLATEAU.) They are then dissected by their streams and thus diversified in the course of geological periods of time. Many examples can be collected in various stages of development. Plains may thus acquire so strong and varied a relief as to be popularly called rolling or hilly country. The littoral portion of the gently inclined coastal plain from New Jersey to Texas is very little dissected, and only by shallow valleys; it presents broad stretches of almost dead-level surface. Further inland, where the ascending plain is higher and has been out of the sea longer, it is more diversified, giving a pleasing variety of gentle hills and valleys. It is not infrequently the case that the former inland extension of a coastal plain has been stripped off from its foundation rocks, and that the edges of the more resistant strata of the plain thus take the form of inland-facing slopes or escarpments. The lowland on the inner side of the escarpment is then chiefly drained by longitudinal streams, which escape by occasional transverse valleys through the outer and higher part of the plain. The belt of elevated ground from Navesink S. W. across New Jersey to Delaware Bay is of this origin; railways and canal between New York and Philadelphia follow the inner longitudinal lowland. If the coastal plain consists of several alternating harder and softer strata of considerable thickness and gentle seaward inclination, several higher and lower belts roughly parallel to the coast-line may be developed by denudation; the inner slope of the higher belts being relatively steep, while the outer slope is gentle and even. The coastal plain of Alabama has several of these belts, of which the Chunnenuzza ridge is the strongest; it descends by a tame escarpment to an inner lowland belt. In Texas, similar features are well shown; one of the most distinct of the inward ascending plains being the Grand Prairie, which falls off westward by a well-marked ragged inland-facing escarpment to the central denuded region of the State. The Cotswold and the Chiltern hills, drained by the upper Thames in England, belong here; they descend gently to the S. E. and more abruptly in ragged escarpments to the N. W. The Niagara upland of Western New York terminates in an escarpment facing the ancient crystalline area of Canada. (See NIAGARA FALLS.) Wisconsin possesses a well-marked example of this kind; its central denuded plain being inclosed on the S. and W. by dissected uplands rising from the plain in very ragged escarpments and numerous detached outliers.

Plains of Denudation.—When plains have long been above the sea, the widening valleys consume the uplands, decreasing the variety of form that was for a time developed, and ultimately producing a broad lowland of denudation. A great part of the SAHARA (q. v.) is well advanced toward this consummation, its broadly denuded surface having a variety

of open lowlands, retreating escarpments, and isolated outliers; but it is a mistake to regard it as an even lowland, and only a very small marginal part of its area is below sea-level. The great plains in the western part of the U. S. have also reached an advanced stage of denudation, as their numerous isolated mesas and outliers testify.

At any stage in the reduction of uplifted plains to lowlands of denudation the region may again be elevated and enter a new cycle of dissection and denudation. Large areas in Central Missouri, Southern Ohio, and Northern Kentucky have this composite history, their even uplands of to-day being old lowlands of denudation. Portions of the Great Plains, as in Eastern Montana, are similarly uplifted lowlands of advanced denudation, occasionally surmounted by unconsumed mesas and outliers, and now trenched across by young valleys that belong to the new cycle of dissection; many bad-land areas are found along the borders of these valleys of the second generation. Northwestern France possesses a well-marked old plain of denudation, now raised to an upland and beautifully dissected by the valleys of its rejuvenated streams.

Plains of quite another kind occur in regions of disordered structure that were once mountainous, but which are now reduced to lowlands of faint relief by long continued denudation. These lowlands are never so even as those formed beneath seas or lakes; nor have they commonly an extended surface; they most commonly occur as gently rolling lowlands, associated with low ridges that are not yet subdued to the lowland level. The open lowlands of the great Appalachian valley and the more irregular lowlands that run among the Appalachian ridges are of this kind. Mention of related features will be found under PLATEAU.

The climatic conditions of plains are in many cases closely associated with their conditions of origin. For example, the ice-plains are deserts of cold; the plains of interior basins, once lacustrine, are now prevalently arid and desert, peopled only where streams descend from the inclosing mountains and afford water for natural or artificial irrigation. Salt-plains, the residual deposits of certain evaporated lakes, are absolutely barren. On the other hand, the flood-plains of rivers are ordinarily fertile, being of fine soil and plentiful water-supply; they may be productive even when bordered by deserts, as in the famous case of the Nile and in many less-known examples, such as those which descend from the Andes through the deserts on the westward slope. Delta plains of large rivers are fertile; but those of smaller rivers descending from mountains close to the sea are often stony. Lava-plains are deserts until a soil is formed by weathering their surface; then they may be fertile, as in the lava plateau of Southern India. Marine plains are of such vast extent that they embrace all conditions of climate and fertility. They include the frozen ground of Siberia and Northern Canada; the arid steppes of Western Asia, yielding grass under their summer rains; the broad Sahara, whose varied surface is parched by the drying trade-winds, refreshed by winter rains on its northern border, by summer rains on its southern border. In the New World there are the luxuriant selvas of the Amazon, partly marine, partly fluvial in origin, well watered by the equatorial rains; the llanos of Venezuela and the campos of inner Brazil, well watered and grassed under a vertical sun, but dry and dusty in the opposite season. The Argentine pampas are prevailingly too dry, being like the Great Plains of the U. S. in the rain-shadow of the Cordilleras. (See DESERTS and RAIN.) South America, narrowing in the temperate zone, has no analogue to the broad plains and uplands of the eastern part of the U. S.

Resources of Plains.—Lacustrine plains and river flood-plains usually have a fine soil, admirable for agriculture if the climate is favorable; but they have no mineral resources except clays and sand, or salt in the case of certain lacustrine plains. Young marine plains, however well adapted to agriculture, are, as a rule, poor in mineral products, although they sometimes have, in addition to sand and clay, valuable deposits of marl and phosphates, useful as fertilizers, and sometimes diatomaceous earth, useful in various arts. In the absence of good road metal, and by reason of the flatness and poor drainage of the surface, the roads of all these plains are prevailingly poor, being least bad on gravels and worst on clays. Older dissected plains, whose rocks were deposited long ago, and whose surface may have been through successive cycles of denudation, may be as rich agriculturally as the younger forms; as, for example, in the famous Blue Grass region of Central Kentucky; and they

possess in addition a moderate variety of useful minerals and plentiful good road metal. Coal and iron ores are found in the dissected uplands of the Ohio valley: ores of lead and zinc occur in the uplands of Missouri, Iowa, and Wisconsin. Building-stones, limestone, and clay, as well as road materials of high value, are here well distributed. Those lowland plains which are produced by the denudation of former mountains have a great variety of mineral products. The forest products vary greatly with the climate.

W. M. DAVIS.

Plainfield: city (incorporated as a city in 1869): Union co., N. J.; on Green Brook, and the Central Railroad of N. J.; 11 miles N. of New Brunswick, 24 miles W. S. W. of New York city (for location, see map of New Jersey, ref. 3-D). It is a beautiful residential place, with Netherwood Heights on the E. and ranges of the Blue Mountains on the W. The city and cluster of suburban villages are lighted with gas and electricity, and are laid out with broad straight streets tastefully ornamented with lawns, parks, and shade trees. Plainfield contains 14 churches, 5 public-school buildings, public-school property valued at over \$180,000, a seminary for young ladies, an academy for boys, public library and art gallery, public-school, seminary, and Y. M. C. A. libraries, 2 music-halls, Muhlenberg Hospital, 2 national banks with combined capital of \$350,000, a savings-bank, and 3 daily, 2 weekly, and three monthly periodicals. The principal industries are the manufacture of printing-presses, oil-cloth, carpets, and machine tools. Pop. (1880) 8,125; (1890) 11,267; (1895) 13,629.

Plain Song, or Plain Chant (Lat. *cantus firmus*, Ital. *canto fermo*): in music, the simple, grave, and unadorned chant in which the services of the Catholic Church have been rendered from a very early age. It consists largely of monotone, and its inflections seldom exceed the range of an octave. The ecclesiastical chant is supposed to be chiefly of Greek origin, with some modifications brought in from Hebrew sources by the converts from Judaism in the first centuries. Prior to the time of St. Ambrose (fourth century) the music of the Church was in a rude and unsettled condition, but by his skill and energy it assumed the more regular form known as the Ambrosian chant. At a later period Gregory the Great introduced many improvements, corrected certain abuses, and gave to the ritual chant that more systematic form which has since borne his name. Plain song is usually written in black note on a staff of four lines, with either a C or an F clef. See GREGORIAN MUSIC.

Revised by DUDLEY BUCK.

Plains, The, or The Great Plains: one of the great physiographic districts of North America. Through the entire breadth of the U. S. from Texas to the northern boundary and thence for a distance half as great in the Dominion of Canada, a sloping plateau descends eastward from the eastern base of the Rocky Mountains. Its breadth is from 300 to 600 miles, and the eastward descent in that distance ranges from 2,000 to 5,000 feet. The plain appears to have been more nearly level until a late geologic period, being partly occupied by lakes in early Neocene time. It then received its inclination through the uplifting of its western edge at a time when the plateau carrying the Rocky Mountains was also raised. Its surface is diversified by a few mountain districts, such as the Black Hills and Sun Dance Hills, by numerous streams which cross it from W. to E. and have excavated valleys to a depth of several hundred feet below the general surface, and by other districts, such as the Bad Lands of Dakota, where the surface has been intricately sculptured by rains and minor streams; but in general the surface is undulatory and monotonous. The characteristic feature of the climate is aridity, the amount of rainfall ranging from ten or fifteen degrees at the west to twenty or twenty-five degrees at the east. In the western portions agriculture can not be practiced without artificial irrigation of the land, and at the east it is somewhat precarious, as severe suffering is caused by occasional droughts. In general the stream-beds are of such character that the control of their waters for purposes of irrigation is difficult, but near the mountains the conditions are more favorable and an increasing acreage is irrigated. This, however, must always constitute but a small fraction of the entire surface, and grazing is likely to remain the prevailing industry of the region. In general the plains are treeless except in the immediate vicinity of permanent streams, but there are a few forest tracts in the northern portion and elsewhere near the eastern margin. See PLAIN.

G. K. GILBERT.

Plaintiff [from Anglo-Fr. = O. Fr. *plaintif*, complaining, deriv. of *plainte*, complaint. Cf. Eng. *plaintive*]: one who makes plaint; that is, one who states in a common-law court his cause of action against another. In equity courts, the moving party in a suit is called the complainant; and in admiralty and ecclesiastical tribunals, the libellant. Sometimes the legal title to the claim sued upon is in one person, while another holds the equitable title thereto. The former is known as the legal plaintiff, while the latter is the equitable plaintiff. Under the common-law procedure a claim which had been assigned was suable only in the name of the assigner, who was called the nominal plaintiff, while the one who brought and enforced the action was the real plaintiff. Modern codes generally require actions to be brought in the names of the real parties in interest. Plaintiff in error designates the one who sues out a writ of error—that is, appeals to a higher court from the decision of an inferior tribunal.

FRANCIS M. BURDICK.

Planché, plān'shā', JAMES ROBINSON: playwright, archaeologist, and herald; b. in London, Feb. 27, 1796; became early distinguished as a writer of plays and librettos; gave great attention to archaeology and costumes, on which subjects he wrote; aided in founding the British Archaeological Association, and was long its honorary secretary and editor of its *Journal*: author of some 200 dramatic pieces; published in 1852 *The Pursuivant of Arms* (3d ed. 1874), a treatise on heraldic subjects, which procured him the appointment of Rouge Croix Pursuivant in 1854. In 1866 he was promoted to be Somerset Herald. He wrote books of travel, songs, etc. D. May 29, 1880.

Plancy, plān'see', JACQUES ALBIN SIMON COLLIN, de, generally called **Collin de Plancy**: author; b. at Plancy, department of Aube, France, Jan. 28, 1793; went to Paris in 1812; built up a business as a printer, publisher, editor, and author, and wrote *Dictionnaire infernal*, *Dictionnaire féodal*, *Mémoires d'un Vilain au 15^e Siècle*, *Tour des Parties casuelles de la Boutique du Pape*, *Biographie pittoresque des Jésuites*, *Le Diable peint par lui-même*, etc.—all in an anti-religious, revolutionary, and frivolous manner. In 1830 he fled from Paris on account of pecuniary difficulties, and settled at Brussels, where he wrote *Fastes militaires de la Belgique*, *Histoire des premières Années du Règne de Léopold*, and other things—all very flattering to the national vanity of the Belgians. In 1837 he was able to return to Paris, and he went back thoroughly converted. He then wrote *Légendes de la Sainte Vierge*, *Légendes des Origines*, *Légendes du Juif-Errant*, *Chronique de Godfrey de Bouillon*, *Légendes des Sept Péchés capitaux*, *Légendes des Esprits et des Démones qui circulent autour de nous*, *Le Chansonnier du Chrétien*, etc. The method which he generally applied in making a new book consisted in cutting up two old ones and rearranging their contents. The new book was then generally provided with a new pseudonym. Among the many names he employed as an author are Paul Bréranger, Croquelardon, Hormisdas-Peath, Baron Nilense, Saint-Albin, and Johannes Videlbius. D. Jan. 13, 1881. Revised by A. G. CANFIELD.

Planer-tree [named from J. S. Planer (1743-89), a German botanist]: a rather small ulmaceous tree (*Planera aquatica*) of swampy lands in the southern parts of the U. S. It has the general appearance of the elms, but is quite distinct from them in flower and fruit. Its timber is hard, and suitable for many economic uses. The wood of *Planera abelicea*, of the Levant, is aromatic. It is the Cretan false sandal-wood of old writers. Another planer-tree is *P. richardi* of Persia and the Caucasus, partly naturalized in Europe, and sometimes called *zelkova*. It is a tall and handsome tree, producing excellent timber.

Revised by L. H. BAILEY.

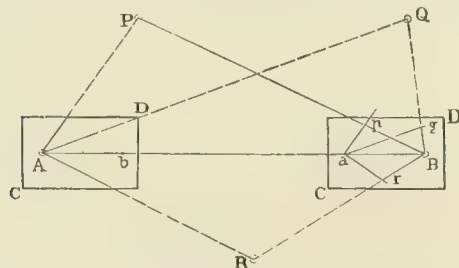
Planet [viā O. Fr. from Lat. *planēta* = Gr. *πλανήτης*, planet, liter., wanderer, deriv. of *πλάνη*, a wandering, deriv. of *πλανᾶσθαι*, wander]: originally, any one of those heavenly bodies which seemed to change their positions on the celestial sphere. In the earliest days it was noticed that all the constellations and the thousands of stars which formed them preserved their relative positions from year to year and from generation to generation without any apparent change whatever, rising and setting as if they were fixed to the interior of a revolving sphere encompassing the whole earth. Seven celestial bodies were found to form an exception; these were the sun, the moon, and five bright stars, Mercury, Venus, Mars, Jupiter, and Saturn. From the changing positions of these bodies they derived their appellation of planets. See PROLEPTIC SYSTEM.

When the Copernican system was established a different classification became necessary. One of the planets, the sun, became the center of the solar system. The term planet could therefore no longer be applied to it. On the other hand, the earth itself became a heavenly body, revolving around the sun like the five known planets. The position of the moon alone remained unchanged. It was still a planet revolving around the earth. Thus by a natural use of words the term planet was applied to all the bodies which perform their revolutions around the sun. Those which, like the moon and the satellites of Jupiter, revolve around these planets are sometimes called secondary planets; but in the practical use of words the term planet is now applied only to those bodies of which the sun is the center of motion.

Among the common characters possessed by the planets are (1) they are globular bodies, rotating on their axes, and therefore slightly ellipsoidal in figure; (2) most of them are probably surrounded by atmospheres, more or less dense; (3) they shine by reflecting the light of the sun. Particulars of their relations to each other and of the elements of their orbits are given in the article SOLAR SYSTEM. A detailed description of each of the major planets is given under its name.

S. NEWCOMB.

Plane-table: an instrument used in surveying for mapping in the field. It is particularly employed for making topographical maps in cases where a triangulation has first been executed. It is not used where great accuracy is required, but is particularly valuable on account of the rapidity with which it can be used in good weather. Although an ancient instrument, its use has been mainly confined to topographical mapping on a small scale. The plane-table consists essentially of a drawing-board mounted on a tripod in such manner that its upper surface may be made horizontal, and so that the entire table may be turned in azimuth through any angle whatever. The combination of parts by which these motions are effected is similar to that employed in leveling and orienting the horizontal limb of an engineer's transit. The instrument as described is accompanied by a ruler, usually of brass, and provided with a telescope so mounted that its line of collimation and the edge of the ruler shall always be in the same plane. The telescope is arranged with a vertical arc, by means of which small angles of elevation and of depression may be measured. The paper on which the map is to be made is stretched and held firmly in contact with the table by suitable clamps. One of the methods of using the plane-table is indicated in the diagram. Let it be required to determine the relative



tion; the points P, Q, and R, in which the latter lines intersect the former, have the same relative positions on the plot that the given points have in the field. Another method is to determine the distances AP and AR by means of a stadia-rod, when they may be laid off to scale from A, thus locating P and R; by this method it will be unnecessary to transfer the table to B. Revised by MANSFIELD MERRIMAN.

Planetoid: See ASTEROID.

Plane-tree Family [*plane* is viâ O. Fr. from Lat. *platanus* = Gr. *πλάτανος*, plane-tree, deriv. of *πλατύς*, broad]: the *Platanaceæ*; trees with alternate palmately veined leaves; flowers monœcious, much reduced, in globular heads; perianth of three to six sepal-like scales; stamens three to six; pistils two to eight, superior, each with a single ovule. The single genus, *Platanus*, contains six species, widely distributed in north temperate regions. *P. occidentalis* is the common plane-tree or buttonwood of the Eastern U. S., where it is often erroneously called sycamore. *P. orientalis*, the plane-tree of the Old World, which resembles the former species, is occasionally planted in America. In Cretaceous and Tertiary times there were many more species of *Platanus* than are now living. C. E. BESSEY.

Planquette, plān'ket', ROBERT: opera-composer; b. in Paris, France, July 31, 1850; educated in the Paris Conservatory. His early operettas, *Valet de Cour*, *Le Serment de Mme. Gringoire*, and *Paille d'Avoine*, were successful. Next came his greatest success, *Les Cloches de Corneville*, well known in English as *The Chimes of Normandy*; first performed in Paris Apr. 19, 1877. He has since composed several operettas, including *Rip Van Winkle*, *Le Chevalier Gaston*, *Les Voltigeurs*, and *Nell Gwynne*. D. E. H.

Plant: See VEGETABLE KINGDOM, BOTANY, GEOGRAPHICAL BOTANY; PLANTS, FOSSIL; PHYSIOLOGY, VEGETABLE; MORPHOLOGY, VEGETABLE; CLIMATE, etc.

Plantagenet: the surname of the Angevine dynasty of English monarchs, derived from the marriage of Matilda, daughter of Henry I., to Geoffrey Plantagenet, Count of Anjou. The Plantagenet monarchs reigned from 1154 to 1485, when the victory of Bosworth transferred the crown to the house of Tudor. They were usually ambitious and warlike princes. See ENGLAND, HISTORY OF.

Plantain [from O. Fr. *plantain*, plane-tree: Span. *plátano*, *plátano* < Lat. *platanus*. See PLANE-TREE FAMILY]: the fruit of the coarser cultivated varieties of *Musa paradisiaca*, the finer and more delicate sorts being called bananas. The plantain is a native of the East Indies, but is now common in nearly all hot countries. It is of the family *Musaceæ*. The plantain furnishes a very large part of the food of the human race in some hot countries. The leaves yield a fiber which closely resembles MANILLA HEMP (*q. v.*). The name plantain is also applied to the species of the weedy genus *Plantago*, inhabitants of all yards and waste places in temperate climates. Revised by L. H. BAILEY.

Plantain Family: the *Plantaginaceæ*; a family of dicotyledonous herbs of doubtful affinity found in nearly every part of the world, but mostly in temperate regions. Most of the species, of which there are from 150 to 200, belong to the genus *Plantago*. The common plantain, *Plantago major*, is common in nearly every part of the world. Although nearly inert, it is employed in domestic medicine. Its seeds are fed to cage-birds, and its young leaves, boiled as pot-herbs, are palatable. In the U. S. the ribwort (*P. lanceolata*) is a common weed. The fleaworts (*P. psyllium* and *P. arenaria*) are raised in France for the seeds, which yield a valuable size for cotton goods and paper. CHARLES E. BESSEY.

Plant-cutter: a bird of the genus *Phytotoma*, so called from its habit of cutting off leaves and buds from trees and plants. The birds of this genus are characterized by tooth-like serrations along the edge of the mandible as well as inside the upper jaw. The few species are peculiar to South America, and are very destructive. They resemble sparrows in appearance, but are most nearly related to the tanagers.

Plantigrada, or **Plantigrades** [from Lat., pl. of *plantigradus*, plantigrade, from Lat. *planta*, sole + *gradus*, walk]: those animals in which the heel touches the ground in walking, as the bear, raccoon, etc. The term is the opposite of DIGITIGRADA (*q. v.*), and was employed by Illiger for a "family" of mammals, including species now placed in separate families. It is now used in a descriptive sense only. F. A. L.

Plant Jelly: See PECTIN.

Plant-louse: See APHIDES and GALL INSECTS.

Plants, Fossil: plants or vegetable impressions preserved in the earth by natural agencies, such as imburcation, petrification, carbonization, or incrustation.

HISTORY OF THE SCIENCE.—In view of the great abundance of vegetable remains now known to occur in nearly all the great systems of rocks throughout the world, it has been considered remarkable that no mention of their existence should have been found in the writings of the ancient Greeks and Romans nor in any extant work earlier than the thirteenth century. The first published allusion to fossil plants thus far discovered occurs in the treatise on minerals of Albertus Magnus, which appeared in the last half of that century. More than a hundred years later Martin Luther, in his commentaries on the books of Moses, brought forward the existence of petrified wood as evidence of the Noachian deluge, and during the sixteenth century considerable discussion was carried on by Agricola, Matthiolus, Gesner, and others relative to the nature and origin of vegetable petrifications, embodying the vague speculations of these early times.

All this, however, had reference to petrified or lignitized blocks of wood or trunks of trees, and betrayed no acquaintance on the part of these writers with any of the definite organs of plants in the fossil state. It was not until toward the close of the seventeenth century that these latter at length attracted attention, and although Daniel Major of Jena, in 1664 included some such in his *Lithologia curiosa*, it remained for Edward Lhwyd, a Welshman, in 1699, in an important illustrated work, to furnish the basis for the future scientific study of fossil plants. From this time to the close of the eighteenth century the evidence rapidly accumulated, and discussion was rife and sometimes acrimonious.

The primitive notion of the formation of these objects in the rocks, through the action of a *virtus formativa* or *vis lapidifica*, gave way to the Lutheran doctrine that they represented plants that were washed up and stranded on the shores of Europe by the flood, of which Scheuchzer proved the most vigorous champion. The botanists who at last began to examine the abundant Carboniferous ferns taken from the coal-mines declared that they were not the same as those then inhabiting the country, but were of tropical aspect, and the theory was set on foot that by some great convulsion the vegetation of the torrid zone had once been torn from the soil by tidal waves of the sea and transported to more northern climes. Among those who leaned toward this view was Antoine Jussieu, the first of the great line of botanists of that name.

In this pregeologic age the idea that the fossil plants were extinct forms and belonged to a past age of the world had not yet dawned, but it was destined soon to do so, and the teachings of Leonardo da Vinci, Leibnitz, and Lehmann at last prepared the way for Blumenbach, who, before the end of the eighteenth century, laid the foundation for the true science, upon which Baron von Schlotheim, Count Sternberg, and especially Adolphe Brongniart, early in the nineteenth century, erected so noble a superstructure.

The succeeding half century brought forth an extensive literature of fossil plants, embracing among others the works of Göppert, Unger, Schimper, Williamson, Heer, Ettingshausen, Schenk, Saporta, and Carruthers in Europe, of Sir William Dawson in Canada, and of Lesquereux and Newberry in the U. S.

Progress in the knowledge of fossil plants naturally increased with the quantity and quality of the material brought to light. Scheuchzer in 1723 enumerated 445 species, and attempted to classify them according to the system of Tournefort, but his work was unscientific, and his species largely fanciful. Brongniart in 1828 described 501 species after a thorough revision of all the specimens known and careful exclusion of doubtful material. This formed a solid basis for future work, and the number of authenticated forms rapidly increased. Unger was able to catalogue 1,648 species in 1845, and three years later Göppert raised this to 2,055. Progress was unabated during the next twenty-five years, and Schimper's great work, published in 1874, describes about 6,000 species of fossil plants. At the present time (1895), though all care were exercised in eliminating synonyms, there would probably remain upward of 10,000 forms which, so far as can be known, are distinct.

When we consider that the present known flora of the globe comprises over 150,000 species of plants, the number of fossil plants, distributed as they are through so many geologic periods, seems small indeed, but it is still true that the representation from some horizons and particular localities occasionally approaches the numerical relations that

subsist at the present time. But the botanist is interested in the number of these forms only as furnishing a basis for their classification, and thus throwing light upon the real character of the extinct vegetation of the earth.

DIFFICULTIES IN THE WAY OF THE STUDY OF FOSSIL PLANTS.—The study of fossil plants presents peculiar difficulties to the paleontologist from the fragmentary character of most plant-remains, and from the incomplete preservation of their perishable tissues. Of many extinct species of trees, in which the individuals may have been 100 feet in height, the only traces yet obtained are a few leaves of which the outlines and the nervation are imperfectly preserved. All botanists know how variable the leaves of trees are; and since they often find much difficulty in discriminating between genera and species when many entire individuals, complete in root, stem, leaf, flower, and fruit, are before them, it is not surprising that they have little faith in the deductions made from a few variable and incomplete organs. No doubt the inherent difficulties of the subject have favored hasty generalization—have, in fact, led to many errors—and should inspire a proper caution; yet many fossil plants have been discovered, and the preservation of some of them is so complete that they afford material for legitimate and important deductions in regard to the history of plant-life on the globe; indeed, it may be said that the generalities of this history are already well established.

GEOLOGICAL HISTORY OF THE PRINCIPAL TYPES OF VEGETATION.—The plants now inhabiting the earth's surface, as well as those that have successively flourished during the several geologic ages of its history, may be divided into a few great groups which constitute so many different kinds or *types* of vegetation, varying greatly in form and general character as well as in their degree of structural advancement or perfection. The time and manner in which these several great types made their appearance on the globe are indicated, in so far as they can be known at all, by fossil plants. It therefore becomes a matter of the highest interest to endeavor to trace these types of vegetation back to their origin, and to note the manner of their subsequent development.

According to the most approved modern classification of plants the vegetable kingdom is primarily divided into the four co-ordinate groups or sub-kingsdoms called respectively, 1, *Thallophytes*; 2, *Bryophytes*; 3, *Pteridophytes*; and 4, *Spermophytes*; the first of which embraces the lowest cryptogams, the second the mosses and liverworts (these two constituting the old division of cellular cryptogams), the third the vascular cryptogams, and the fourth all phanerogams. These divisions are, however, usually broader than the *types* which will be treated below, and in most cases embrace several such. It must also be remembered that in dealing with the extinct forms of the remote past one is looking back through the stages of plant-development. In fact, there is no longer any doubt that many of those ancient types really embodied the primal elements of several of those which in the slow course of ages were evolved out of them, and ultimately assumed more definite and distinct form. They are in such cases what have been called *comprehensive types*—i. e. types that comprehend in their structures the inchoate germs of later forms. Such types have also been happily termed *prophetic*, in that they contain the promise and prophecy of a life that is to flourish in subsequent ages.

The types of vegetation whose history the study of fossil plants serves best to elucidate are the following: Under the Thallophytes fall, in ascending order of development, 1, the *Protophytes*; 2, the *Algae*; 3, the *Characeae*; 4, the *Lichens*; and 5, the *Fungi*. The Bryophytes play so inconspicuous a rôle that their subdivision is unnecessary. Under the Pteridophytes are ranged, 1, the *Ferns*; 2, the *Rhizocarps*; 3, the *Equisetines*; and 4, the *Lycopodines*. The above ten types complete the cryptogamic series, which, though it fills a subordinate place in the present flora, assumes extraordinary prominence in the history of past plant-life. The great sub-kingsdom of spermophytes or phanerogams has for its leading fossil types, 1, the *Gymnosperms*; 2, the *Monocotyledons*; and 3, the *Dicotyledons*; the last two constituting the *Angiosperms*, which crown the vegetable series. The geological history of these thirteen types of vegetation may be briefly sketched as follows:

The Protophytes.—From the supposed absence of the lowest forms of cellular cryptogams in the older rocks it has been argued that such forms are of comparatively modern origin. The greater part of these, however, are of such a

soft or gelatinous nature that they obviously could not be preserved under any ordinary conditions of sedimentation. The diatoms, which possess siliceous shields, are preserved in vast abundance in many parts of the world, heavy deposits of diatomaceous earth occurring along the Potomac and James rivers in Maryland and Virginia, at Monterey in California, in Bohemia, and many other parts of Europe, as well as in remoter regions. But all such beds are of Tertiary or more recent date, and it is fair to claim that this group at least is of modern origin.

The fact that plants alone can transform inorganic into organic matter has justly been brought forward in support of the claim that plant-life must have preceded animal life. But however conclusive this proposition may seem it would have little value for science if not confirmed by facts. There are, however, certain facts bearing upon this question which were confidently urged long before the discovery of any of the primitive forms of vegetable life in the older sedimentary rocks. Chief among these is the existence of vast deposits of plumbago or graphite, a pure form of carbon, in rocks too ancient to contain any definite forms of life either animal or vegetable—viz., in the Laurentian system of Canada and other ancient deposits. The doubts that existed in the minds of some as to the organic origin of graphite would seem now to be dispelled by the discovery of the fronds of ferns in the Devonian in the state of graphite.

The nature of the vegetation that produced the Laurentian graphite beds is of course conjectural, but within the last decade, due chiefly to the investigations of Reinsch, it has been made practically certain that the waters of the Paleozoic seas teemed with myriad forms of lowly cryptogamic life, forms related to the *Myxomycetes* and other protophytes. The metamorphic rocks have probably lost all traces of these structures, while those of the Cambrian and Silurian do not seem to be adapted to retaining them, but from the Devonian upward to the Cretaceous, and especially in the Carboniferous, impressed upon the coal itself and occupying the chinks and crevices in its seams and lumps, these strange microscopic organisms have left their traces in great profusion. Much light is thus thrown on the origin of coal, while the existence of a great abundance of primordial vegetable life as the food and sustenance of the early animals seems sufficiently demonstrated.

The Algae.—There has been much animated discussion as to the nature of certain objects which have been held by some paleobotanists to be fossil algae. These consist of markings and reliefs of somewhat definite form resembling living Algae upon the rocks of Paleozoic or even earlier ages. The most important of these have been referred by these authors to the genera *Bilobites*, *Cruziana*, *Rhyssophycus*, *Vexillum*, *Eophyton*, *Dendrophycus*, etc. In most cases they are so indefinite that even the most sanguine admit their doubtful character; in a few, however, the evidence of their vegetable origin is more distinct. But in nearly all it has been called in question, and the problem is one for which from its very nature a definite settlement can scarcely be hoped. The principal authors who have maintained that these markings represent real plants are the Marquis Saporta and Senhor Delgado, while of those who have most vigorously attacked this view Dr. A. G. Nathorst has taken the lead, and been followed by Dawson, Newberry, and many others. All, however, admit that there is no antecedent improbability that algae inhabited the waters in which these rocks were laid down, and also that some of these forms really represent such organisms. Among the best authenticated of these fossil algae may be mentioned forms of *Buthotrephis*, *Palaeophycus*, *Licorophycus*, *Phytopsis*, *Sphenothallus*, *Harlania* (*Arthrophycus*), and *Palaeochondrites* of the Silurian, and *Spirophyton*, *Fucoides*, and *Nematophyton* of the Devonian. The remarkable trunks from the Lower Devonian of Canada, described by Dawson and Penhallow under the name of *Nematophyton*, and claimed to represent veritable trees, have been subjected to the most rigid examination, and are pronounced to be Algae allied to the *Laminariae*. Similar trunks have also been found lower in the scale, even as low as the Denbighshire Grits at the base of the Lower Silurian. Amid all the diversity of opinion therefore it seems evident that the Paleozoic seas contained and probably abounded in marine algae; while the occurrence of *Nematophyton*, above mentioned, which is held to have inhabited the land, tends to show that this type formed no exception to the law, so well exemplified by the higher ones, that the prevailing types of struc-

ture reached a higher expression in Paleozoic time than the same types exhibit at the present time.

In later geological formations the forms of algae, though less robust, are more definite and better preserved, and from the Carboniferous to the Miocene, but especially in the Cretaceous and Eocene (Flysch), such genera as *Chondrites*, *Halymenites*, *Sphaerococites*, *Gyrophylites*, *Münsteria*, *Cylindrites*, *Delessertites*, *Cystoseira*, etc., are of common occurrence.

The Characeae, which mark a sort of transition from the algae to the bryophytes, are represented in the fossil state by some sixty species of the genus *Chara*, which makes the "feather beds" at the bottom of ponds and rivers, all founded on the characteristic spirally twisted "fruits" of that genus. They range from the Oolite to the Pleistocene, but are most abundant in the Eocene. That the group may have had a much earlier origin is at least suggested by the discovery in the Lower Devonian (Carboniferous Limestone) of Ohio of small bodies having a great general resemblance to *Chara* fruits, though differing in both the number and direction of the coils. The former reference of these forms, as well as of the nearly identical *Saccamina* of Dawson, to the *Foraminifera* is disputed by Brady, the highest authority on that group of animals.

The Lichens.—This group, which is classed with the fungi by many modern botanists, but forms a type very distinct in external appearance, though abundant at the present day is hardly known in the fossil state, some dozen species only, part of which are of doubtful character, having been described, all from the late Tertiary deposits. Those, however, that have been found imbedded in amber are very perfectly preserved, and belong in some instances to the same species with the lichens most common in Europe and America at the present time. From their nature the lichens are not likely to be preserved, but it is probable that certain of the hard and woody forms that grow on trees will be found attached to petrified trunks so abundant in some places. It seems quite certain that if these plants had been at all abundant in the forests of the coal period they would have been found in connection with the perfectly preserved impressions of the external surfaces of trees in our coal mines. It is probable that lichens, if they existed at all, were much less abundant in the Carboniferous period than they are at present.

The Fungi.—Quite a large number of fossil fungi have been described first and last by Unger, Göppert, Heer, and others, and Prof. Meschinelli has recently published, as a part of Saccardo's great work on the fungi of the globe, a complete list of all the known species, amounting to 329, and classed under forty-one genera. They are chiefly Tertiary, and found forming spots on dicotyledonous leaves. Such are the large genera *Sphaerites*, *Xylomites*, etc., but the genera *Archagaricon*, *Peronosporites*, *Protomyces*, and *Excipulites* are Carboniferous, and there are a few Mesozoic forms.

The Bryophytes.—The plants of this group, which include the mosses and liverworts, and with the thallophytes constitute the cellular cryptogams, form a conspicuous feature in the present vegetation of the world. They were, however, prior to the year 1885, unknown with certainty in any formation older than the Tertiary. It is true that Debey and Ettingshausen in 1859 had figured an obscure form from the Upper Cretaceous of Limburg, in Belgium, which they regarded as an ancestral moss, and still earlier (1839) Roemer had made known another equally uncertain supposed muscivore from the Wealden of Hanover, neither of which, however, was accepted by Schimper, the great authority on both living and fossil mosses. The celebrated Swiss paleontologist Oswald Heer, having in 1865 detected certain beetles of the genus *Byrrhus* that now live exclusively among mosses as occurring in the Lias of Schambelen in Switzerland, remarked that the ground at that spot was then probably carpeted with mosses, and ventured the prediction that their fossil remains would yet be found. This prediction has not yet been verified for any part of the Mesozoic age, but its sagacity has been strongly vindicated by the identification in 1885 by Renault and Zeiller in the coal-measures of Commeny, department of Allier, France, of what these authors regard as a true moss allied to *Polytrichum*, to which they gave the name *Muscites polytrichaceus*. This accidental discovery of mosses in the Carboniferous is due to the extremely favorable conditions that existed at that period for the preservation of fossil plants, even those least adapted to it, and the absence of the

Bryophytes throughout the Mesozoic must in like manner be attributed to the less favorable conditions for the preservation of plant remains that characterize that prolonged period. That plants of this type will some time be found in considerable abundance in the Paleozoic and the history of the type be traced through the several systems of Mesozoic strata is a forecast which is justified by the history of science.

Both mosses and liverworts occur in considerable abundance in the Tertiary, especially in the amber and lignite or brown coal, to the latter of which they seem to have contributed largely, as they now do to the formation of peat. The species found in the amber are so perfectly preserved that their generic and specific characters may often be determined with accuracy, and it is an interesting fact that all the species so determined are closely allied to, and some are identical with, those now growing in Europe. The *Marchantia polymorpha*, a liverwort, is perhaps the most widely distributed of all living plants, and a fossil species, *M. saccinensis*, from the lowest Tertiary (Paleocene) strata of France, closely resembles it and may have been its progenitor. The *Hepaticæ*, or liverwort family, are somewhat less highly organized than the *Musci*, or moss family, and their future discovery much earlier in the series would not be a matter of surprise.

The Pteridophytes.—These embrace the great group more popularly known as the vascular cryptogams, and it is not an exaggeration to say that they have a greater interest for paleobotany than any other one of the primary subdivisions of the vegetable kingdom. Nearly all the living types are represented in the fossil state, but several of these, especially the ferns, *Equisetinae* and *Lycopodinae*, attained in Paleozoic time a development and luxuriance far exceeding those exhibited by the same types at the present day. They constituted the bulk of the great coal flora, assumed the stature of true trees, and formed veritable forests on the low marshy continents and islands of the Carboniferous epoch.

The Ferns.—Probably the most conspicuous type of ancient vegetation was that of the ferns. The ferns of temperate regions are now chiefly small herbaceous plants, but in the tropics tree-ferns still abound. In the Carboniferous there were doubtless some ferns of low stature, but there is evidence that the tree-ferns were a regular constituent of the forests everywhere, and that in many places they overshadowed all other vegetation. The classification of ferns is chiefly possible only by their fruiting organs, but the remains that have come down contain these only in extremely rare cases, so that it is still scarcely known to which of the living groups the great genera *Pecopteris*, *Neuropteris*, etc., are most closely related. Discoveries, however, point to the conclusion that these ancient forms were very unlike those of modern, or even of Mesozoic time, and that there was almost as great a change at the close of the Paleozoic in the character of the ferns as in that of the other types of pteridophytes.

The Rhizocarps.—The small family of rhizocarps includes the popularly little-known genera *Marsilea*, *Pilularia*, *Salvinia*, and *Azolla*. They differ in appearance from most ferns, but structurally they are the same except in bearing two kinds of spores, the one kind small, called microspores, and performing male functions, the other large, called macrospores, and performing female functions. The first named of these genera occurs in the fossil state, the four or five species of fossil *Marsilea* ranging from the Jurassic to the Miocene. *Salvinia* is even better represented, a dozen or more species occurring in the Upper Cretaceous and through the Tertiary. But the type is probably much older. Sir J. W. Dawson is disposed to refer his Devonian genus *Psilotophyton* to the rhizocarps, and it certainly does closely resemble the modern *Pilularia* or pillworts. The Mesozoic *Sapranopteris* is now referred to the *Marsileaceæ*, and this may take with it the much older *Glossopteris* and its allies. But besides these indications of the antiquity of this type there have now been found at a number of places in the Devonian the characteristic spore-cases of the rhizocarps, most resembling those of *Salvinia*. These occur in Canada, Illinois, Ohio, and Brazil. Dawson has described a number of species founded on these objects under the name of *Protosalvinia*, and he cogently argues that they indicate the prevalence in those ages of an abundant rhizocarpean flora.

The Equisetinae.—This type is only represented in the living flora by the genus *Equisetum*, the scouring-rushes, so called from the quantity of silex contained in their tissues.

They are mostly low, rush-like, but leafless marsh-plants with jointed stems. In the early floras, however, the type embraced the great family *Calamariæ*, including the genera *Calamites*, *Calamodendron*, *Asterophyllum*, etc., and a host of other forms mostly of arborescent character and strange aspect. They abound in the coal-measures of all countries, and reach far back into the Devonian. They became extinct at the close of the Paleozoic and were succeeded by Triassic forms of *Equisetum*, much larger than those of the present day, and by the allied genus *Schizoneura*. Reduced forms of *Equisetum* continue through the Tertiary, at the close of which the type had dwindled to something like its present insignificance.

The Lycopodinae.—If the ferns were the most universal and ubiquitous of the primordial types of vegetation, the lycopods excelled in their size, majesty, and strangeness. For to this type, now represented by the humble ground-pines or club-mosses, belonged the great Carboniferous genera *Lepidodendron* and *Sigillaria* with their numerous relatives, whose scaly trunks are so abundant in the roof-stones of all coal-mines. It was also one or several of these great trees whose subterranean parts are known as *Stigmaries*, and which form such conspicuous and grotesque objects in the coal-measures of nearly all countries. These plants were also true forest-trees, rising above the ferns and calamites and dominating the Carboniferous landscape. They probably had their origin in the Silurian, being abundant in the Devonian, where many species of *Lepidodendron* have been found, and where the anomalous *Berwynia* and *Arthrostroma* described by Dawson may have preceded and begotten them.

All these monarchs of the Paleozoic forests went down with the calamites before the Permian winter, to be but feebly succeeded by forms of *Lycopodites* connecting them with the modern *Lycopodium*. Of other lycopods the genus *Selaginella* is sparingly represented in the fossil state from the Cretaceous upward, while forms allied to *Isoetes*, the quillworts, have been found in the Jurassic and also in the Miocene.

The Gymnosperms.—This group, now constituting a class in botany, and perhaps too comprehensive to be regarded as a single type, embraces the three natural orders *Cycadaceæ*, *Coniferae*, and *Gnetaceæ*. The first two of these are among the most important families of fossil plants.

The *Cycadaceæ*, now a rare group, but familiar to all through the common *Cycas revoluta* of the greenhouses, and seeming, by its external appearance at least, to connect the tree-ferns with the palms, once formed the leading type of vegetation over the greater part of the earth. This was in Jurassic time, since which, like the great cryptogamic types of earlier ages, it has declined and nearly disappeared.

The *Coniferae*, or cone-bearing family of plants, which embraces the pines, firs, spruces, cedars, etc., had a very early origin, being found in forms approaching some of the living ones at the close of the Carboniferous, when such genera as *Walchia*, *Ulmannia*, and *Voltzia* made their appearance. These, however, as well as the modified Mesozoic forms, *Brachyphyllum*, *Palissya*, *Araucarites*, etc., that succeeded them, were more closely allied to the present South American araucarian pines than to those that make up the evergreen forests of the northern hemisphere, while the predominant Cretaceous and Tertiary forms so closely approach the great redwoods of Western North America that most of them have been referred to the genus *Sequoia*. The true pines were of more modern origin.

The *Gnetaceæ* embrace the three genera *Gnetum*, *Ephedra*, and *Welwitschia*, all singular plants, the last two especially being among the most anomalous of all known forms of vegetable life. *Ephedra* is the only one of the three genera to which any fossil plants are believed to be related. One such was described by Heer from the Oölite of Siberia under the name of *Ephedrites antiquus*. Another has been found in the Upper Jurassic of France. Two others range through the Tertiary, and one, possibly a true *Ephedra*, is a celebrated amber-plant. The genus has also been found in the Pleistocene.

There exist in the flora of the globe certain forms which bear evidence of being the lingering representatives of great families that have flourished in the remote past, and are now approaching extinction. Such forms have been appropriately called *waning types*. To this class belong the genera *Equisetum* and *Lycopodium*. The modern cycads are a further illustration. Some of the most interesting of these waning types, however, belong to the *Coniferae*, chief

among which are the well-known maidenhair-tree, *Ginkgo biloba*, and the redwood and mammoth trees of the Pacific coast. The maidenhair-tree is the sole survivor of a long line of ancestors which appear to have been abundant at different epochs. It can be traced back through all the ages of Cenozoic and Mesozoic time, with little change in the form of leaf until the Oölite is reached, when the blade becomes so divided that some of its extreme forms take the name of *Baiera*, a genus ranging through most of the Mesozoic. In the Permian it is replaced by the still more dissected forms *Ginkgophyllum* and *Trichopitys*, which are probably its ancestors, and these in turn were preceded, and perhaps begotten, by the whittleseas, *noeggerathias*, and *cordaites* of the Carboniferous and Devonian measures.

That the sequoias are a waning type is proved by their extremely restricted range and number in the present flora, coupled with their great abundance and wide distribution in the floras of the past, the two Californian species being all that remain of more than fifty species known in the fossil state, ranging from the Jurassic to the Pliocene, and from Greenland and Spitzbergen to Chili and New Zealand.

These are by no means the only cases, and the class of gymnosperms bears evidence of having been very gradually ushered into existence. Toward the close of the Carboniferous there appeared a number of aberrant forms, such as *Dolerophyllum*, *Psygmoephyllum*, *Cuniophyllites*, *Dicranophyllum*, etc., which are probably ancestral Gymnosperms, and these, with the line of *Taxineæ* leading from *Cordaites* to the modern ginkgo and the yews, it has been proposed to erect into a group to be called *progymnosperms*. Indeed, the Marquis Saporta would take the *Cycadaceæ* out of the true gymnospermic column and unite them with this ancestral group.

The Monocotyledons.—Much interest attaches to this type of vegetation, which, though comparatively small, has the extraordinary merit of furnishing all the cereals for man's use. None of these, however, are found at any remote geologic epoch, and they seem, singularly enough, to have been developed at about the same time that man made his appearance on the earth. The ancestry of this type is enshrouded in obscurity, and some have maintained that its origin was not as remote as that of the dicotyledons. Certain it is that none of the now recognized forms of monocotyledonous plants have been recognized with certainty at an earlier period than the Cretaceous. There are, however, certain peculiar forms of extinct vegetation occurring in the Lower Trias and extending to the Upper Jurassic, that have been referred with confidence by some authors to the monocotyledons. Such are the *Yuccites* and *Æthophyllum* of the Buntersandstein of Alsatia, and the *Williamsonia* and *Weltrichia* of the Rhetic and Oölite. To these have been added the *Dichoneuron hookeri* of the Permian of Russia. Of these and some other forms usually referred to the *Cycadaceæ*, Saporta would establish an ancestral group, the *proangiosperms*, analogous to the *progymnosperms* above-mentioned. This author, in conjunction with Dr. Marion, made an exceedingly praiseworthy effort to demonstrate from both paleontology and embryology the transition from the monocotyledon to the dicotyledon, and at least succeeded in showing that the distinction so obvious between the linear parallel-nerved monocotyledonous and the broad netted-veined dicotyledonous leaf is obliterated in many cases in the life-history of these plants.

With the exception of the palms the monocotyledons have played an unimportant rôle in the past history of vegetation. The date of their first appearance is imperfectly known on account of the problematical character of most of the early forms. All those that can with certainty be so classed occur as late as the Cretaceous, while the ancestors of our grasses and cereals, as well as of the now abundant rushes, club-rushes, and sedges do not appear earlier than the Tertiary. The chief interest centers in the palms, which began their career in the Upper Cretaceous and attained their maximum development in the early Tertiary. During all but the latter part (Pliocene) of Tertiary time, as well as during the Senonian and Laramie periods (Upper Cretaceous), the palms flourished in great luxuriance, and have left their gigantic leaves and peculiar fruits in the rocks of Europe and North America as far north as England and Vancouver island. Among the richest of these deposits of palms are those of Golden and Florissant, Colorado, representing the Laramie, Denver, and Green river formations, where *Sabal major* and *Flabellaria florissanti* exhibit leaves from 2 to 4 feet in width.

The Dicotyledons.—This great type, embracing most deciduous trees and foliage-plants and thousands of broad-leaved evergreen tropical and subtropical trees and shrubs, now constitutes the dominant vegetation of the globe. It had no existence in the earlier geologic ages and only came on the scene in late Mesozoic time. But it soon outstripped all its competitors, vying with the palms for the mastery during the late Cretaceous and gaining the complete ascendancy during early Tertiary time. Its geologic history is chiefly known through leaves that have been dropped or blown by the winds into the waters of the seas, lakes, and rivers on whose shores these plants grew, and which, from the thin and broad nature of such organs, were quickly covered by the sediment and preserved in the rocks. Other organs, such as flowers and fruits, especially the latter, are, however, sometimes found, and by their aid the determinations based on leaves alone can then be verified or corrected. The necessity for identifying so large a mass of material from leaves alone has created a new department of botany previously neglected. The form of leaves was formerly alone relied upon in describing plants, but this furnishes little aid to the paleobotanist, who must determine not only the species but the genus and even the order from such data alone. This led to the study of nervation, which was found to have a much higher systematic value. It may be said that while form possesses only specific value, nervation possesses generic, and sometimes ordinal, value in the classification of plants, and a somewhat complete system of classification has been laboriously elaborated, based on the nature and arrangement of the veins and veinlets that distribute the fibro-vascular bundles to the blade of the leaf.

Throughout Cretaceous and all but late Tertiary time the evidence thus presented goes to prove that the dicotyledonous vegetation consisted chiefly of trees and shrubs with somewhat thick, tough, and leathery leaves, such as now characterize the flora of tropical and subtropical countries, and this is in harmony with the views of most geologists that the climate of the earth has undergone a gradual change by the slow lowering of its temperature, at least down to the beginning of the last series of glacial epochs, during and since which little is known of the fossil vegetation.

Many Cretaceous and early Tertiary forms have been referred to genera that now exist, such as *Populus*, *Salix*, *Sassafras*, *Platanus*, *Quercus*, *Ficus*, *Magnolia*, *Liriodendron*, *Viburnum*, etc., and doubtless such references possess a degree of correctness, but it is better to make the mental reservation in most cases that these ancient forms are probably the forerunners and ancestors of the living genera, and that could their flowers, fruits, and other organs be perfectly known it might be necessary to create new genera for their reception.

The Dicotyledons furnish numerous examples of waning types as defined above. Such is the genus *Sassafras*, with only one living representative of some dozen fossil species. The same is true of the tulip-tree, *Liriodendron tulipifera*, and the ancestors of both these species date back to the Lower Cretaceous. *Liquidambar* is a somewhat similar example, and seems to merge into *Platanus*, which is probably the most interesting genus from this point of view.

GEOLOGICAL RÉSUMÉ.—The general character of the fossil vegetation of the globe has been depicted in the foregoing paragraphs, but in treating the great types, some of which range through a series of geologic ages, it has not been possible to convey as clear an idea as seems desirable of the flora of each of the successive periods of geologic time. A brief résumé, therefore, from this point of view, seems to be justified even at the risk of some slight repetition.

It should be premised, however, that the fundamental divisions of geologic time which are suggested by the history of plant-life differ slightly from those commonly adopted as based upon animal life. The Eophytic and Paleophytic ages correspond with sufficient exactness with the Eozoic (Archean and Algonkian) and Paleozoic (Cambrian, Silurian, Devonian, and Carboniferous) ages, but the Mesophytic age properly ends with the Jurassic instead of the Cretaceous, because it is here that the greatest break in the entire series occurs by the introduction and rapid rise of the great dicotyledonous flora which ever afterward maintained such an undisputed supremacy. Again, the Cenophytic age begins with the Cretaceous instead of the Tertiary, which is the point of origin of the Cenozoic, and is more completely broken in the plant than in the animal series by the approach of the glacial epoch, while this break occurs some-

what earlier in the former than in the latter, or at a point in the Neocene period corresponding approximately to the line drawn by Lyell between the Miocene and the Pliocene. Below this line there is everywhere evidence of a warm tropical or subtropical climate, and the introduction of forms indicative of a temperate or more or less arctic climate is here somewhat sudden and abrupt.

So far as plants are concerned, therefore, the geological series may be divided into five great ages: the Eophytic, Paleophytic, Mesophytic, Cenophytic, and Neophytic ages. The Eophytic and Paleophytic constitute the Primary, the Mesophytic the Secondary, the Cenophytic the Tertiary, and the Neophytic the Quaternary division of time. In the following enumeration of the successive floras, however, the lesser periods in more common use by geologists will be employed:

The Precambrian Flora.—Little as is known of what the real nature of the Eophytic flora was, there is still sufficient evidence, as was set forth when treating of the Protophytes, to make it tolerably safe to assume that this primitive vegetation consisted mainly or exclusively of the lowest forms of cryptogamic life—those unorganized plasmata, cytodes, or unicellular bodies which formed the initial life of the planet, and sprang by some unknown archegonic process from the womb of the great "mother of life," the sea. To such forms, and many still exist, the term Protophytes has been applied. The Eophytic period may therefore be appropriately called the age of Protophytes.

The Cambrian Flora.—The Cambrian, which is now recognized as including the Potsdam Sandstone, the Taconic system, and all below the Ordovician of some authors, contains many of the problematical organisms discussed under *Algae*, some of which are undoubtedly plants belonging to that type. Among these are probably some of the species of *Fucoides*, *Buthotrephis*, and *Palaephycus* that have been described from rocks of this age in New York, Vermont, Wisconsin, and the Black Hills of South Dakota, as well as from England, Wales, Sweden, and other countries of Europe.

The Silurian Flora.—Scarcely more can be said for the Lower Silurian than for the Cambrian, and the same forms recur only in greater number and distinctness. But here is encountered in the Trenton Limestone the genus *Phytosia*, and in the Hudson River Group the genera *Sphenothallus* and *Licorhynchus*, as well as all the various forms from Southern Ohio, some of which are doubtless of vegetable nature. The *Sphenophyllum primævum* and *Protostigma sigillarioides*, as well as the supposed species of *Sigillaria*, described by Lesquereux from this deposit have been called in question and are still in doubt, and the same is true of *Eopteris morierei*, a supposed Lower Silurian fern from Southern France. It is therefore still uncertain whether any positive evidence exists of the occurrence of Pteridophytes or any form of land-vegetation in the Lower Silurian.

In the Upper Silurian, however, such forms have been found under conditions that seem to leave no doubt of their existence at that epoch. Besides the recurrence of the fucoidal remains with increasing abundance and definiteness of structure, there is not only the land-thallophyte *Nematophyton*, but the supposed rhizocarpous genus *Psilophyton*, and the probably pteridophytic *Protannularia*, *Arthrostigma*, *Berwynia*, and *Glyphodendron*, constituting a firm Silurian basis for the future land-vegetation of the globe.

The Devonian Flora.—The change in passing from the Silurian to the Devonian flora is so abrupt that it must be attributed in great part to the imperfection of the geological record. Still it strongly suggests that there may have been about the close of Silurian time a great lowering of temperature analogous to that which is now generally believed to have occurred at the close of the Carboniferous. Scarcely any of the fucoidal forms persisted, though some peculiar to that age, such as the *Spirophylon*, or cocktail fucoid, are found. But the places of these are supplied many times over by far higher types of land-plants, clearly impressed upon the rocks or petrified in place with their internal structure preserved, so as to leave no doubt as to their vegetable nature, and to enable us to determine their botanical relations. Not only were all the great types of Pteridophytes represented—the ferns by *Archæopteris*, *Cyclopteris*, *Sphenopteris*, *Rhachiopteris*, *Megalopteris*, etc.; the rhizocarps by *Psilophyton* and *Protosalvinia*; the *Calamaria* by *Bornia*, *Calamites*, *Asterophyllites*, and *Anacalmaria*; and the lycopods by *Lepidodendron*, *Sigillaria*,

Knorria, and *Stigmara*—but a large number of gymnospermous or progymnospermous forms were introduced, such as *Noeggerathia*, *Cordaites*, *Dadoxylon*, and *Seymouria*. The Devonian flora was therefore the beginning of the Carboniferous flora, which is next to be considered.

The Carboniferous Flora.—This flora is too well and popularly known to require a detailed examination. It was the climax in the development of all the great types of Pteridophytes above described. It flourished during a period of the earth's history marked by a warm, tropical climate, yet not too hot for the growth of land-vegetation; by a great preponderance of ocean over land; by a mostly low, flat, marshy condition of the land-surface, which was probably largely insular or peninsular, the islands, tongues, and necks of land, as well as the marshy and lake-strewn continental expanses bathed in the moisture of their almost steaming waters, and perhaps nearly always overhung with a nimbus cloud-envelope and drenched by ceaseless mists or rains. Under such conditions the luxuriant forests of tree-ferns, lepidophytes, calamites, and cordaites, flourished unmolested, and were able to attain that extraordinary development which constitutes one of the greatest wonders that science has revealed to man.

Toward the close of the period, during the phase which is commonly marked off as the Permian, a change began to take place in the character of the flora; the earlier forms were reduced in size and importance, and new ones, such as *Walchia* and *Ulmannia*, appeared, more nearly approaching the later forms of the *Coniferae*. Among these the genus *Voltzia* is sparingly found, a form which was to reappear in the early Trias. The rapid and ultimately complete extinction during this epoch of the great Paleozoic Pteridophytes that reigned so absolutely over the preceding ages marks one of the most abrupt transitions in the geological history of the earth.

The Triassic Flora.—To pass from the Paleozoic to the Mesozoic age is to enter a new world. The calamites of the Carboniferous had disappeared, but these had given place to forms of true *Equisetum*, some of which, such as *E. rogersi* of the Richmond coal-field in Virginia, still attained a great size. The great lycopods of the coal-period had all perished, as no traces of them are found in the Triassic. The most noticeable trees of the Lower Trias are the peculiar conifers *Albertia* and *Voltzia*. They are both araucarians, but quite different from those which preceded and followed them. The most conspicuous and characteristic feature in the Triassic flora is the great development it exhibits of the family of cycads. These were so numerous, varied, and showy that they have caused the Triassic and Jurassic ages to be called by some the reign of cycads.

The flora of the Trias has now been somewhat thoroughly studied in North America from large collections made in the coal-basins of Richmond, Va., and of the Deep and Dan rivers, North Carolina, as well as from the Connecticut valley, from the Newark beds of New Jersey, and in the West from the copper region near Abiqui, New Mexico. These investigations have revealed a flora most like that of the Upper Trias in the Old World, being composed of the same genera and in part of the same species. The ferns and cycads form the largest groups, and are about equally predominant. After these come the conifers and next the equiseta. More than one hundred species of these four types are now known from the American deposits. Careful comparisons have been made of this flora with those of other countries, and the conclusion has been reached that it represents the extreme upper member of that system, corresponding to the Upper Keuper or Rhetie of Europe.

This Upper Triassic flora is of the greatest interest, as it bears evidence of having migrated from the southern hemisphere. It abounds in Australia and India, and has been found in South Africa and the Argentine Republic. From these regions it seems to have spread in the Old World to Asia Minor, Cochin China, China proper, Japan, Siberia, and Europe, and in the New World to Honduras, Mexico, and the regions of the U. S. enumerated above. It appears in India and Australia at an earlier period, and is a modification of the Carboniferous types that existed there. These survived the ordeal that laid low the pteridophytic coal flora of the north, and reappeared in altered forms as the widespread Mesozoic flora of the globe.

The Jurassic Flora.—No fossil plants have yet been found in America which come from strata that have been identified with certainty as Jurassic, although the Triassic flora above described belongs, as stated, to the extreme top of

that system, and was long supposed to represent the Oölite, which in Europe is rich in plant-remains. On the Yorkshire coast of England and in many parts of France, Italy, and Germany, as well as in India and Siberia, there are extensive deposits of that age that contain fossil plants, of which some five or six hundred species have been described. Several hundred more are known from the Lias below, and the Coral, Portland, Purbeck, and Kimmeridge beds above the Oölite. These constitute simply a gradual modification of the Keuper and Rhetic flora already described, and their differences are too much matters of detail to require enumeration here.

The Cretaceous Flora.—As already remarked, the Cretaceous gave a new dispensation to the plant-life of the globe in the first appearance here of the great type of Dicotyledons. These are now known to occur at the very base of the system, but of peculiar form and character, indicative of an embryonic state, and mingled with other types—ferns, cycads, conifers, etc.—of Jurassic aspect. The Potomac formation of Virginia, first made known in its botanical relations by Prof. Fontaine in 1889, is the earliest in the world at which this type of vegetation is known to have existed. Saporta, however, has discovered dicotyledonous plants in collections from Portugal at a horizon only slightly higher. A single plant of this sub-class had been found by Heer during his study of the arctic floras in the Kome beds of Greenland, which were referred to the Lower Cretaceous, but not to its extreme base, prior to which none were known older than the Cenomanian or Middle Cretaceous of Europe. At that horizon they had long been known, and have been described from many parts of the Continent—Saxony, Bohemia, Moravia, etc.—also from the Atane beds of Greenland. The Dakota formation of Kansas and Nebraska is placed at about the same age, and has yielded a very large flora in which Dicotyledons greatly predominate. Until very recently it was believed that the Raritan and Amboy clays of New Jersey, which have also furnished plants of this type, were nearly of the same age, but researches now in progress point to an earlier date for these deposits, while the same flora has been found to extend southward to the Chesapeake Bay and Potomac river, where it blends with that of the Potomac formation. It likewise recurs in Alabama and Mississippi, where large collections have already been made, and it will probably be traced much farther.

The forms other than dicotyledons that characterize the Potomac formation—ferns, equiseta, cycads, and conifers—have been found in the Kootanie formation of the British Northwest Territories and at Great Falls, Montana; and during the summer of 1891 a flora was brought to light in the Trinity division of the great Comanche series of Texas which embodies the same types and is probably of the same age.

The Upper Cretaceous flora, which is also very rich and has been made known in many parts of Europe, in Greenland, and in British America, shows some advance toward that of the Tertiary, especially in the presence of palms, but also in the more modern character of both its dicotyledons and its less advanced types. Distinct from this and occupying the extreme Upper Cretaceous, perhaps extending into the Eocene, is the great Laramie formation of the Rocky Mountain region. Its flora is remarkable both in its character and its abundance. Notwithstanding its modern aspect, containing as it does several now living species, it still embraces a great number of wholly peculiar forms, some of which seem to be of South American type. This interesting flora is as yet only partially known to the world, and is still the object of active research.

The Tertiary Flora.—In the geological history of the earth there have been two great periods during which the deposition of vegetable matter has played a leading rôle—great shoaling periods, they may be called—resulting in extensive coal-beds, and in and about these, immense deposits of fossil plants. These periods were the Carboniferous and the Tertiary, or, in a more restricted sense, the coal-measures and the Eo-Miocene. No other periods can be compared with these from this point of view, and they seem to mark the completion of a great cycle in the ages.

The dicotyledons predominate in the Tertiary flora, and the generalities of its features have been already given in what has been said of the geological history of that type. The flora of the Tertiary is also so great and so varied that any detailed description of it would carry this article far beyond its prescribed limits. Probably half of all known species of fossil plants occur in the Tertiary, and these not

only represent every one of the great types of vegetation that have been passed in review, but they also represent a great number of the orders and genera of the present flora of the earth. A few general conclusions drawn from the facts are therefore all that can, with propriety, be added:

1. Everything indicates that the flora of the Tertiary was directly derived from that of the Cretaceous, and has in turn given birth to the flora of the present day.

2. In the Eocene Tertiary a luxuriant vegetation covered the northern portion of the North American continent, Northern Asia, and the arctic lands as far north as Grinnell Land, lat. 81° 46' N., and some 400 species of chiefly arborescent plants are represented in this arctic flora.

3. The number of arctic American Tertiary species found in European deposits of the same age is so large as to warrant the inference that there was a land connection between the two continents during this age. This community of character has also been considered indicative of the colonization of Europe by the American flora in the Miocene age, and the plane-tree of the Old World has been shown to have had an American origin. Moreover the similarity of the flora of Japan to that of Eastern North America indicates that there was a land-connection between North America and Asia during Tertiary time.

The Neophytic Flora.—The properly geological record of plant-life practically closes with the Miocene. The Pliocene flora is very small, and most of the forms occurring in it are still living. The remainder are found upon comparison to resemble living ones more or less closely, which lessens the interest usually felt in them. The Auriferous Gravels of California and Australia contain, however, a good number of apparently extinct species represented chiefly in the former case by leaf-impressions and in the latter by fruits and seeds. Pleistocene plant-bearing deposits occur in many parts of Europe, notably at Utznach and Dürnten in Switzerland, at Cannstatt in France, and on the Norfolk, Suffolk, and Sussex coasts of England. They are also known in North America, as at Green's creek on the Ottawa river in Canada, near Columbus, Ky., on the Mississippi river, and at Boaz in Graves County of the same State. Dr. Nathorst has long been studying the glacial-drift deposits of Northern Europe to find remains of glacial vegetation, and has discovered many species. Some of the localities are as far south as Switzerland, Würtemberg, Bavaria, and Hungary. Prolonged study of the geographical distribution of living plants, in connection with the above-mentioned facts, has led to the following general conclusion: With the approach of the glacial period the flora of the Tertiary, where it could retreat, was driven southward; where it could not, it was destroyed, and even the lowlands were occupied by an arctic vegetation. When at length, however, the climate moderated after the ice period, these boreal plants moved northward or climbed the mountains, where they found a permanent arctic temperature. The more ancient flora that had been driven southward then gradually resumed its northward march, and, greatly modified by its long exile and wanderings, slowly reclaimed the less elevated territory, forming ultimately the present flora of the temperate zone.

Dominant Types of Geologic Ages.—A retrospective glance over the successive ages of geologic time, as stamped each by its peculiar flora, will make it possible to select in each case some type of plants which may be said to characterize that age, to dominate it, as it were, and reign for the time being over all other types. Thus the Eophytic age may be called the reign of protophytes; the Cambrian and Silurian taken together, the reign of algæ; the Devonian and Carboniferous taken together, the reign of pteridophytes; the Triassic and Jurassic taken together, the reign of gymnosperms; and the Cretaceous and Tertiary taken together, the reign of dicotyledons. The algæ culminated in the Upper Silurian; the ferns, lepidophytes, and calamites in the coal-measures; the cycads in the Oölite; the conifers in the Cretaceous; the palms in the Eocene; and the apetalous and polypetalous dicotyledons in the Miocene. The present may be regarded as the age of liliaceous and glumaceous monocotyledons and gamopetalous dicotyledons.

RELATION OF FOSSIL PLANTS TO BIOLOGY IN GENERAL.—The discovery and careful study of such large numbers of plant-forms occurring in the different geological formations have greatly enlarged the fund of knowledge relative to the history and development of plants, and led to extensive modifications in the prevailing system of classification.

Only a few of the more important of these results can be presented here.

It was formerly supposed that the structure of the stem constituted the most fundamental character in the classification of phanerogams, and that sub-kingdom was accordingly subdivided primarily into those possessing the endogenous and exogenous structures respectively. This classification naturally grouped the gymnosperms with the dicotyledonous angiosperms, leaving the monocotyledons to constitute a distinct class supposed to be lower in organization than any of these. But the order of appearance of these several types in the past history of the earth, as set forth above, showed that the gymnosperms antedated the monocotyledons by a vast period, and almost demonstrated their direct development out of the early cryptogams. At first it was sought to take advantage of this to disprove the true course of evolution of plant-life from the lower to the higher types; but, on the one hand, closer study of the internal structure of the gymnosperms soon showed that this was widely unlike that of the dicotyledons, while on the other, the investigations of German botanists established the real genetic relationship between the reproductive apparatus and function in gymnosperms and the higher cryptogams. Both these results may now be regarded as established in their general aspects, and discussion is narrowed down to the minor details. This affiliates the *Cycadaceæ* and *Coniferae* with the cryptogams and separates the gymnosperms from the dicotyledons as forming a far earlier and less developed type of vegetation. The monocotyledons, possessing the closed ovary in common with the dicotyledons, can now be appropriately united with the latter to form the true angiosperms, giving to their endogenous structure its proper subordinate rank in the classification. To add to the force of these modifications it has more recently been discovered that a number of the more highly developed cryptogams of Paleozoic time acquired the exogenous structure. Such is the case with *Sigillaria*, *Stigmaria*, *Calamites*, *Calamodendron*, and other less prominent types. The truth seems to be that in the process of development in plants the exogenous structure has been attained in varying degrees along several ascending lines, and that there is a different kind of exogeny in the calamite, the lepidophyte, the cycad, the conifer, and the dicotyledonous angiosperm, while something resembling exogeny has been shown to exist in certain fossil ferns and in certain living monocotyledons.

Fossil plants also clearly illustrate the much wider truth that progress in organic development takes place by means of an irregular succession of new departures or fresh ramifications from the older or lower parts of the generally advancing trunk by a process which has been called *sympodial dichotomy*, and is not in any sense a continuous chain or linear series. The ancient types that reached so high a degree of development became extinct, while lower and less perfect types underwent advantageous modification and were perpetuated. In other words, evolution takes place through the extinction of trunk lines of descent and the persistence of unspecialized types—through the origination out of the lower, less differentiated forms of potentially higher types of structure, i. e. types of structure better adapted to their environment, while the forms that have become specialized and attained the maximum development possible for that type of structure, unable to change, succumb to the changing environment. Thus broadly viewed the law of evolution holds strictly throughout the geological history of the vegetable kingdom; that is to say, progress from the lower to the higher types went on with the advance of geologic time, and there was a general upward tendency in structural development through the great periods of geology. Although the highest forms of all the most ancient types have become extinct they have always been succeeded by higher types, and although the lower forms of these earliest types have sometimes persisted, they have always remained subordinate to the great ruling types that have distanced them in the race for life.

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Planula [Lat., liter., little plane]: a stage in the development of Cœlenterates, etc., in which a solid, two-layered embryo is developed, not by typical gastrulation (see *EMBRYOLOGY*), but by a cutting off of the inner ends of the cells of an earlier stage.

Plaquemine, plāk'meen': town; capital of Iberville parish, La.; on the Mississippi river, and the Texas and Pacific Railway; 20 miles S. of Baton Rouge, 85 miles W. by N. of New Orleans (for location, see map of Louisiana, ref. 10-E). It is a shipping-point for cotton and sugar, and has sawmills and shingle-mills, barrel-factory, a State bank, the Academy of St. Basil, and a daily and two weekly newspapers. Pop. (1880, 2,061; 1890, 3,222).

Plasma: See *BLOOD*; also *CHALCEDONY*.

Plassey, Battle of: See *CHIV*.

Plaster [O. Eng. *plaster*, from Lat. **plastrum*, *emplastum*. Gr. *ἐμπλαστρον*, *plaster*, deriv. of *ἐμπλασσειν*, *daub on*, still in: *ἐν. π. + πλάσσειν*, to mould]: in pharmacy, an adhesive mixture of lead oxide and a fatty acid, or a resinous and fatty compound, often medicated, designed to be spread upon leather, linen, or even paper, and then applied to some portion of the human body. Plasters have a considerable use in medicine, and especially in surgery, where strips of adhesive plaster are employed for many purposes.

Plastering: See *STUCCO*.

Plaster-of-Paris: See *GYPSUM*.

Platæ'æ (in Gr. *Πλαταιαί*, or *Πλάταια*): ancient city of Greece, in Boeotia; on the northern slope of Mt. Citharon; famous as the place where in 479 B. C. the Greeks under Pausanias totally routed the Persians under Mardonius. The city was destroyed by the Thebans, in 427 and in 374 B. C., but was both times rebuilt, and existed in the sixth century A. D. Remains of it are still visible near the village of Kokhla. The site was excavated by the American School of Classical Studies at Athens in 1889. See *American Journal of Archaeology* (1889), pp. 428-439, and 1890, pp. 108-111.

Revised by J. R. S. STERRETT.

Plata, La: See *ARGENTINE REPUBLIC*.

Plata, La (city): See *LA PLATA*.

Platanis'tidæ [Mod. Lat., named from *Platanis'ta*, the typical genus, from Lat. *platanis'ta* = Gr. *πλατανιστής*, an animal of the Ganges, perhaps the susu]: a family of the toothed cetaceans, allied to the dolphins and represented by the singular susu of the Indian rivers. The form is dolphin-like except as to the head, which is distinguished by its up-raised forehead and its small eyes; the blow-hole is longitudinal; the beak is elongated; the cervical vertebrae are all separate; the costal cartilages remain unossified; the maxillary bones are remarkable for their large bony, incurved crests; the teeth are simple and destitute of cingulum or tubercle. The family is represented by a single known genus, with two species—(1) *Platanista gangetica*, inhabiting the Ganges and Brahmaputra and their tributaries; and (2) *P. indi*, found in the river Indus. They rarely exceed the length of 7 feet. Although the body appears to be adapted for swiftness, they are said to be rather sluggish animals; they prey upon fish, like their salt-water relatives.

Revised by F. A. LUCAS.

Plata, Río de la (in English often called *River Plate*): an inlet in the southeastern coast of South America; properly the estuary of the river PARANÁ (*q. v.*), but also receiving the Uruguay. It separates Uruguay on the N. from the Argentine Republic on the S. W. It is about 190 miles long and 143 miles wide at the mouth; the depth varies from 2½ to 10 fathoms; and the strong currents make navigation difficult. During storms, especially the *pamperos* of the winter months (May to October), the Plata is more dangerous than the open sea. The best harbor is that of Montevideo; there are no good natural ones on the Argentine side, landing being obstructed by wide shallows; a partial remedy has been formed in the artificial port of La Plata. The Río de la Plata drains, by the Paraná, Paraguay and Uruguay, an area of about 1,100,000 sq. miles. H. H. S.

Plateau: a term introduced by the French geographer Buache in the eighteenth century, to designate elevated regions of somewhat even surface. Like plains, the greater number of plateaus are built of essentially horizontal strata, either sedimentary beds or lava-sheets. The effort to distinguish between plains and plateaus at some definite limit of altitude is not successful, because it introduces an arbitrary division where nature exhibits many gradations. The Great Plains of the U. S. are known as plains, although only their eastern border is below the altitude that is usually adopted as separating the two classes of forms. On the other hand, the term plateau is often justly applied to an upland having a moderate altitude above sea-level, but rising over a lower plain by a well-marked escarpment, as in the case of the Niagara limestone plateau of Western New York. Plateau is not an appropriate name for elevated basins, like the parks of the Rocky Mountains in Colorado or the Vale of Kashmir in the Himalaya Mountains, which are closely walled in on all sides by higher land; nor is the word well used to refer to the unseen foundation-mass of land above which mountains rise and into which valleys are not yet cut, although it is employed in this sense by some geographers.

Lofty plateaus are seldom so level as lowland plains; for example, the plateaus of Arizona are great blocks of country, 6,000 to 10,000 feet in altitude, separated from one another by profound divisional planes or "faults," each block having a slight inclination and a slightly different altitude from that of its neighbor; yet the *llano estacado* or stockaded plain of Western Texas, with an altitude of 3,000 or 4,000 feet, is remarkably smooth over great areas, being compared to the surface of the sea; its margin, however, is eroded into deep valleys and isolated outliers.

Owing to their height, plateaus may attain a great diversity and intensity of relief under the action of denuding forces, as in the high plateaus of Utah, whose marginal cliffs or escarpments are profoundly gashed by colossal ravines, or the plateaus of Arizona, which are trenched across by the cañon of the COLORADO RIVER (*q. v.*). Like lofty mountains, the uplands of lofty plateaus are cooler and generally better watered than the surrounding lowlands; thus one of the plateaus of Utah is named the Aquarius, from bearing streams and forests while overlooking arid and desert lower lands; but when, in spite of being high, plateaus are sheltered on the side toward the sea by yet more lofty mountains, they are dry, and instead of suffering dissection by outflowing streams, they may gather the waste from the adjacent higher slopes and build up their surface. Thus the broad interior plateau of Tibet, with an altitude of 12,000 or 14,000 feet, bordered on the S. by the towering Himalaya and broken by various mountain ranges, is an arid region, with glaring sun and strong dusty winds by day, and cold, relatively calm nights.

When plateaus are well dissected little of the even surface of the original upland may remain, the region being thoroughly invaded by irregularly branching valleys. The greater part of the Alleghany plateau is in this stage of development. In the northeastern part its inequality of form is so great as to give it the name of Catskill Mountains. In West Virginia it is deeply trenched by many valleys, notably by the canyon of New river, over 1,000 feet deep beneath the remaining portion of the upland, all of which is diversified by ramifying river branches. In Northern Alabama relatively large blocks of even upland remain between wide open valleys. Plateaus in this stage of varied form and strong relief are less easily occupied than in earlier or later stages. The people dwelling in strongly dissected plateaus have a difficult life; they can not move about easily, and their advance in civilization is slow.

In later stages of denudation the valleys within the plateaus widen and consume the greater part of the uplands, leaving only isolated masses, such as occur on a moderate scale in Saxon Switzerland, or with much greater magnitude in the interior of British Guiana, where great table-mountains—Roraima and its fellows—rise to commanding altitudes, descending on all sides by steep cliffs of 1,000 or more feet to the surrounding lower lands. Similar dissected plateaus and table-mountains of sandstone and lava beds are found in the plateau region of Abyssinia.

Denudation of Plateaus.—In the progress of denudation of a great plateau-mass the weaker strata are selected for faster consumption by the atmospheric forces, while the interbedded harder strata stand out in bold escarpments or cliffs. Thus in Eastern Utah, when standing on the mar-

gin of one of the higher plateaus at an altitude of 11,000 feet or more, the eye ranges over a vast expanse of nearly level terraces, descending from one to the next by cliffs of strange aspect, which, as described by Dutton, "are truly marvelous, whether considered with respect to their magnitude, their seemingly interminable length, their great number, or their singular sculpture." Each terrace slopes gently back from its cliff-edge to the foot of the next cliff behind it. Each cliff, 1,000 to 1,500 feet in height, marks the occurrence of a relatively resistant stratum in the plateau-mass, the total thickness of strata being 10,000 feet. Although for the most part barren of vegetation, the color of the region is greatly varied through reds, yellows, grays, and whites. The features thus described are the result of extensive denudation, while the whole region stood at a much less elevation above sea-level; since then it has been broadly uplifted, and the revived rivers and streams have trenched deep and narrow cañons across the terraced surface. It is a marvelous region, not only from its gigantic illustration of plateau-topography, but from its emphatic teaching of the principles of land-sculpture on a huge scale. A good example of a plateau, of gently ascending surface, terminating in a bold escarpment, is found in the Raube Alp and the associated uplands of Würtemberg. A series of similar forms of moderate altitude occurs on either side of Rheims in Northeastern France. These forms are of interest in their influence on products and occupations in populations of closely adjacent areas, above and below the escarpment.

Plateaus of another class possess an even surface in spite of being composed of disordered rocks, being in fact old mountain regions reduced to lowlands by long-continued denudation (see PLAIN), and then broadly elevated to greater altitude. The plateaus thus formed are never so smooth as the younger plains of the first class; when elevated they are again attacked by streams, and thus diversified in the manner already described for the other class of plateaus; but the valleys are still generally arranged in the prevailing trend of the former mountains, and the intervening plateau uplands therefore present a linear grouping quite unlike the remnants of plateaus of horizontal structure, in which the disposition of the interstream uplands and spurs is excessively irregular. Plateaus of the first class frequently possess well-marked cliffs that rim around their remnant masses, continuous for many miles; plateaus of the second class never possess these forms, but, on account of the tilted and disordered structure of their rocks, are worn into a ridge-like topography. While plateaus of the first class are built of unaltered sedimentary rocks or lava-sheets, those of the second class are often built of greatly disturbed metamorphic sedimentary rocks, or of foliated or massive crystalline rocks, such as prevailed deep within the original mountain mass, now laid bare by denudation. The mineral products of the two classes of plateaus are therefore quite unlike, the second class being much the richer in rarer minerals and in metallic ores.

The broad plateau-like uplands of the Ardennes, along the Franco-Belgian boundary and extending northeastward into Germany, are examples of the second class of plateaus; they are not yet much dissected, but are here and there deeply trenched, as by the Rhine, the Moselle, and the Meuse. The Black Forest is a highland of the same nature, but it was never so well worn down when a lowland, and it is now more dissected since its elevation. The Scotch highlands repeat the same features, but rise to a greater height, and are much interrupted by the opening of their deep glens. Much of the interior of the Scandinavian peninsula seems to belong in this class of forms; but it is still overlooked by so many bold eminences that were not consumed before its elevation to its present altitude that it is commonly classed with mountains; it is, moreover, traversed by deep valleys whose lower courses are submerged, producing the renowned fiords of the Norwegian coast. In the U. S. the highlands of Southeastern New York constitute a dissected plateau, although the relatively even uplands are not to be recognized by the traveler through the deep gorge of the Hudson. As a whole, the uplands slope gently to the S. E., but they may be traced with even altitude southwestward into the highlands of New Jersey, and northeastward into the western plateau (Berkshire Hills) of Massachusetts and beyond. Occasional eminences, unconsumed when the region was a lowland, rise here and there above the plateau uplands, and of these Mt. Monadnock in Southwestern New Hampshire may be taken as the type. The middle part of the Sierra Nevada is an inclined plateau of the same kind,

falling abruptly into the interior basin of Nevada, descending gently to the valley of California, and deeply trenched by cañons. See Physiography.

W. M. DAVIS.

Plateau, plaa'tō, JOSEPH ANTOINE FERDINAND: physicist; b. in Brussels, Oct. 14, 1801. He was an authority in physiological optics and capillarity, but his writings extend over nearly the entire range of experimental physics. He was Professor of Physics in the University of Ghent from 1835 till his death, Sept. 15, 1883, in spite of the fact that in middle life he had sacrificed his eyesight to his studies of subjective vision. Notwithstanding that misfortune, he continued his investigations in physiological optics, observing through the eyes of members of his family. Thus in his paper on *Persistence of Vision* (1876) his son Felix and his son-in-law Van der Mensbrugghe were his visual assistants. Plateau's researches upon the surface tension of liquids were collected in book-form under the title *Statique expérimentale et théorique des Liquides soumis aux seules Forces moléculaires* 2 vols., 1873. His latest work was a very complete bibliography of works on physiological optics.

E. L. NICHOLS.

Plated Ware: See ELECTRO-PLATING.

Platen-Hallermünde, plaa'ten-haa'ler-mün-de, Graf von: poet; b. at Ansbach, Bavaria, Oct. 24, 1796; was educated in the military academy of Munich; served for a short time as an officer in the Bavarian army, but soon tired of military life and studied philology and philosophy at Würzburg and Erlangen. A pension which the King of Bavaria granted him in 1826 enabled him to devote himself entirely to literary pursuits. He went to Italy, where he lived during the rest of his life. D. at Syracuse, Sicily, Dec. 5, 1835. Though Platen in his excellent dramatic satires *Die nehmungsschuld Gabriel* (1826) and *Der romantische Oedipus* (1829) is one of the strongest assailants of the romantic school, his earliest literary productions, the dramas *Der gläserne Pantomime* (1823) and *Der Schatz des Rhapsoden* (1824), distinctly show the influence of romanticism. Of this, however, he gradually freed himself by the study of the classic ancient poets as well as by the development of his innate feeling for perfect artistic form. His mastership in regard to the latter is especially evinced in his poems, which by the purity of their rhymes and the easy handling of the most difficult and complicated rhythms became the models for the younger generations of German poets. While the true poetic value of his lyric productions must be questioned, Platen's claims as a reformer of the technics of poetry remain undisputed. See Platen's *Sämmtliche Werke* (1876); Schack, *Pandora* (1890); B. L. Gildersleeve, *Essays and Studies* (1890).

JULIUS GOEBEL.

Plathelminthes (Gr. πλατός, flat + ἔλμινς (plur. ἑλμινθες), a parasitic worm): one of the divisions of the animal kingdom, embracing worm-like forms with unjointed bodies, in which no coelom is recognizable, and in which the alimentary canal has but a single opening (mouth). Some live freely, and others as parasites. The free forms occur some on the land, some in fresh water, and some in the sea. The parasitic forms, which are usually provided with one or more suckers for adhering to the host, affect almost every group of animals, fastening themselves to the exterior, or occurring in the alimentary tract or penetrating into the various tissues of the body. Three classes are recognized: Turbellaria, Trematoda, and Cestoidea. The Nemertines, formerly regarded as members of this group, are now assigned a different position.

J. S. KINGSLEY.

Platin-iridium: See IRIIDIUM.

Platinum, or **Platina** [*platinum* is Mod. Lat., from Span. *platina*, platinum, dimin. of *plata*, silver]: a whitish, steel-gray metal, malleable, very ductile, and as unalterable by ordinary agencies as gold. It occurs in the native state, and in this form its specific gravity ranges from 16 to 19, and its hardness upon the mineralogical scale from 4 to 4.5, being harder than either gold or silver, and a little softer than iron. When fused and refined, however, it is as soft as copper, and the gravity is increased to 21.5. The conductivity for heat at 12° C. is 8.4; for electricity of the annealed metal at 0° C. is 16.4; silver = 100. This metal was first discovered in Choco, South America, and was taken thence to Spain in 1735 by the traveler Ulloa. Its chemical and physical properties were studied by European chemists as early as 1750. The native mixture of metals from Siberia, called "polyxene," was analyzed in 1828 by Berzelius, who found it to contain iron, rhodium, iridium, palladium, cop-

per, and osmium, the amount of platinum ranging from 73 to 86.5 per cent.

Platinum is found, like gold, chiefly in alluvial deposits, in rounded grains, *pépiles* or nuggets, or in flattened scales worn smooth by attrition in the gravel of river-beds. It is there associated with gold and the other heavy metals, as iridium and iridosmine. Having nearly the same specific gravity as gold, it can not be separated from it by washing in the ordinary way, so that quicksilver, which will amalgamate with the gold and leave the platinum untouched, is used to effect the separation.

Daubrée has shown that a part, at least, of the metal from the Urals was originally imbedded with chromic iron in a serpentine rock derived from olivine. This view has been sustained by the discovery of platinum in place upon Mt. Soloneff, in an inclusion of chromite and serpentine in alternate bands with dolomite, in a country rock of olivine, or peridot, of the variety known as dunite. It has not been found, however, in regular veins in quartz, and its precise mode of occurrence is still obscure. A nugget of platinum weighing 104 grammes, associated with chromite, was found near Plattsburg, N. Y., and is believed to have been derived from serpentine rock. It has been discovered in the form of an arsenide in the Sudbury region, Ontario, Canada. This mineral, containing 52.57 per cent. of platinum, has been described under the name of sperrylite. It has the peculiar property of not being easily wetted by water, and the fine particles float on the surface. British Columbia has supplied a small amount of platinum annually since 1887. It is found in the beach-sands at Port Orford, Or., in small thin scales with osmiridium and other metals of the group. (See *Geol. Rec. Cal.*, p. 300.) The production, however, is only nominal, being incidental to gold-washing, the amount for the whole of the U. S. for 1890 being officially stated as 600 oz., and in 1892 80 oz., valued at \$5.50 per oz. The metal is reported to have been found in New South Wales, but there is no notable production, and while the old localities of Columbia, Brazil, and Borneo may contribute somewhat to the total of the world's supply, the great bulk of the metal is produced in Russia from gravel deposits upon the western slope of the Ural Mountains in the government of Perm, where it is found on various private properties and state lands. In the mining district of Goroblagodat there are seventy allotments, or claims. The product of platinum is subject to a tax of 3 per cent. for leasehold claims and 4 per cent. for the freehold. There are two establishments in St. Petersburg for refining crude platinum ore, polyxene, but the greater portion of the product is exported in its crude state. Although the deposits were discovered in 1819, actual working for production of the metal did not begin until 1824, when rich deposits were found in the Nijnii-Tagilsk district.

From 1828 to 1845 platinum was coined and used as money in Russia in pieces of 3, 6, and 12 roubles; the total value of the platinum coinage was 4,250,000 roubles. During this period the production of platinum was much stimulated. When the coinage was stopped the production almost ceased for some years, but it revived in 1859. From that time the production has been variable according to the demand and price. From 1886 to 1890 the average yearly product was 206 pounds, equivalent to about 3,375 kilog., or 7,425 lb. avoird. The total production of crude platinum in Russia from 1824 to 1890, inclusive, was 6,373 pounds.

At present the most productive deposits are those at Nijnii-Tagilsk, belonging to Prince Donato, and those belonging to Count Shuvalov. In 1890 there were 5,853 men engaged in the production of platinum.

Nearly all the native platinum from the Urals is magnetic. Some masses have true polarity and hold iron filings like magnetic iron ore. There were several specimens of this kind in the collection sent to the Paris Exposition in 1867 by Prince Demidoff. One specimen at Paris was 6 inches in its greatest diameter, and weighed 13 lb. troy. A mass weighing 21 lb. is preserved in the Demidoff cabinet. Masses weighing from 9 to 12 lb. were shown by the Russian Government at Philadelphia 1876. A specimen weighing 4,728 grammes, and perfect in form, was shown at Vienna in 1873.

Platinum is infusible in any ordinary furnace, but melts freely in the flame of the oxyhydrogen or Hare furnace, and in the electric arc. Its melting-point is given as 1,773° C. When heated beyond fusion it begins to volatilize. The fused metal absorbs oxygen and "spits" on cooling. At a red heat it occludes hydrogen, which it retains on cooling. It has the property of condensing oxygen upon its surface,

and the gas so condensed has a high degree of chemical activity shown particularly in spongy platinum and PLATINUM BLACK (*q. v.*). At a red heat platinum permits hydrogen to pass through it, but is not permeable to oxygen, nitrogen, or carbonic acid. At a white heat it is easily welded, which permits of large masses being made from scraps and from platinum sponge.

Achard as early as 1784 worked the metal by alloying it with arsenic, shaping it as desired, and then expelling the arsenic by heat. The process of working platinum sponge into compact metal by compression, usually credited to Wollaston, is said to have originated with Thomas Cock, of England, about the year 1800. Since the production of large homogeneous masses by fusion before the oxyhydrogen flame, these processes have been abandoned. Dr. Hare, of Philadelphia, originated the modern method of fusion. As early as the year 1837 he melted 28 oz. into one homogeneous malleable mass. Deville and Debray, of Paris, perfected this method, and now ingots weighing 200 lb. or more are readily cast. An ingot of this weight was exhibited by Johnson & Matthey at the London Exhibition of 1862. A regulus of platinum-iridium which weighed a quarter of a ton was made in 1874 for the metric commission in Paris.

The chief solvent of the metal is aqua regia, and the chloride is the most important salt. Platinum forms alloys with gold and silver and with many of the more fusible metals. These alloys are more fusible than pure platinum. When combined with iridium it forms an alloy of great hardness, especially well adapted for gun-vents and for standard weights and measures. The alloy known as platinum-iridium is used for the manufacture of standard meters, and is melted in lime-crucibles upon Deville's method. For details of the process for the purification of platinum and its fusion in large quantities reference should be made to the memoirs of Deville and Debray upon platinum and the associated metals. Gold is used as the solder for platinum, but the best joints are made by the autogenic method. Molten platinum is regarded as the best standard of light.

The invention of the incandescent electrical lamp caused a great demand for platinum wire. It is estimated that the quantity required increased from nothing in 1880 to 55,000 oz. in 1892. Large quantities are consumed yearly for dental purposes, probably 35,000 oz. in the U. S. and 25,000 oz. in England. About 80,000 oz. are required yearly for sulphuric-acid stills. Chemists and jewelers require some 20,000 oz., making the entire consumption about 215,000 oz. yearly, of which probably 30 to 40 per cent. is old scrap (see *Eng. and Min. Jour.*, lv., 194). The U. S. importations of platinum for 1891 were 4,649 lb.

The price of platinum varies greatly: In Dec., 1891, it commanded \$12 per oz. in New York; in Jan., 1892, \$10.50; in Mar., 1892, it fell to \$9. For the results of researches on the platinum metals and compounds, reference is made to a series of articles by Prof. Wolcott Gibbs in *The American Journal of Science*, xxix., 1860; xxxi., p. 63; xxxiv., p. 342; xxxvii., p. 57.

W. P. BLAKE.

Platinum Black: a finely divided form of platinum, resembling soot; discovered by Liebig. It has the property of condensing gases upon its surface in a remarkable degree. It absorbs many times its bulk of oxygen gas, and gives it off in contact with alcohol or ether, forming new compounds. It is capable of taking up 800 times its own volume of oxygen, and is a most active catalytic agent. Platinum sponge is another form of the metal, porous and slightly coherent, obtained by heating to redness the double chloride of platinum and ammonium. It also condenses gases upon its surface, and becomes red-hot in a current of hydrogen gas and inflames the gas. The hydrogen lamp of Döbereiner, a scientific toy used to a limited extent for producing a light before the discovery of friction matches, was based upon this property of platinum sponge.

W. P. BLAKE.

Pla'to [= Lat. = Gr. Πλάτων, Plato, a nickname given him from his broad shoulders, deriv. of πλατύς, broad, his true name being Αριστοκλής (Αριστοκλῆς)]; a Greek philosopher, who was born 429 B. C., and died at the age of eighty-one years. Solon and Codrus were both reckoned among his ancestors. With the opinions of all previous philosophers he seems to have been familiar. There are stories of his travels in Egypt and the East, but they rest on little or no foundation in his own writings. Aristotle shows an intimate acquaintance with his doctrines, but tells us hardly anything about him personally. The accounts given first

by writers who lived many centuries after him, such as Proclus and Iamblichus, are of no value; and yet there is no philosopher of antiquity with whom we have the means of so close an acquaintance. There was one teacher whom he has made most familiar to us, and from whom, in turn, we become most familiar with the pupil: Plato and Socrates are inseparable names. They are one power in the world's movement. This view can be held without diminishing the value or the position of either. Plato is not the mere reporter, neither is Socrates the merely ideal sketch. The identity of the two minds appears especially in the *doctrine of ideas*. It is this, more than anything else, that gives character to the Platonic philosophy. It is, too, the doctrine which shows how far from the truth is the prevailing notion of this philosophy, as mystical, transcendental, imaginative, far removed from what is called "common sense" or "positive knowledge." "Nothing so clear," says the young man Simmias in the *Phædo*, "as this doctrine of reminiscence, and the ideas of the fair and the good thus awakened in the soul." The word *idea* is used in two different yet closely related aspects. An idea is, in the first place, what the mind adds to a sensation, so as to make it rational. Without it the sense is *ἄλογος*, as Plato supposed the animal to be (a view, in fact, held by Aristotle as well as Plato), mere sense, and of itself incapable of becoming anything more. His illustrations are drawn mainly from the mathematical ideas. In attempting to follow him here the utmost brevity must be consulted. Let us image to ourselves a confused mass of spots or points, such as the splatterings of a paint-brush thrown at hazard upon a canvas. There is visible, at first, no order, no idea—nothing for the mind, all for the sense. As far as the soul is concerned, there seems *nothing* there—or rather *no thing* since it is *form* of some kind that makes a *thing*; that is, a thing thinkable, a *res* or *reality* for the mind. The animal and the man see at first the same, neither more nor less. So far as sense is concerned, the former may even have the keener vision. The human subject at last beholds the dawning of something supersensual, though the light has come from himself. Even in a single point he sees something more than the point. It is the idea of unity. The splatterings begin to assume form, or the soul is waking up to give its own forms to the formless. He is rising above sense. He begins to see *continuity*, or the rudiments of line-extension. He looks more steadily; there is something more than mere lineality; rectilineality, or *straightness*, is coming into view. It may be a mere approach to it; for the cognition of defect, or deviation, or *non-straightness*, is just as positive an evidence of some supersensual measuring-rule or idea as the most perfect agreement. In all this he not only *cognizes*, but *re-cognizes*. This supersensual thing has an interest for him beyond anything of sense. There is beauty in it. He seems to *know* it, although it never may have crossed his sense before. Has he imagined it? What, then, called out that supersensual power? A closer gaze sees not only a series of points forming one straight line (or evenness, *τὸ ἴσον*), but another seeming to hold to it a peculiar relation. There is the equality, or the approach to equality, of angular spaces. Here is a new beauty, a new interest, which could not have come from lines, perfect or imperfect, inclining to each other in any manner however irregular. There is no name as yet, but the soul sees perpendicularity, and delights in it as satisfying its idea. In the same way it sees parallelism. It is another aspect of the *τὸ ἴσον*. It sees relation; it sees ratio, multiple, proportion. In this way one might go through the infinite range of the mathematical ideas. Their teaching is really *ἀνάμνησις*, recollection, but not merely the recollection of one object of sense by another, as of Simmias by Cebes, but the true calling up of something *in the soul* at the sight of some outward object serving as its perfect or imperfect diagram. It is that which gives intelligibility to the object, making it a real thing for the mind—its own creation, in fact, instead of the *tohu* and *bohu*, the utter formlessness of sense.

In an analogous way are seen the ideas of the *fair* and the *good*. The emotional mingles with them all. In the sight of a straight line even there is beauty, interest, emotion, something of the soul's own; and this is because, like all beauty, it is in some way soul seeing soul, and rejoicing at the sight. If such an appearance were made by nature, it only shows that ideas are older still, fashioning the laws and *powers* of nature in harmony with their forms and equalities. Or it is like the emotion of the boys in the *Meno* and the *Theætetus*, as Socrates, in his obstetric way,

delivers them of their mental births: it is something which they felt they had ever *known*, but did not *know* that they *knew* it. Even experience, here, teaches an *a priori* truth, strange as that may seem. A man need only carefully examine the difference in his own feelings between the learning of an inductive truth wholly from without, and the soul's recognition of an idea in geometry, in morals, or in aesthetics.

Now, this is not mystical or transcendental or a mere play upon words, as the followers of Mill would call it. It is clear as the light itself. It is, as has been said, the true doctrine of "common sense," of the *κοινὴν ἐννοίων*, and Plato is the most lucid of all writers in bringing it out. When a young man sees it, his mode of thinking, his philosophical and, in some respects, his theological, temperament is changed for ever.

Another Platonic doctrine, somewhat different from this, though often confounded with it, is that of *universals* as real existences. Nothing is more certain than that names for them are in language before the names of individuals; and that is one reason why Plato insists so much on dialectics as a mode of discovering universal truths. It is not generalization alone, but that within us, which makes us generalize, instead of being content with individual sense-objects. Without it we should be like the animal, who has no language, not from defect of vocal organs (for some are here superior to man), but because he has no inner or ideal world for which language is needed. We can not seek, says Plutarch, without some idea of that for which we are seeking. We must have some notion of universals before we can even think of classifying. *Humanity* is as real as the individual man, who becomes *man*—that is, who becomes *real*—by partaking of this divine creation. It was for this doctrine of universals that Plato was ever a favorite with the best of the Christian Fathers, the Schoolmen, and the Reformers. In the old Nominalism of Epicurus, especially as revived by Abelard, they saw the dissolution of all faith, even as the best thinkers now regard it as threatening the interest of all true science. If individuals are the only realities, it can not stop short of individual atoms. All forms are but accidental phenomena; there are no species; all are reduced to arbitrary classifications, having no standard but the ever-varying assimilations of sense.

Connected with *ideas* is Plato's doctrine of pre-existence. Did he mean an individual pre-existence? He sometimes seems to accommodate his language to such a conception. In the highly imaginative *Phaedrus*, Socrates has something to say of unborn souls "riding on the supercelestial sphere." On the other hand, it is easy to see that to maintain such a pre-existence of *individual* souls in a former sense-world, like the present, would destroy the argument in the *Phædo*. The true ideal reminiscence is gone. It would only be a sense-notice in this life, recalling a preceding sense-notice in another. The whole of that immortal argument is based upon the fact of a sense-experience here, calling up an idea belonging to the very constitution of the soul regarded as lying back of all sense. It is the pre-existence, then, of something belonging to all rational souls, and by partaking of which they become rational as they are born into this life. "In the image of God made He man."

The doctrine of Plato, that evil dwells in matter, whether as an eternal or an acquired principle, might be regarded as a mere speculation, and in that sense comparatively harmless. It may be called, however, the great defect of the Platonic philosophy; not by making two eternals, but from the great practical mischief it works in its ethical teaching. It may be said to have given it ascetic features not derived from Pythagoras. It introduces a purgatorial idea into its otherwise most impressive system of future retribution; but worse than all is the view it gives of *sin* as mainly, if not wholly, belonging to the *flesh*. It is the *φρόνημα σαρκός*, taking the latter word literally for the very body itself, instead of using it, as Paul does, for all that is wrong in our perverted human nature. In consequence of this laying all evil upon the poor body, it ignores the sins of the spirit, or "lusts of the mind," as Paul calls them—the dire soul-sins, such as ambition, malice, revenge—that have little if anything to do with any corporeal constitution—or envy, that pure spiritual devilism, hatred of another's excellence, which a disembodied demon may be conceived as possessing in even a higher degree than the most fleshly man. These *soul-sins* are hardly mentioned by Plato at all. He stands in striking contrast with the Greek poets here, as his doctrine is equally opposed to a sound ethical psychology. The

body would soon be all right, a *σῶμα πνευματικόν*, in fact, if the soul, the original corrupter, were perfectly pure; and yet to get away from this body, as the seat of evil, is represented, even in the *Phædon*, as the most morally deserving of human efforts.

To compensate for this great defect there is the noble argument, presented in so many places, that *virtue*, the good, the *ἀγαθόν*, inseparable from the *καλόν*, the fair, is the end of the rational life, instead of happiness, the *ἡδύ*, the pleasant, the agreeable, evermore resolving itself, in its more refined as well as its grosser forms, into pleasurable sensations as its ultimate analysis. If *happiness* be the *end*, whether of the individual or of the universe, then *virtue* is a *means*, a subordinate thing; and that is a position which Plato could not bear. It was not a compromise between Hedonism and Cyreneacism, that is, an identifying virtue with happiness, and making the latter, in the end, the un-failing accompaniment of the former, or, as it is commonly expressed, virtue its own reward. Any such thought of compensation would have destroyed the Platonic idea: "Men must serve God, or serve the good, for naught." See the picture of "the superlatively righteous man" (*ὁ δίκαιος ἄνθρωπος*, in the second book of the *Republic*, 360, 361). He has the ring of Gyges that gives invisibility; he can do all evil with impunity and without reproach; yet is he righteous still. He may be the very opposite of this, having the reputation of unrighteousness, and no means of ever reversing the unjust decision; yet is he righteous still. The picture, even thus far, tries our Christian faith, but it does not stop here. He may be made to endure the severest pains, with no prospect of deliverance either now or at any other time; yet he is righteous still. The hope of compensation must have no place on the canvas. Finally, says this strange painter, what may a man thus conditioned expect from his fellow men? Wonderful is the answer: "Ὁ δίκαιος, οἷτ'ω διακείμενος, μαστιγώσεται, στρεβλώσεται, δεδιόσεται, καὶ τελευτῶν, πάντα κακὰ παθὼν, ἀνασχιδυλευθήσεται (The righteous man in this state will be scourged; he will suffer dislocating tortures; he shall be bound with cords, and, finally, after suffering all evils, he shall be impaled or crucified.) It is not at all strange that some of the Christian Fathers were almost inclined to regard this as a prophecy of Him, "the Prince and Perfector of Faith," who, "instead of the joy set before him (*ἀντὶ χαρᾶς*), endured the cross, despising shame," that we might be "partakers of his righteousness." In another place (*Gorg.*, 494, 495) the same exhausting process is pursued in respect to *pleasure*. The *ἡδύ*, or happiness, if it is the end of being, becomes simply a question of *quantity*. It is the amount that is to be considered, whether it be the glut of some exquisite moment, or a thinner pleasure hoarded for its rarity and spread over a longer period. The cultivated Cyrenean has no right to talk of his refined happiness and to condemn that of others as gross and low. If the *ἡδύ* is the *ἀγαθόν*, then it constitutes the *ἀγαθὸς ἄνθρωπος*, and the man who gets the most of it is "the better man." Then, too, if the world were one huge *ζῶον*, so made as to be quivering forever with the maximum of ecstatic sensational delight, that would be the best of all possible worlds. Discard the *ἀγαθόν* as the end of life, and the maxim *De gustibus non est disputandum* becomes the highest ethical rule. Happiness in that case is only to be judged by its degree or its intensity. If there are real differences in pleasures, so that some may be called *good* and others *bad*, then there must be some more ultimate principle, not resolving itself into happiness or into "self-rewarding virtues," according to which their respective ranks and moral values are to be determined. The argument is unanswerable, and this gives rise to a like extreme statement in the opposite direction. Some of the lowest pleasures, as they are called, excel all others in the fullness of their pleasing sensations. Let the man who chooses this have it for his portion to all eternity—no palling, no abatement; one everlasting succession of never-paining, never-cloying, pleasurable, and even ecstatic, emotion. The Almighty might have made it so. He has, indeed, most mercifully put Nature in the way, making her his executioner, instead of the lawgiver, as a certain kind of modern ethics are inclined to regard it. Plato, however, presents it as an ethical and æsthetic supposition. What should we think of one who had chosen, and to whom there was permitted, for ever, such an uncloyed existence? The answer is most dramatically brought out of the moral feeling, even of the sensualist. Socrates but gives back to him his own rising thoughts: "Such an existence, would it not be *δεινὸς καὶ αἰσχρὸς*—awful and shame-

ful?" "Would he not be *ἄθλιος*, a very *wretch* indeed, not in the sense of pain, but as denoting the extreme of degradation and perdition, abhorrent to the rational mind?"

What is called Plato's hedonic view is carried even into the state. As he says, in the beginning of the fourth book and in other parts of the *Republic*, the object of government is not so much to make men happier or richer as to secure a healthy civic organism—*ὅπως ὅτι μάλιστα ὅλη ἡ πόλις*—"for in such a commonwealth may we best hope to find righteousness." There is the same idea in the *Gorgias*, that the true statesman is he who aims not to *please*, but to leave the people morally better, "healthier in their souls," than he found them.

There is one feature in the Platonic *Dialogues* which has not received the attention it deserves. Allusion is made to what are called the Platonic myths. For the more extensive and gorgeous of them the reader is referred to the close of the *Republic*, the *Phædon*, and the *Gorgias*; the first two setting forth the retributions of the unseen world, and the third the appalling scenes of the spiritual judgment "for sins done in the body." Nowhere out of the writings of Paul does this expression assume a more terrific significance. The "sins done in the body," all appearing as marks in the soul, not one, the least, having failed in stamping itself upon the tablet of the eternal spiritual memory. There is the myth of *Prometheus* in the *Protagoras*, the fanciful myth of the *Phædrus*; the wholly original and splendid myth of the *Politicus*, setting forth the alternating cosmical periods, the one of the divine order, the other of Nature left to herself, when (in direct opposition to the latest scientific holdings) she inevitably begins to degenerate, as having in herself no principle of progression, or even of permanence, though even in her abandonment she may preserve some portions of the spermiatic reasons that were sown during her diviner circuit.

Some dialogues, even quite long ones, seem to come to no result. These have been called *tentative*, sometimes skeptical. Socrates himself is made to style them the *kathartik*, sometimes the *kunegetic*. Their object is to evacuate the soul of error before the attempt to fill it with truth—to chase away the idols of the cavern in order to admit the sunlight with its realities; or, to use another figure, to test whether the idea so long sought proves to be, on its birth, a true offspring of the soul or nothing more than an *ἄννεμιον*, an abortion, or *wind-egg*, to be cast away.

There have been various translations of Plato, such as those of Taylor, Sydenham, Victor Cousin, and others. The one, however, which for the English reader must supersede all others is that of Jowett. He has transferred this most spiritual and colloquial Greek into the most vivacious and, at the same time, idiomatic English. See *SOCRATES, IDEA, and IDEALISM, PHILOSOPHY, PLOTINUS, IMMORTALITY, REALISM, and SOUL*.

Revised by W. T. HARRIS.

Platt, THOMAS COLLIER; politician; b. at Owego, N. Y., July 15, 1833; was educated at Yale College, but early gave up the idea of a professional career, entered into business, was president of the Tioga National Bank, afterward of the United States Express Company, took an active part in politics, and was elected a member of Congress in 1873 and 1875. On Jan. 18, 1881, he was chosen U. S. Senator, but, on account of a disagreement between him and the executive with respect to the appointment of the collectorship of the city of New York, he resigned his seat on May 14, 1881. He has always been a prominent member of the Republican national conventions, and the recognized leader of the Republican organizations of his State. Elected to the U. S. Senate Jan., 1897.

Plattdeutsch, or **Low Saxon**: the eastern branch of Low German. The term "Plattdeutsch" occurs first in the middle of the seventeenth century. Low Saxon is spoken in Northern Germany, its area covering about one-third of that of the German empire. It passes beyond the German boundary only toward the W., where it is found in the eastern provinces of the Netherlands. (See *DUTCH LANGUAGE*.) The boundary between Low Saxon and Low Frankish—and further on between Low Saxon and Midland German—lies E. of the Rhine, and may be roughly indicated by a line running from the southeast corner of the Zuyder Zee to a point a few miles beyond Elberfeld in the direction of Siegen. There it turns northeastward, running in an almost straight line to the Elbe, N. of Wittenberg. From Wittenberg the boundary-line takes its course eastward until it crosses the Spree near Lübben. There it again turns to the N. E., crosses the Oder at Fürstenberg, and finally reaches the Sla-

vonie frontier in the Prussian province of Posen, near Birnbaum on the Warthe. In the east and north the boundary of the Low Saxon dialect coincides with that of the German language, which is, however, not exactly identical with that of the German empire.

There are, according to time and locality, several varieties of Low Saxon, viz.:

(1) *Old Saxon*, from the earliest times until about the end of the eleventh century. The earliest monument is a baptismal vow, composed for the mission among the heathen Saxons in 772 or soon afterward. The year 830 is generally assumed as the date of the most important work in Old Saxon, viz., the so-called *Heliand* (i. e. Saviour), a poem of about 6,000 lines in alliterative verse, narrating the life and death of the Saviour according to the four Gospels. Its author seems to have been a monk of the monastery Werden on the Ruhr. It is certain that the poem originated in the neighborhood of the Low Frankish dialect. For a long time the text of the *Heliand* was known from two fairly complete manuscripts (the *Cottonianus*, C, and the *Monacensis*, M) and a short fragment found in 1880 at Prague (and accordingly marked P). Another fragment (V) was discovered in Apr., 1894, by Prof. Zangemeister, of Heidelberg, in the Vatican Library at Rome. The same MS. in which this was found also contains several fragments (amounting altogether to 337 lines) of an Old Saxon *Genesis*, written like the *Heliand* in alliterative verse, and probably also the work of the author of the *Heliand*. This discovery is important in several respects, since it throws additional light on the question of the origin of the *Heliand*, and, among others, confirms the theory advanced in 1875 by Prof. Sievers that part (viz., about 600 lines) of the Anglo-Saxon *Genesis* was translated from an Old Saxon poem.

To the ninth and the beginning of the tenth century belong, furthermore, a formula of confession (apparently older than the *Heliand*), two charms, a fragment of a translation of one of Bede's homilies, two leaves (badly preserved) from a commentary to the Psalms, lists from two monasteries of taxes which they were entitled to collect, and finally several collections of glosses. Old Saxon dialect forms are recognizable, too, in one of the earliest and most important Old High German poems, the *Hildebrandslied*, which was transcribed into High Frankish from an Old Saxon original. Most of the remnants of Old Saxon literature come from the western part of the Saxon territory, especially from Westphalia and the districts near the area of the Low Frankish dialect. There existed at that time no common literary language in Low German, each scribe using, as a rule (i. e. unless he copied, more or less closely, the dialect of another manuscript), his own dialect. Toward the end of the tenth century literary production in Old Saxon apparently came to a stop; at least there is in tradition at that time a break which extends beyond the next 200 years.

(2) *Middle Low Saxon*, from the twelfth to the end of the sixteenth century. This period is distinguished from Old Saxon by differences similar to those that separate Middle Dutch from Old Dutch, or Middle High German from Old High German, the most noticeable among which is the transition of the earlier various vowels of inflectional endings into the one vowel *e*. There is every reason to believe that these changes took place gradually. The year 1100 is an approximative limit between the two periods, although, as far as literary tradition is concerned, the former ceases during the tenth century and the latter does not commence before the beginning of the thirteenth. The earliest poetical work in Middle Saxon appears to be the rhymed chronicle of Gandersheim (a convent in Brunswick, near the Hartz Mountains), written in 1216 by the priest Eberhard. Among the earliest prose works is the *Sachsenspiegel*, a description of the Saxon common and feudal law, made by the knight Eyke von Repchow (or Repgau, in the duchy of Anhalt), probably between 1220 and 1230. This is one of the most important works in Low German and one of the chief sources of Germanic law. It was soon adopted as a legal code in Northern Germany and was imitated in Southern Germany by similar works, the best known of which is the *Schwabenspiegel*. To a cleric, who, like the author of the *Sachsenspiegel*, belonged to the family von Repgau in Anhalt, is due the first attempt in Middle Saxon historical prose, viz., the so-called *Saxon or Repgowish Chronicle*, written in or soon after the year 1237. It is noteworthy that most of the earlier Middle Low Saxon literature belongs to the region N. and E. of the Hartz Mountains, in the vicinity of Goslar, Blankenburg, Bernburg, and near the frontier of

those districts in which formerly Slavonic was spoken. Later on the center of literature is shifted northward, and a predominant position is occupied by the Hanse towns, Bremen, Hamburg, Lübeck, Lüneburg, Brunswick, Stralsund, Riga, and others. The culmination of Middle Low Saxon or, as it is generally termed, Middle Low German literature (from about 1350 to 1500) almost entirely coincides with that of the Hanseatic League. There is from the fourteenth century downward a remarkable uniformity in the literary language, which finds its explanation by the fact that the official language of the Hanseatic League (sometimes called *deutsche Sprache*, the eastern language), or, in other words, the dialect of its metropolis, Lübeck, furnished the basis for a fixed literary language. The differences between the local dialects of Lübeck, Hamburg, Bremen, Lüneburg, Stralsund, and other towns of Northern Germany were from the outset very slight. Using in script the same dialect as Lübeck did not for these towns mean adopting a new but simply writing their own dialect. After this dialect had gained the rank of an official and literary language among the Northern German towns it was gradually adopted in literary usage in the southern and western parts of the Low Saxon territory, where it differed considerably from the local dialects. Traces, indeed, of local peculiarities are found in works written, e. g., in Brunswick or in Westphalia, but not to such an extent as we should find them if the scribes had really intended to write in their own dialect. Even in charters and private deeds the usage of local dialects is more and more superseded by that of the literary language. It is for this reason impossible to gain from our sources a correct idea of the condition of the Low German dialects at the Middle Saxon time. There is in Middle Low German after 1350 an extensive literature, both in poetry and in prose. Most of the poetical works lack in originality, and do not, with the exception of the beast-epic and of several ecclesiastical dramas, reach the standard of Middle High German literature. The best-known poem is the beast-epic *Reineke der Vos*, published at Lübeck in 1498. The work is a mere translation of the Dutch *Reinaert*. It follows closely that edition of *Reinaert's Historie* which about 1487 had been published by the Dutch schoolmaster Heinric van Alkmaer; but the unknown Low German author has translated so skillfully that his work reads like an original poem. It at once met with general favor and before 1662 there were 14 Low German editions, 7 Latin, 3 Danish, and 1 Swedish. As regards prose works, Middle Low German is in every respect superior to Middle High German. The prose style had been cultivated in Middle Saxon at an early date in legal, historical, and ecclesiastical writings. The authors even of those early works show a perfect command of the language, and we must admire, in translations as well as in works written originally in Low German, on the one hand a natural gift for narrating in a simple and entertaining manner, on the other hand a remarkable ability in expressing abstract thoughts and in easily handling difficult syntactical relations. Specimens of Low German prose of the best time are Detmar's *Chronik of Lübeck* (written between 1386 and 1400), the *Seelentrost* (a dogmatic work, preserved in several MSS., the earliest of which is from 1407), and the *Passional* (printed at Lübeck in 1488 and later, also found in earlier MSS.). After the beginning of the sixteenth century, when the Hanseatic League was losing its influence and High German began to occupy a predominant position in the Church and in literature, Low German entered upon a period of decline. The transition of the sixteenth to the seventeenth century marks the limit between Middle Saxon and Modern Saxon, since by that time High German had in Northern Germany become the recognized literary language.

(3) *Modern Low Saxon*, from about 1600 to the present time. While the present Low Saxon dialects differ considerably from Middle Low Saxon, there is but little difference between the language of the sixteenth and that of the early seventeenth century. Not a few Middle Low German books intended for the use of the people appeared in new editions in the first half of the seventeenth century, and in exceptional cases even later. The last Low German Bible was printed in 1621. With the exception of these posthumous works of Middle Low German literature, Low Saxon in the seventeenth and eighteenth centuries takes the position of a popular dialect, which is admitted into regular literature only occasionally and for special purposes—e. g., in rustic poems or in poems that ridicule current fashions and follies (especially those of the upper classes), or contrast Low German with High German. Here belong the *Veer Schertz*

Gedichte (Four Humorous Poems), published in 1652 by Prof. Laurinberg (see LAURINBERG, J., 1888), and in the eighteenth century several original poems (e. g. *Die hülflose Sassinne*) and translations of Vergil's *Eclogues* and of some of Horace's *Epistles and Satires* (partly published in 1729 and 1732, partly extant in a MS. volume of 1738), by the rector Caspar Abel. Low Saxon scenes occur in melodramas and comic operas of the sixteenth and the seventeenth centuries, the Low German peasant being a traditional favorite in the jester's part. Among the *Idyllen*, written in hexameters by the well-known poet Joh. Heinr. Voss, there are two in Low Saxon, viz., *De Winteravend* (1775) and *De Geldhapers* (1777). His example caused Joh. P. Hebel to publish in his native South German dialect his *Allemannische Gedichte*, which soon became popular, and in return encouraged Low Saxons to avail themselves more frequently of their dialect in poetry. There is at present an ample literature in Low Saxon, both in poetry and in prose, representing many local varieties of the dialect. The best-known modern authors in Plattdeutsch are Fritz Reuter (1810-74) and Klaus Groth (b. 1819). The former gained a prominent place among the German humorists by his *Ut mine Stromtid* (i. e. In my Farming Time), *Dörchlüchting* (i. e. His Highness), and other tales from Low German country-life, written in the Mecklenburg dialect and collected under the name of *Olle Kamellen* (i. e. Old Stories). Groth's chief work is the *Quickborn* (i. e.—Spring of Life), a collection of poems written in the dialect of Ditmarschen (in Holstein), which were first published in 1852 and have gone through many editions since. While Reuter is an eminently realistic author, Groth's purpose was to write poems in which the Low German people might recognize themselves in an idealized form. Notwithstanding these and many other attempts to secure for the Plattdeutsch a place in literature, High German is at present in Northern Germany the language of literature, and also that of the school and the Church, of the Government, and of the educated classes. Low Saxon, as a spoken language, is losing ground from day to day. Even where the people still adhere to the Plattdeutsch, which as a rule is the case in the country districts, the genuine dialect is becoming adulterated by words and constructions borrowed from High German. On the other hand, the value of Low Saxon, both in its literary monuments and in its living dialects, as a means for investigating the development of German mental life and the history of the German language, is more and more appreciated. The center of the efforts that are made to this end is the Low German Dialect Society (*Verein für niederdeutsche Sprachforschung*), founded in 1875, whose publications consist of an annual volume (*Jahrbuch*), a monthly periodical (*Korrespondenzblatt*), a series of Low German texts (mostly reprints of earlier works), and a collection of dictionaries and grammatical studies. Among the works undertaken by individual scholars, the most important is the *Sprachatlas von Nord- und Mitteldeutschland*, which is being compiled, with the support of the German Government, by Dr. G. Wenker at Marburg. This author sent to every school-teacher in Germany a sheet containing forty simple sentences in Modern German, and asked for a translation into the local dialects. These sentences were selected so as to contain certain words in which the peculiarities of the various dialects should appear. The 44,251 answers furnished him with the material for his maps. The first number of the *Sprachatlas*, containing six maps, appeared in 1881. Publication, however, was subsequently abandoned, and the author now gives his autograph maps to the Royal Library at Berlin for preservation. They are open to the inspection of scholars. The Modern Low Saxon dialects fall into two groups, viz., (1) Northeast Saxon, in Oldenburg, Bremen, Hanover, Brunswick, Hamburg, Holstein, Mecklenburg, Brandenburg, Pommern, East Prussia; (2) Westphalian, in the Prussian province of Westphalia and in the principality of Waldeck. The former are better known, since the writings of Reuter and Groth belong to that group. They are closely related to the Hanse dialect of Middle Low German literature. The Westphalian dialects are especially noteworthy on account of their vowel system, which to this day preserves many original features that were lost in the north-eastern group more than 600 years ago. There are numerous local varieties in both groups.

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* Works on Low German dialects in 2 vols. (1892).

Grundriss der german. Philologie, vol. ii., pt. 1 (Strassburg, 1893), p. 198, *seq.* The best critical edition of the *Heliland* is the one by Sievers (Halle, 1878), which gives the MSS. *C* and *M*. The Prague fragment, *P*, was published by Lambel (Vienna, 1881), the Vatican fragment, *V* (with the Vatican fragments of the *Genesis*, by Zangemeister and Braune), in *Neue Heidelberger Jahrbücher*, iv., nr. 2 (Heidelberg, 1894). There are smaller editions, with vocabulary, by Rückert (Leipzig, 1876, with notes), Heyne (3d ed. Paderborn, 1883), and Behaghel (Halle, 1882). The best dictionary is Schmeller's *Glossarium Saxonicum* (Munich, 1840). The smaller Old Saxon texts are found in Heyne's *Kleinere altniederdeutsche Denkmäler* (2d ed. Paderborn, 1877). A new edition by J. H. Gallée is to appear at Leyden. For Old Saxon grammar, see Gallée's *Altsächsische Grammatik*, i. (Halle and Leyden, 1891), and W. Schlüter, *Untersuchungen zur Geschichte d. altsächs. Sprache*, i. (Göttingen, 1892).

(b) *Middle Low Saxon*.—A brief sketch of Middle Low Saxon literature by H. Jellinghaus is found in Paul's *Grundriss*, ii., 1, p. 419, *seq.*; a fuller account of the poetry in Goedeke's *Deutsche Literaturgeschichte*, i., pp. 457-484. The Gandersheim chronicle was published by Weiland in *Deutsche Chroniken*, vol. ii., p. 397, *seq.* There is a critical edition of the *Sachsenspiegel*, by Homeyer, in 3 vols. (1835-44; vol. i. in 3d ed. 1861), and smaller editions by Weiske (6th ed. 1882) and by Lübben (1879). An edition of the *Saxon or Repgawish Chronicle*, by Weiland, appeared at Hanover in 1877. Recent editions (with vocabulary) of the Low Saxon *Reineke der Vos* are those by Lübben (Oldenburg, 1867), by K. Schröder (Leipzig, 1872), and by Prien (Halle, 1887). Many Middle Low Saxon texts are still unpublished. The elements of Middle Low Saxon grammar and specimens of various literary works are given in Lübben's *Mittelniederdeutsche Grammatik mit Chrestomathie und Glossar* (Leipzig, 1882). A comprehensive dictionary, in six volumes, was begun by Schiller in 1872 and finished by Lübben in 1881. There is a handy dictionary, in one volume, by Lübben and Walther (Norden, 1888).

(c) *Modern Low Saxon*.—For a bibliography of works on Low German in general and Modern Low Saxon in particular, see C. F. Hermann, *Bibliotheca Germanica* (Halle, 1878), p. 67, *seq.*; von Bahder, *Die deutsche Philologie* (Paderborn, 1883), p. 160, *seq.*; Kauffmann, in Paul's *Grundriss*, i. (1891), p. 968, *seq.*; Mentz, *Bibliographie der deutschen Mundartenforschung* (Leipzig, 1892); also the *Jahresbericht über germanische Philologie*, vol. i., *seq.* (Berlin, 1879, *seq.*). Important periodicals are *Die deutschen Mundarten* (vols. i.-vi., 1854-58; vol. vii., 1877); *Jahrbuch des Vereins für niederd. Sprachforschung* (vol. i., *seq.*, 1875, *seq.*); *Korrespondenzblatt des Vereins für niederd. Sprachforschung* (vol. i., *seq.*, 1874, *seq.*). There are several dialect maps, e. g. Bernhadi, *Sprachkarte von Deutschland* (2d ed. Cassel, 1849); Piper, *Die Verbreitung der deutschen Dialekte bis um das Jahr 1300* (Lahr, 1880). Lauremberg's *Veer Schertz Gedichte* have been reprinted by Braune (Halle, 1879). Selections from Abel's poems are given by Hofmeister in the *Jahrbuch* of the Low German Dialect Society, vol. viii., p. 115, *seq.* (collected by Gaedertz). There is a small *Plattdeutsches Wörterbuch zu Fritz Reuters Werken*, by Frehse (Wismar, 1867). Groth's *Quickborn* contains a brief but valuable glossary by K. Müllenhoff. A comprehensive collection of specimens of the various dialects is Firmenich's *Germaniens Völkerstimmen* (3 vols., Berlin, 1843-68). Grammars and dictionaries are: (1) North-east Saxon: Neger, *Grammatik des mecklenburgischen Dialekts* (Leipzig, 1869); *Versuch eines Bremisch-Niederdeutschen Wörterbuches* (6 vols., Bremen, 1767-1869); Ten Doornkaat-Koolmann, *Wörterbuch der ostfries. Sprache* (3 vols., Norden, 1879-84); Schambach, *Göttingisch-Grubenhagenesches Idiotikon* (Hanover, 1858); Schütz, *Holsteinisches Idiotikon* (4 vols., Hamburg, 1800-06), etc. (2) Westphalian: Holthausen, *Die Soester Mundart* (Norden, 1886); Woeste, *Wörterbuch der Westfälischen Mundart* (Norden, 1882). On the classification of the modern dialects and the differences between Northeast Saxon and Westphalian, see Jellinghaus, *Zur Einteilung der niederdeutschen Mundarten* (Kiel, 1884); Wenker, *Das rheinische Platt* (Düsseldorf, 1877); the reports on Wenker's *Sprachatlas*, by Wrede, in *Anzeiger f. dt. Alterthum*, vol. xviii., *seq.* (Berlin, 1892, *seq.*); Jostes, *Schriftsprache und Volksdialekte* (in the *Jahrbuch* of the Low German Dialect Society, xi., p. 85, *seq.*); Collitz, *Ueber das vergleichende Studium der niederdeutschen Mundarten* (in the *Korrespondenzblatt* of the Low German Dialect Society, xi., p. 23, *seq.*).

HERMANN COLLITZ.

Platte River: a stream formed in Lincoln co., Neb., by the union of the North and South Forks. The former rises in the North Park, Col., receiving the Sweetwater, the Laramie, and other streams. The South Platte flows from the South Park of Colorado, and in its upper course is extensively utilized in irrigation and as a source of water-power. The united stream flows E., and reaches the Missouri at Plattsmouth. It is the widest affluent of the Missouri, but neither the largest in volume nor the longest. Its mouth is over 1,000 yards wide, but it is so shallow that it can nowhere be navigated with much success. Its valley is generally very fertile. The drainage area is estimated at 7,500 sq. miles. The Loup Fork and Elkhorn are the chief tributaries. Length of the main stream, 900 miles.

Platteville: city; Grant co., Wis.; on the Little Platte river, and the Chi. and N. W. and the Chi., Mil. and St. P. railways; 18 miles N. N. E. of Dubuque, Ia. (for location, see map of Wisconsin, ref. 7-C). It is in an agricultural and lead-mining region, contains a State normal school, a national bank with capital of \$50,000, and two weekly newspapers, and has several flour- and planing-mills, foundries, etc. Pop. (1880) 2,687; (1890) 2,740; (1895) 3,321.

Plattsburg: village; capital of Clinton co., N. Y.; on the Saranac river at its entrance into Cumberland Bay, a part of Lake Champlain, and on the Chateaugay and the Del. and Hudson railways; 20 miles N. W. of Burlington, Vt., 155 miles N. of Albany (for location, see map of New York, ref. 1-J). It has an excellent harbor, good water-power from the lake, and a large lake commerce and lumber-trade. There are 4 national banks with combined capital of \$400,000, a daily, 2 monthly, and 2 weekly periodicals, U. S. Government building, the finest U. S. army barracks in the Union, a State normal school, academy, 2 libraries, and woolen-, flour-, and saw-mills, several large pulp-mills, and 3 foundries, sewing-machine factory, and machine-shops. Plattsburg is becoming noted as a summer resort. It is the home of the Roman Catholic Summer School of America, an institution on the plan of Chautauqua. In Sept., 1814, Commodore McDonough gained a victory over a British fleet in Cumberland Bay, and Gen. Macomb repulsed a superior British force on land. Pop. (1880) 5,245; (1890) 7,010; (1894) estimated, 8,600. W. H. FERRELL, EDITOR OF "THE PRESS."

Plattsmouth: city (site acquired by the U. S. Government by treaty with the Indians in 1854, incorporated as a town in 1855); capital of Cass co., Neb. (for location, see map of Nebraska, ref. 10-H); at the confluence of the Platte and Missouri rivers; on the Burlington Route and the Mo. Pac. railways; 22 miles S. of Omaha. It is engaged in the grain-, cattle-, and lumber-trade, and has 4 cigar-factories, brick- and terra-cotta works, carriage- and wagon-factories, and the principal shops of the Burlington Route Railway. There are 11 churches, 8 public-school buildings, including a high school that cost \$25,000; court-house that cost \$80,000; opera-house that cost \$50,000; gas and electric light plants; improved water-works; new sewerage system; a national bank with capital of \$50,000, and 2 State banks with capital of \$100,000; and 3 daily and 3 weekly newspapers. Pop. (1880) 4,175; (1890) 8,392.

EDITOR OF "HERALD."

Platyp'tera [Mod. Lat., from Gr. *πλατύς*, broad + *πτερόν*, wing]; the order of insects which includes the white ants and which is also known as Isoptera. See ENTOMOLOGY and TERMITES.

Platyt'pus: See DUCKBILL and ORNITHORHYNCHIDE.

Plauen, plow'en : town; in the kingdom of Saxony, Germany; on the Elster; 78 miles by rail S. of Leipzig (see map of Germany, ref. 5-F). It has many good educational institutions, and large manufactures of paper, leather, muslin, cambrie, jaconet, and other woolen and linen goods. Pop. (1890) 47,007.

Plau'tus, TITUS MACCIUS : play-writer; b. about 254 B. C. at Sarsina, in Umbria; went early to Rome, where he found employment with the actors; saved some money and started a business of his own, but failed; worked afterward at a hand-mill at Rome, and wrote, while thus employed, three comedies, which he succeeded in selling to the managers of the public festivals. They were well received, and from this time till his death, 184 B. C., he lived as a play-writer. The plots, and also generally the characters, of his plays he took from the Greek comedians, as Menander, Diphilus, Demophilus, and Philemon, but both underwent a very free treatment and a thorough Latinization, which may be in-

ferred from the general character of his dialogue; it is not only fluent and witty, but racy and taken fresh from the lips of the people. In his handling of the meters he shows great skill and versatility. While Terence, who was much more elegant, but also a much closer imitator of the Greeks, complains that the audience ran away from his plays to look at some rope-dancer, Plautus remained a favorite with the Romans down to the time of Diocletian, and was appreciated not only by the masses, but also by the most fastidious people—e. g. Cicero. According to Gellius, there existed 130 plays which bore his name, but the number of those unquestionably genuine Varro limited to twenty-one, which are doubtless those extant, namely, *Amphitruo*, *Asinaria*, *Aulularia*, *Bacchides*, *Captivi*, *Casina*, *Cistellaria*, *Curculio*, *Epidicus*, *Menachmus*, *Mercator*, *Miles gloriosus*, *Mostellaria*, *Panulus*, *Persa*, *Pseudolus*, *Rudens*, *Stichus*, *Trinummus*, *Truculentus*, and *Vidularia*. Of the last of these, only fragments remain in the Ambrosian palimpsest. The great progress made in Plautine criticism in the nineteenth century is due largely to Ritschl and his school. The great critical edition begun by him was completed by Loewe, Goetz, and Schoell (Leipzig, 1871-94). A notable contribution also is Studemund's *Plauti fabularum reliquiae Ambrosiana* (Berlin, 1889). See also Usings's complete edition with Latin notes (5 vols., Copenhagen, 1875-86). The Plautine literature is very extensive. Of annotated editions of separate plays may be mentioned *Captivi*, *Trinummus*, *Miles*, and *Menachmi*, by Brix (Leipzig); *Miles*, *Mostellaria*, and *Pseudolus*, by Lorenz (Berlin); *Captivi*, by Hallidie; *Miles*, by Tyrrell; *Amphitruo*, by Palmer; *Rudens* and *Mostellaria*, by Sonnenschein; *Pseudolus*, by E. P. Morris. There is an English translation by Thornton and Warner (5 vols., 1767-74); another by Riley (2 vols., 1852).

Revised by M. WARREN.

Playa: a name adopted from the Spanish (meaning, literally, shore or strand), for barren mud-plains, left by the evaporation of temporary lakes in arid regions. Typical examples occur in many of the desert valleys of the Great Basin, between the Rocky Mountains and Sierra Nevada. The winter is there the rainy season, and water collects in the valleys, forming shallow lakes, or "sinks," which are sometimes 200 or 300 sq. miles in area, but do not overflow. These lakes usually evaporate to dryness during the succeeding summer, but in other instances exist for a series of years, and are desiccated only during seasons of exceptional dryness. These "playa-lakes" are always alkaline, and of a yellowish color, owing to the exceedingly fine silt held in suspension. The deposits they leave on evaporating become so hard that the wheels of a heavy wagon leave but a slight impression on them. Their surfaces shrink and crack so as to resemble a tessellated pavement of cream-colored marble. In some instances the playas become coated with efflorescent salts during the summer, and then appear as if covered with drifting snow. Excavations made in the playa-earth fail to reveal a stratification of the deposit. In some instances land- and fresh-water shells are washed into the playa-lakes, and bones of land-animals and other stream-borne debris may be contributed by the streams which feed them. The valleys of the Great Basin are filled to the depth of many hundreds of feet with playa-deposits, and in some instances, judging from the character of the nearly buried mountain-peaks in the centers of broad deserts, the depth of filling must be measured by thousands of feet. Playa deposits bear a striking similarity to the loess of Asia, and seem to indicate the mode in which that deposit was formed. (See LOESS.) Consult *Lake Lahontan, Monograph No. 11, United States Geological Survey*, and *Subsided Deposits of the Arid Region of North America*, in *Geological Magazine*, vol. vi. (London, 1889). ISRAEL C. RUSSELL.

Playfair, JOHN: scientist; b. at Benzie, Forfarshire, Scotland, Mar. 10, 1748; educated at the University of St. Andrews, where he was distinguished for his attainments in natural history; became a minister of the Scotch Church 1772; held the living of Benzie 1773-82, when he resigned, removed to Edinburgh, and became a private tutor; was appointed assistant Professor of Mathematics in the University of Edinburgh 1785, Professor of Natural Philosophy 1805, and became in the same year general secretary of the Edinburgh Royal Society. He was a frequent contributor to the *Transactions* of that body, as well as to *The Edinburgh Review*; published *Illustrations of the Huttonian Theory of the Earth* (1802) and *Outlines of Natural Philosophy* (2 vols., 1812-16), containing the substance of his university

lectures. Prof. Playfair was one of the precursors of the geological discoverers of the nineteenth century, and traveled in search of geological data in France, Switzerland, and Italy; left incomplete at his death an interesting *Dissertation on the Progress of Mathematical and Physical Science*, prepared for the supplement to the *Encyclopædia Britannica*. D. in Edinburgh July 19, 1819. A collected edition of his works was issued at Edinburgh (4 vols., 1822).

Revised by G. K. GILBERT.

Playfair, LYON, Baron, K. C. B., F. R. S., LL. D.: scientist and statesman; b. at Meerut, in Bengal, May 21, 1819; educated at St. Andrews, Scotland, and the Andersonian University, Glasgow; studied chemistry under Graham and Liebig; engaged in industrial chemistry; became in 1843 Professor of Chemistry in the Royal Institution, and was in 1844 appointed on the commission constituted to examine into the sanitary condition of the large towns and populous districts of Great Britain; was appointed special commissioner in charge of the department of juries at the London exhibition of 1851, and in 1858 took the chair of Chemistry in the University of Edinburgh; became in 1868 a liberal member of Parliament for the Universities of Edinburgh and Aberdeen; postmaster-general 1873-74; and has held many other public positions of importance. He was made a K. C. B. in 1883 and raised to the peerage as Baron Playfair of St. Andrews in 1892. Together with W. Gregory he edited Liebig's *Chemistry in its Application to Agriculture and Physiology*, and is the author of numerous scientific memoirs—*Science in its Relation to Labor* (1853); *On the Food of Man in Relation to his Usual Work* (1865); *On Primary and Technical Education* (1870); *On Teaching, Universities, and Examining Boards* (1872); *Universities in their Relation to Professional Education* (1873); *Science in Relation to the Public Weal* (1885), and a variety of minor papers.

Playing-cards: a kind of cards used for playing games. In modern times, and for the most common games, a pack of cards numbers fifty-two, and consists of four suits, two red (hearts and diamonds) and two black (clubs and spades), each suit comprising thirteen cards—three picture-cards, the king, queen, and knave; and ten pip-cards numbered from one, the ace, to ten. Chinese packs have only thirty cards—three suits of nine cards each, and three single cards, which rank higher than the others. In India and other countries there are various other kinds of playing-cards, and in Europe and America innumerable games require cards made especially for them.

The traditional history of European playing-cards derived them, like chess, from Asiatic sources. In one account it is asserted that the Saracens first introduced them into Spain and Italy, and that thence they spread to the rest of Europe, while other authorities attribute their origin to China and to India; but later investigations have thrown much doubt on all previous theories, and it is claimed that playing-cards originated in Europe itself, probably in the fourteenth century. Prior to their invention, cards with emblematic pictures were used in fortune-telling. The first packs for playing-purposes varied in the number of picture cards, but pip-cards were from the first divided into four suits. The modern hearts, diamonds, clubs, and spades were designated in Italy and Spain by cups, money, clubs, and swords, and in Germany by hearts, bells, acorns, and leaves. All symbolic meanings attached to these devices are fanciful.

The fifty-two card pack has existed substantially as at present since the fifteenth century. Indicators, or small indexes placed at the corners of the cards, were introduced in 1860. The modern production of playing-cards is enormous; the number of packs made annually runs up to the tens of millions. Their manufacture is a Government monopoly in Russia, and in Great Britain and the U. S. forms a subject of special taxation. The first games played were chiefly of chance, but the tendency has generally been toward those that require greater skill. See E. S. Taylor's *History of Playing-cards* (1865); Willshire, *Descriptive Catalogue of Cards in the British Museum* (1877); Van Rensselaer, *The Devil's Picture-books* (New York, 1890). For a description of the most common games, see WHIST, CASSINO, ECHEQUE, SEVEN-UP, etc. S. A. TORRANCE.

Plea [M. Eng. *plee*, *plai*, *plait*, from O. Fr. *plait*, *plaid* < Lat. *placitum*, judgment, opinion, decision, liter., that which is pleasing to one, deriv. of *placere*, please]; in the common-law system of pleading, strictly, the first defense

or statement of fact interposed by the defendant in an action at law. (See PLEADING.) The term plea is also used as a name for an action or suit, as in the expression *court of common pleas* (see COURTS); also in the expression *pleas of the crown*, used to designate the criminal cases in England, in which the crown is the nominal PROSECUTOR (*q. v.*), although in fact the prosecutor is usually a private person.

F. STURGES ALLEN.

Pleading [deriv. of *plead* < M. Eng. *pleden*, *plaiden*, from O. Fr. *plaidier*, deriv. of *plaid*, plea. See PLEA]: in law, the making of the written allegations of the parties to an action, by which they state their respective claims and defenses and finally arrive at an issue of fact or of law, the decision of which will determine the judicial controversy between them; also (in the pl.) the allegations themselves. The pleadings of an action are a part of the steps comprehended under the general term PROCEDURE (*q. v.*), and, like the other parts of procedure, they are marked in the early stage by a rigid and excessive formality which is unsuited to the needs of our modern civilization. This early excessive formality and the subsequent modifications to meet the needs of changing circumstances can be noted here only as it has taken place in the law of England and the U. S. Only pleading in civil actions will be here treated of, since, although the terminologies in civil and criminal pleading differ, the principles are the same; thus, an *indictment* in a criminal action corresponds to the *declaration* or *complaint* of a civil action. Prior to the comprehensive reforms effected by statute there had long existed in England and the U. S. three different types or species of pleading—*common-law* pleading, *equity* pleading, and pleading by *allegation* (in the admiralty and ecclesiastical courts).

Common-law Pleading.—The common-law method prevailed exclusively in the courts of law. At a very early period the parties to a suit appeared in open court and made oral statements of their claims and defenses in the actual presence of the judges, which were at once written down by an officer of court; and this official transcript constituted the record of the proceedings. This oral mode seems to have continued until about the middle of the reign of Edward III. The common-law system, as it was subsequently perfected, arose from the substitution of written allegations in the place of these oral ones; and such writings, instead of being presented to the judges themselves sitting in court, were filed by the attorneys in the offices of the proper clerks.

The first pleading by the plaintiff was the *declaration*, which contained a statement of the cause of action made in a highly artificial, formal, and technical manner, and in language which differed widely from the English of ordinary narrative, and also indicated the particular form of action which the plaintiff had adopted.

If the defendant admitted the truth of the facts set forth by the plaintiff, but denied that in law they constituted the cause of action against him, his pleading was termed a *demurrer*. If, however, he desired to present an issue of fact, his pleading was styled the *plea*. The pleas by the defendant, and all subsequent pleadings in the suit by either of the parties, were separated into two classes—those by way of *traverse*, which directly denied all of the essential statements of fact contained in the preceding pleadings of the adverse party; and those by way of *confession* and *avoidance*, which admitted such statements to be true, but alleged other and new facts obviating and destroying their legal effect. If the defendant's plea was a traverse, an issue of fact was formed at once; if it was in confession and avoidance, the plaintiff must interpose a *replication* or a demurrer. In this manner the alternate allegations were conducted until either an issue of law was presented by a demurrer or an issue of fact by a direct affirmation on the one side and a denial thereof on the other; in actual practice, however, the series seldom was extended beyond the replication.

The rules which governed the common-law system and regulated the manner of making the averments were exceedingly refined, precise, and formal, and litigations were often decided upon the most technical questions, without reference to the merits of the controversy.

Equity Pleading.—In a case in equity the complainant's case was stated in a *bill of complaint* and the defendant's in an *answer*, and these ordinarily constituted the only pleadings, although a few particular defenses were set out in a form known as the *plea*. The parties were not subjected

to the technical rules of the common law, but used a more natural mode of statement. The pleader averred not only the principal facts constituting the ground for relief or the defense, but also the evidence by which these facts were substantiated, so that the cause could often be decided upon these averments alone.

Pleading by Allegation.—The mode of pleading in the court of admiralty and the ecclesiastical courts was substantially identical, in respect to the matters required to be stated, with the equity method, and differed from that simply in the external form of the averments. Each important fact, together with the detail of evidence concerning it, was contained in a separate paragraph, technically termed an *allegation*, so that the LIBEL (*q. v.*) of the complaining party, which corresponded to the declaration and the bill of other courts, was separated into a number of distinct paragraphs or allegations, each relating to a single fact or occurrence.

Code Pleading.—The injustice and delay occasioned by these formal and cumbersome methods of pleading led to the series of reforms which have created the systems of code pleading. In the U. S. the Legislature of New York began the reform in 1848 by effecting for that State a radical change in these modes of pleading by the adoption of the Code of Civil Procedure; the reform thus inaugurated has extended into most of the States and Territories of the U. S. In England the first decisive step in this direction was made by the Common-law Procedure Act of 1854; but the system of code pleading was not fully adopted there until the Judicature Acts of 1873 and 1875 consolidated all the common-law and equity courts, and abolished the distinction between legal and equitable suits and the rules which governed the common-law pleading. The parties in all actions are required to state the facts constituting the ground of relief or the defense as they actually existed, in ordinary language, without any technical formality, and without any averments of evidence or of legal conclusions. In some of the States the first pleading by the plaintiff is denominated the *complaint*, in others the *petition*, while in England it is called the *statement of claim*. The only pleading of fact by the defendant is styled the *answer* in all of the several States, but in the English practice the *statement of defense*. Under certain circumstances the plaintiff must put in a *reply*, but the pleadings of fact can seldom extend beyond this point. The defendant may demur to the plaintiff's complaint, petition, or statement of claim, and to his reply; and the plaintiff may demur to the defendant's answer or statement of defense. The underlying principle of this reformed system is natural, correct, and at the same time truly scientific, but in its practical application there is yet much to be learned. See the works of Stephen, Chitty, Story, and Gould on Pleading; Odgers's *Principles of Pleading* (in England); Bishop's *Code Practice in Personal Actions* (in New York); and the *Reports of the Royal Commissioners on Practice and Pleading* (1829-34 and 1851-60); also the *American and English Encyclopædia of Law*.

JOHN NORTON POMEROY.

Revised by F. STURGES ALLEN.

Pleas of the Crown: See PLEA.

Pleasanton. ALFRED: soldier; b. in the District of Columbia, Dec., 1823; graduated at the U. S. Military Academy 1844; assigned to First Dragoons; captain Second Dragoons Mar., 1855; major Second Cavalry Feb., 1862. He took part in the war against Mexico, and served on frontier duty as acting assistant adjutant-general. In the civil war he served throughout the Virginia Peninsular campaign of 1862; appointed brigadier-general of volunteers July 16, 1862, he commanded in September the division of cavalry following Lee's army. He was engaged at Boonsboro, South Mountain, Antietam, and Fredericksburg; at Chancellorsville his action was most effective in checking the further advance of Stonewall Jackson's corps, which threatened to carry all before it. Promoted to be major-general in June, 1863, he was engaged in the actions preceding Gettysburg, where he also commanded in chief the cavalry; transferred to Missouri in 1864, he drove Gen. Price from the State. He received the brevets of lieutenant-colonel, colonel, brigadier and major-general for gallantry in the field. Mustered out of the volunteer service Jan., 1866, he in 1868 resigned his commission in the regular army, and became U. S. collector of internal revenue. He was appointed major U. S. army Oct. 19, 1888; retired 1888. D. in Washington, D. C., Feb. 17, 1897.

Pleasure: See PAIN.

Plébiscite, plā-bi-seet' [Lat. *plébiscitum*]: in modern France, a decree of the whole nation obtained by universal suffrage, a proceeding which both Napoleon I. and Napoleon III. used in order to legitimize their *coups d'état*. After the dissolution of the Directory, Nov. 9, 1799, Napoleon I. appealed to the nation in this way, and Napoleon III. did the same after the dissolution of the National Assembly, Dec. 2, 1851, the first *plébiscite*, in May, 1804, giving a majority of 3,572,399 votes; the second, in Nov., 1852, giving a majority of 8,157,752 votes. In the Roman republic a *plébiscitum* was a law passed at the *comitia tributa* by the *plebs* or commons on the rogation of a tribune, and was different from a *lex*, which was passed at the *comitia centuriata* by the *populus* or patricians on the rogation of a consul or other senatorian magistrate.

Plebs and Plebeians: See PATRICIAN.

Pleop'tera [Mod. Lat., from Gr. *πλέκω*, twist + *πτερόν*, wing]: that order of insects which contains the so-called stone-flies (*Perlidae*), and which receives its name from the fact that the broader hinder wing is folded, when at rest, beneath the other, much as in the grasshoppers. The larvæ are very abundant in fresh-water streams, where they crawl about beneath stones, etc., and furnish a considerable element in the food-supply of many fishes. In Europe several species are used for bait in fishing, one being called "yellow Sally" and another "willow-fly." See ENTOMOLOGY.

J. S. KINGSLEY.

Pledge: See PAWNBROKING and MORTGAGE.

Pleiade: name assumed by a group of seven Greek poets of the third century B. C., and in imitation of them by seven French poets of the sixteenth century, who, inspired by the revival of the study of classical letters, strove to renew French language and literature in their image. They were Pierre Ronsard, who came to be the leader of the movement, Joachim du Bellay, Remi Bellau, Jean Daurat, Pontus de Tyard, Antoine de Baif, and Étienne Jodelle. A. G. C.

Plei'ades, or **Plei'ades** [= Lat. = Gr. *Πληιάδες* and *Πλειάδες*; cf. *πλέω*, to sail, their rising indicating the beginning of the time of safe navigation]: in astronomy, a group of stars in the shoulder of Taurus, called "the seven stars," though to most eyes only six are visible, while keen eyes can see eleven. There are, however, hundreds of telescopic stars in the group, and Herschel has shown that they are, physically, closely related to each other. In Grecian mythology the seven stars were seven daughters of Atlas and Pleione, one of whom (Sterope) became invisible from shame, because she had been embraced by a mortal. S. NEWCOMB.

Pleistocene Period [*pleistocene* is from Gr. *πλεῖστος*, most + *καινός*, new]: the latest division of geologic time, or the division succeeding the Neocene period and preceding historic time. The terms Quaternary era, Post-tertiary period, Glacial period, and Ice-age are synonyms. Most of the geologic periods are distinguished one from another by means of their faunas and floras, but the Pleistocene is primarily distinguished by peculiarities of its climatic history. The climate of the earth, or of a large part of it, was then colder than it had previously been for several geologic periods, and colder than it is at present.

Extent of Glaciation.—The most striking feature connected with this lowered temperature was the growth of mountain glaciers and the creation of immense ice-fields where none had existed before. The evidence of these changes is found not only in certain deposits of peculiar composition, but in equally peculiar types of topographic form. In unglaciated regions streams descend over successively gentler slopes from head to mouth. Lakes are of rare occurrence, being confined for the most part to deltas and to interior basins. In glaciated regions there is relatively little continuity of slope, lakes are abundant, and the courses of streams are irregular. In unglaciated regions the soil results from the disintegration and decomposition of the rock beneath, except that the alluvium along streams consists of gravel and finer particles brought down by the streams. In glaciated regions the soil is never derived directly from the rock beneath, but consists of material transported from a greater or less distance. This material, known as **DRIFT** (*q. v.*), differs from alluvium in that some of its boulders are of great size, in that its transportation has not been simply down the slope, in that its materials are not generally rounded and sorted, and in other ways. Beneath the drift the bed-rock lies undecomposed, and its surface is usually polished or covered with parallel scratches and

grooves. Deposits made by water are in general smooth of surface, and slope in the direction of the depositing current. Deposits from ice are of uneven surface, abounding in knolls and undrained hollows. By the aid of such data as these the following general facts have been learned with reference to the distribution of the Pleistocene ice. In North America the small glaciers of the Rocky Mountains and the Sierra Nevada, and the greater glaciers of Alaska, were all expanded, descending the mountain slopes to greater distances. Glaciers were also formed on many mountains where they no longer exist. The glaciers of the Alaskan mountains and the western mountains of British America extended so as to coalesce and fill the intervening valleys, producing an ice-field comparable with that of Greenland. At the same time a much larger field was formed in Northeastern America. Its northern limits are not yet determined, but it extended eastward to the Atlantic Ocean, westward nearly to the northwestern field just mentioned, and southward over the Great Lakes into the U. S. (See GEOLOGY, map No. 2.) New England was completely buried, nearly the whole of New York, and parts of New Jersey and Pennsylvania. The Ohio river was reached near Cincinnati, and the Missouri at many points. Indeed, the present courses of the Ohio and Missouri were largely determined by the position of the ice-front. In Europe the glaciers of the Pyrenees, Alps, and Caucasus were greatly extended. Those of Scandinavia not merely coalesced, but spread to immense distances eastward, southward, and southwestward, making an ice-field several times greater than that of Greenland. A large part of Russia, Poland, Denmark, and Holland, and parts of Germany and Belgium were covered, as also were the North Sea, the whole of Scotland and Ireland, and all but the southern extremity of England. In the Himalayas, Tian Shan, and other high mountains of Asia the local glaciers were increased. The combined ice-fields of Europe and North America were then equal to the present great ice-field of the Antarctic continent.

In the southern hemisphere the changes were equally significant, although less in areal extent by reason of the smaller ratio of land to water. It is believed that the Antarctic ice-field was extended. The mountain-glaciers of Patagonia were expanded, becoming confluent and overrunning the greater part of the peninsula, so as to produce a field little inferior to that of Greenland. The southern island of New Zealand was largely overrun by ice, and a few glaciers were created in Australia and South Africa.

Associated Phenomena.—Where the glaciers reached the ocean they broke up into icebergs, which distributed the detrital matter widely over the bottom of the sea, and some portions of this sea-bottom have since been lifted into land. Elsewhere ice-tongues served as dams, obstructing the free drainage of valleys and creating temporary lakes, by means of which iceberg drift was transported. Some of the most important of these occupied the basins of Lake Winnipeg and the Laurentian lakes, but instead of discharging to Hudson Bay and the Gulf of St. Lawrence, found outlet southward to the Mississippi and Ohio, and eastward to the Hudson. (See AGASSIZ, LAKE.) In regions of interior drainage the cooler climate, by diminishing evaporation and possibly by increasing rainfall, caused the creation or expansion of lakes which left permanent record in the form of beach-lines and sediments. Great Salt Lake, Utah, Pyramid Lake, Nevada, and the Caspian and Dead Seas of Asia were all greatly enlarged. (See BONNEVILLE, LAKE, and LAHONTAN, LAKE.) Coincident with the greatest expansion of glaciers were local changes in the relative altitude of land and sea, and to some extent the connection of these has been definitely established. Thus certain gravels, sands, and terraces on the plains bordering the Atlantic and Gulf coasts of the U. S. have been determined to be of Pleistocene age.

As the temperature fell, animals and plants of polar and temperate zones gradually worked toward the tropics, and as the temperature again rose they slowly migrated poleward. At each locality, therefore, there was a series of life-changes corresponding to the climatic changes, and to some extent these are recorded by fossils in contemporaneous deposits. They are recorded also by a peculiar isolation of various species upon mountain tops. During the period of rising temperature the plants and animals favored by low temperature were able to adjust themselves to changing conditions not only by migrating poleward, but also by ascending mountain slopes; and thus many mountain tracts in temperate regions came to be inhabited by colonies of plants and animals belonging to distant latitudes and separated

from cognate floras and faunas by wide intervals whose present climate is a complete barrier to intercommunication.

Cause of Climatic Changes.—One of the vexed questions of geology is the cause of the Pleistocene cold. One theory ascribes it to variations in the quantity of heat radiated by the sun. This theory is adequate, and, as regards the earth, simple; but it has not been widely entertained, because no satisfactory explanation has been offered of the postulated variation in solar radiation. A second theory is based on secular variations in the relation of the earth to the sun. The eccentricity of the earth's orbit varies slowly and irregularly, and it is computed that two important maxima of eccentricity have occurred at late geologic dates. The theoretic effect of high eccentricity is to produce a glacial climate in one hemisphere and a mild climate in the other, the difference depending on the relation of the solstices to perihelion. When these relations are reversed through precession, the climates of the two hemispheres would be interchanged, and such interchange should theoretically occur many times during each period of maximum eccentricity. This theory has received more attention and is more widely entertained than any other. A third theory assumes that the axis of rotation has changed its position with reference to the earth's surface, or, in other words, that the pole has wandered, carrying with it glacial conditions. This theory seems adequate, but there is no independent evidence that the pole has thus wandered, and a competent cause for any permanent or large change of position has not been discovered. A fourth theory appeals to geographic changes, especially changes in the distribution of land and water. As large aqueous precipitation is necessary to the formation of glaciers, their present distribution is greatly influenced by the relation of bodies of warm water to bodies of cold land. Thus ocean currents are important factors. The directions of ocean currents are determined by the distribution of land and water. It can readily be imagined that the land and water of the globe might be so distributed as to prevent, on the one hand, or greatly increase, on the other, the polar accumulations of ice, and the theory appeals to this possibility; but it has not yet been ascertained that the actual arrangement of land and water in Pleistocene time was such as to produce the climates which then existed. A fifth theory ascribes Pleistocene glaciation to a general and great uplifting of the regions in which it occurred. This cause is probably competent, but it has not been shown that the glaciated districts actually had great elevation at the time when their glaciers were formed. In the presence of so large a number of theories deserving serious consideration, it is needless to enumerate less plausible explanations, of which a considerable number have been suggested. The body of known facts is of such importance, and the body of pertinent and obtainable knowledge is so vast, that we may feel assured a satisfactory explanation will eventually be found.

Complexity of Pleistocene History.—In many places glacial deposits are overlain by peat or other deposits which could not have been formed beneath the ice, and these in turn are overlain by other glacial deposits. In this way it is shown that mountain glaciers and lowland ice-sheets advanced and retreated more than once. In the opinion of some students, such advances and retreats were numerous and of great amount, so that there were in effect a considerable number of glacial epochs. In the opinion of others, there were two principal glacial epochs, separated by an interglacial epoch, when the climate did not differ greatly from that of the present time. A third opinion recognizes but one great climatic revolution, this being characterized by minor oscillations, causing the ice margin to advance and retreat over narrow areas. When this question has been settled, an important contribution will have been made to the question of cause, for the current theory, founded on the astronomic history of eccentricity and precession, implies a long alternation of glacial and mild climates in each hemisphere, while the theories of varying solar energy and geographic change can most plausibly be appealed to in explanation of a single great climatic event.

Closely related to the question of complexity is the question of synchrony. While there is much evidence to show that the ancient glaciation of different continents and different hemispheres occurred in the same general portion of geologic time, it is as yet impossible to say whether the great climatic changes of widely separated regions occurred at the same time.

LITERATURE.—Although the Pleistocene is the shortest of

all the geologic periods, its literature is by far the most abundant. This is due largely to the fact that the Pleistocene deposits, being last formed, overlie all others, and are exceptionally prominent and accessible. From these abundant data it is possible to derive some comprehension of the complexity of the physical history of the period, and the field for discussion thus opened has proved fertile and attractive. It may fairly be assumed that the histories of other geologic periods are equally complex, and appear simple only from the paucity of data for their determination.

Additional information in regard to glacial sculpture may be found in the articles **GLACIERS** and **MOUNTAIN**. (See also **DRIFT** and **GEOLOGY**.) The question of the unity or diversity of the period is discussed by Wright and Chamberlin in *The American Journal of Science* for 1892 and 1893. The following books and papers discuss the causes of the glacial climate, and describe the more important of the American Pleistocene phenomena: Chamberlin's *Hypotheses as to the Cause of the Glacial Period* (*American Geologist*, vol. viii., 1891); *Terminal Moraine of the Second Glacial Epoch* (*Third Annual Report, United States Geological Survey*, 1883); *Rock Scorings of the Great Ice Invasions* (*Seventh Annual Report, United States Geological Survey*, 1888); *Croll's Climate and Time* (1875), *Climate and Cosmology* (1885); Dawson's *Later Physiographical Geology of the Rocky Mountain Region of Canada* (*Transactions of the Royal Society of Canada*, vol. viii., 1890); *Geikie's Great Ice Age* (1873), *Fragments of Earth Lore* (1893); *Gilbert's Lake Bonneville* (*Monograph I., United States Geological Survey*, 1890); *Wright's Ice Age in America* (1887).

G. K. GILBERT.

Pleonasm [from Gr. *πλεονασμός*, superabundance, deriv. of *πλεονάζειν*, to be more than enough]: the use of more words than are strictly necessary for the bare expression of an idea. It involves the use of words whose idea is already contained in some other part of the statement, generally in some part which is syntactically different. It represents, though logically inaccurate, a natural linguistic method of enhancing and enforcing an idea, or of giving it clearer definition, and appears in the greatest variety of usages; thus, *like as if, from henceforth, most unkindest, φεύγειν φύγῃ*, to flee in flight, *the reason why he did this is because*, etc.

BENJ. IDE WHEELER.

Plesiop'idæ [Mod. Lat., named from *Plesiops*, the typical genus; Gr. *πλησιός*, near + *ὤψ, ὀπίς*, eye, face]: a family of fishes of the order *Teleostei*. In external appearance they have some resemblance to the American sunfishes, the body being oblong, compressed, and covered with moderate scales; the lateral line is interrupted; the head rounded anteriorly; the opercula unarmed; the mouth has a lateral cleft, and the upper jaw is moderately protractile; teeth small, on the jaws as well as palate; branchial apertures continuous below; branchiostegal rays six; dorsal elongated, with the spinous portion longer than the soft; anal with its soft part opposite that of the dorsal, and armed with three spines; pectorals with branched rays; ventrals each with a spine and four soft rays. These fishes are especially recognizable by the development of only four soft rays in the ventral fins. They inhabit the salt water, and extend from the Red Sea to the Pacific Ocean. The scientific name alludes to the approximation of the eyes, resulting from the narrow frontal bones.

Plesiosau'rus [Mod. Lat.; Gr. *πλησιός*, near + *σαῦρος*, lizard]: a genus of large extinct marine reptiles, which were abundant in Mesozoic time, but had no representatives in the Tertiary. The skull was small, and the teeth were in distinct sockets. The neck was much elongated, and the tail comparatively short. The limbs were in the form of paddles, resembling those of the turtles, and were nearly of the same size before and behind. Some members of the group were of enormous size, and others quite small. The genus *Plesiosaurus* is not rare in European formations, but has not been found in America, its chief representatives there being *Pantosaurus* in the Jurassic, and *Cimoliosaurus* in the Cretaceous.

O. C. MARSH.

Pleskov: See **PSKOV**.

Pleth'ora [Mod. Lat., from Gr. *πληθώρα*, fullness, plethora, deriv. of *πλήθος*, multitude; cf. *πλήρης*, full]: among older medical authorities, the condition now commonly called full-bloodedness. This excessive richness in the quantity or quality of the blood was thought to be indicated by the redness of the skin and mucous membranes, the full, bounding

pulses, the tendency to hemorrhages and palpitations, and other symptoms. Modern investigation, however, has shown that these symptoms are the result of peculiarly vigorous circulation and not of excess of blood. In reality plethora does not exist excepting possibly as a temporary condition.

WILLIAM PEPPER.

Pleu'ra [Mod. Lat., from Gr. *πλευρά*, rib, side]: a thin membrane that lines the cavities of the chest, extending over the external surface of the lungs. It consists of two closed sacs. The portion lining the chest is distinguished as the costal pleura, and is a sheet of elastic cellular tissue loosely attached to the ribs, muscles, and adjacent parts. That lining the lungs, known as the pulmonary pleura, is composed of a superficial layer of fine cellular tissue and a second elastic layer of coarser fibrous tissue, which materially assists in expiration. Both portions of the pleura are covered inside with a delicate layer of endothelium, and the narrow spaces inclosed in each sac are known as the pleural cavities, and are kept constantly supplied with a serous fluid which enables the opposite layers to glide easily upon each other in the movements of respiration.

In *entomology* the pleura is the side of the stethidium between the thorax and pectus. Revised by W. PEPPER.

Pleurisy, or Pleuritis [from Fr. *pleurisie* < Lat. *pleurises*, for earlier *pleuritidis*—Gr. *πλευριτις*, pleurisy, deriv. of *πλευρά*, rib, side]: inflammation of the PLEURA (*q. v.*), acute or chronic. It may be what is called dry, with little or no effusion, or it may be accompanied by effusion. Pleurisy may be caused by exposure to cold, injuries to the membrane itself (traumatism), or the communication of inflammation from adjacent structures. This latter head includes many causes, such as inflammation of the lung, of the chest-wall, of the diaphragm, and of the organs contiguous to the wall of the chest and the diaphragm. Besides these, a very common cause of pleurisy is tuberculosis; and in patients who have repeated attacks of pleurisy this is probably almost always the cause. Rheumatism is also a cause of pleurisy, and it may occur in the course of fevers, especially in smallpox and scarlet fever. Blood-poisoning (septicæmia) is quite a common cause of pleurisy, and so is disease of the kidneys.

In the dry form of pleurisy the first change visible is a clouding of the cells on the surface of the pleura, so that it loses its beautiful transparent luster and looks opaque, reddened, slightly roughened, and is marked by minute congested blood-vessels. This congestion sometimes causes a rupture of small vessels and the pouring out (extravasation) of small quantities of blood beneath the surface layer of the pleura. After this there often form on the surface of the pleura patches of organized lymph (plastic exudate) like adherent flakes. At this stage of pleurisy the exudate may be reabsorbed and the patient may recover perfectly, or it may remain as an organized deposit on either the lung pleura (visceral pleura) or the pleura covering the chest-wall (parietal pleura), or that of the diaphragm or mediastinum. This form of pleurisy may also result in adhesions between the opposite pleural surface and the formation of patches of adhesion or of bands, narrow but of appreciable length, limiting the movement of the lung in the thoracic cavity.

In pleurisy with effusion (hydrothorax) there is poured out more or less excess of the fluid which ordinarily merely lubricates the pleural surfaces. When this effusion is small it may cause no appreciable trouble, and indeed entirely escape detection; when it is extensive, it may press the lung into a very small space, and so seriously interfere with respiration and circulation as to cause death. A pleuritic effusion may become purulent by the multiplication in it of pus cells. This constitutes empyema, a condition which endangers life, not only by mechanical pressure on the lung, but also by the impairment of the constitution incident to the presence in the body of what is practically a huge abscess. An empyema may remain for some time without communication with the outer air, or it may burrow its way out through the walls of the chest or the diaphragm, or into a bronchial tube. In the latter case the pus is discharged by coughing.

The symptoms of pleurisy are fever, pain in the side, difficulty in breathing, and often a dry, unproductive cough. A patient often finds it easier to lie upon the affected side, because the motion of the side is thereby restricted. There are general symptoms of illness, by which the disease may be distinguished from neuralgia or rheumatism of the chest-wall. The physical signs of dry pleurisy are very

slight, consisting chiefly in the sound of rubbing (friction sound) between the two roughened pleural surfaces. In the stage of effusion the sounds are those to be expected from the displacement of the air vesicles of the lungs by a fluid. Percussion over the former discloses resonance, while there is dullness or flatness on percussion over the area occupied by fluid, whether this be serous or purulent. In pleurisy there is always some impairment of the motion of the side of the chest affected, and evidences of interference with the function of respiration, such as shortness of breath and imperfect aëration of the blood, are often plainly discernible by the eye. Where there is much effusion there is bulging of the affected side, and obliteration of the lines of depression which normally exist between each pair of ribs. With such effusions there is sometimes displacement of the heart and even encroachment upon the opposite side of the chest. After the fluid of pleuritic effusion has been absorbed, or that of empyema has been carried off or discharged, the crowded lung sometimes fails to expand again and to occupy the full lung space of its side of the chest. This may be due to permanent contraction of the lung, or to the formation, when it is contracted, of adhesions to the chest-wall, which prevent the lung from resuming its former dimensions. In either case the thorax becomes distorted by depression of the chest-wall under the pressure of the atmosphere, especially in young subjects.

The treatment of pleurisy without effusion is usually simple, consisting in measures to promote excretion from the bowels, from the kidneys, and from the skin, with rest in bed and judicious diet. No medicines are needed except such as contribute to these ends or as are used to allay pain. Pleurisy with effusion requires more treatment and often surgical measures to rid the chest of its accumulated fluid. When the effusion is serous it may be removed easily and simply by the operation of tapping the chest. The most perfect form of tapping is that by means of an instrument called "the aspirator," invented by a French physician, Dieulafoy. In this, a suction pump, attached to a tube and a hollow needle, is used to withdraw fluid from the chest. When the effusion of pleurisy is purulent, the accumulation must be treated on the same principles as those that govern the treatment of abscesses elsewhere in the cavities of the body. So long ago as the time of Hippocrates such cases were treated wisely and skillfully by surgical operation—that is, by making an incision through the chest-wall and allowing the fluid to come away. In modern times such abscess cavities are treated by opening, emptying, washing out—especially with medicated fluids—and prolonged drainage by means of the insertion of tubes, or even by the removal of a portion of a rib or ribs.

In itself pleurisy is not a very dangerous disease, but if it be caused by constitutional disease like tuberculosis, or if it occur in a patient with a poor constitution, or if it be unwisely managed, it may end in death or permanent disability.

CHARLES W. DILLIS.

Pleurisy-root: See ASCLEPIAS and BUTTERFLY-WEEB.

Pleurodel'idae [Mod. Lat., named from *Pleurodeles*, the typical genus; Gr. *πλευρά*, side, ribs; and *δῆλος*, visible]: a family of salamanders chiefly inhabiting the Old World. The palatines bear teeth on the inner margins; prefrontals as well as pterygoids are present; the frontals are broad, and not embraced by the parietals; the occipital condyles are sessile; the parasphenoid has no dentigerous plates; the vertebrae are only concave behind; the carpus and tarsus are ossified. The typical species has the ribs protruding through the sides of the body, in allusion to which the name *Pleurodeles* has been given.

J. S. KINGSLEY.

Pleurodi'ra [Mod. Lat.; Gr. *πλευρά*, side + *δεῖρή* (dial. for *δέρη*), neck]: according to some authors, a sub-order of the order *Testudinata*, or tortoises; distinguished by the neck bending sideways and the incapability of retraction of the head completely under the carapace, and thus contrasting with those tortoises in which the neck bends in a vertical plane. The pelvis is fixed to the carapace and plastron. The group embraces families peculiar to the southern hemisphere and related forms found in the early epochs of the northern. The generally recognized families are *Podocnemididae*, *Cryptodidae*, *Hydroscaphidae*, *Pseudemididae*, and *Sternotheridae*.

Revised by D. S. JORDAN.

Pleuronec'tidae [Mod. Lat., named from *Pleuronectes*, the typical genus; Gr. *πλευρά*, side + *νῆκτης*, swimmer]: a family of fishes including the ordinary flat-fishes, such as flounders, turbot, halibuts, plaice, etc. It belongs to the

order *Heterosomata*. The body is always much compressed, with one of its sides (which is upward when the animal is reclining on its side) dark-colored, and the other (which is downward) generally white: the scales are variously developed (sometimes ctenoid, sometimes cycloid, and sometimes wanting); the head compressed; both eyes are on the same side, one being on or near the forehead, the other comparatively low down; opercula normal, unarmed; mouth terminal, and with an oblique lateral cleft and of various extent; branchial apertures continuous below; branchiostegal rays five to eight; dorsal elongated, extending generally from about the rostral region to near the caudal fin; anal fin also elongated, and extending about as far back as the dorsal; both are composed almost solely of articulated rays; caudal fin distinct from the dorsal and anal; pectorals on both sides; ventrals jugular. The skeleton has numerous vertebrae; pyloric caeca are generally developed, but in small number. The species of the family thus defined are distinguishable into three sub-families—(1) *Pleuronectinae*, in which the mouth is small, and the supramaxillary ends before or under the front of the eye; (2) *Hippoglossinae*, in which the mouth is large, and the supermaxillaries extend more or less under the eye, and the ventrals are lateral; and (3) *Rhombinae*, in which the mouth is large, and the ventral fin on the dark side inserted on the ridge of the abdomen. The species are numerous, and are found distributed in every sea, and some of them ascend rivers. They live chiefly on sandy bottoms, and rest with their white side below and the dark one upturned. Although almost all have the eyeless side white or colorless, a few have dull spots on that side, and in some species it is colored like the eyed side. The very young have the body vertical in the water and the eyes symmetrical. In the process of development the body becomes horizontal, and the head is twisted or modified so that the eye of the lower side is transferred around or through the head to the opposite side. In the U. S. the most common species in the markets of the Eastern States are the small-mouthed flounder (*Pseudopleuronectes americanus*), a large-mouthed flounder (*Paralichthys dentatus*), and the halibut (*Hippoglossus hippoglossus*). The American species are mostly different from those of Europe, and the true turbot, like the true sole, has never been taken in American waters.

Revised by D. S. JORDAN.

Pleuro-pneumonia: one of the names by which the ordinary type of pneumonia (croupous pneumonia) has been designated. It signifies that the pleura or covering of the lung is inflamed at the same time as the lung itself. This is always the case in croupous pneumonia; but exceptionally the pleural involvement is of such prominence that the term pleuro-pneumonia seems specially applicable. W. P.

Pleuro-pneumonia (of cattle), or **Lung Plague**: a contagious febrile disease of cattle, characterized by a progressive interstitial pneumonia, in which the inflammatory process usually extends to the pleura.

It has been known from the time of the first written records of the diseases of animals. It has often followed in the wake of European armies, having been spread by the cattle carried along for food. This disease has existed in all countries of Europe, with the exception of Norway and Sweden, and has been carried by cattle from these infected countries to Great Britain, Africa, Australia, and North America. Lung plague usually spreads rapidly among the cattle of a country into which it is introduced, unless restrictive measures are adopted to prevent traffic in diseased and possibly diseased animals. In 1839 cattle from The Hague carried this malady to Cork, Ireland, and from this point the British Isles became infected. A British ship landed a cow suffering with pleuro-pneumonia at Brooklyn in 1843. Many cattle in the adjacent districts became infected from this source, and the disease gradually spread until herds were infected in several of the Eastern States. Subsequently shipments of diseased cattle carried pleuro-pneumonia to Kentucky, Indiana, Illinois, and Missouri. The disease has, however, been completely stamped out in the U. S. by the bureau of animal industry. The symptoms of lung plague are fever, dry muzzle, accelerated pulse and respiration, depression, cough, and the altered sounds upon auscultation and percussion that indicate pneumonia and pleurisy. In about one-half of the cases death occurs in from two to four weeks after the beginning of an attack. Of the remaining cases about equal numbers become chronic and recover. After death the lungs have a peculiar "marbled" appearance, due to the exudation of yellowish serum

into the thick layers of connective tissue which separate the dark colored and hepatized areas of lung tissue. In advanced cases the lung becomes broken down and caseous in spots that range in size from that of a walnut to that of a child's head. These areas are encapsulated in a fibrous membrane. It sometimes happens that cattle that have apparently recovered convey the disease to others after several months or years have passed, and this is explained by the fact that these capsules may break, allowing their semi-fluid contents to escape.

No therapeutics that has been tried is of any value, so efforts to cure have been abandoned, and governments have made regulations providing for the quarantine of diseased and suspected animals and for the slaughter of all that are regarded as dangerous to healthy cattle. It was by the enforcement of these measures that the U. S. freed itself from pleuro-pneumonia, and the same measures are (1894) being employed in England with good prospects.

It is estimated that for a long series of years the annual loss to Great Britain from lung plague amounted to £2,000,000. It is impossible to estimate accurately the amount of loss caused by this disease in the U. S., but it is known to amount to several million dollars. LEONARD PEARSON.

Plevna (Bulgarian, *Pleven*): town of Bulgaria; on the Vid; 26 miles S. of the Danube (see map of Turkey, ref. 3-C). Here the Ottoman army under Osman Pasha was besieged by the Russians from July 18 to Dec. 10, 1877, and, after a desperate resistance, was forced to surrender, 43,000 men being taken prisoners. This was the critical event of the Russo-Turkish war. Pop. (1888) 14,307.

Plin'y (full Latin name *Gaius Plinius Secundus*), generally called **Pliny the Elder**: author; b. at *Novum Comum*, 23 A. D., of a noble and wealthy family; served in the army under Domitius Corbulo and Pomponius Secundus in Germany, where he composed *De Jactatione Equestri* and began a history of the wars in Germany (*Bellorum Germanie libri xx.*); was in Rome again in 52; studied jurisprudence and began to practice. During Nero's reign he composed his *Studiosus*, in 3 books, and *Dubius Sermo*, in 8 books. According to a Greek inscription found in Arados, which Mommsen refers to Pliny, he served in the Jewish war in Syria in 70 and was afterward *procurator Syriae*. We know also that he was procurator in Spain under Vespasian, and that he must have been in Gaul and Africa, but it is impossible to date his journeys. In Rome he lived in great intimacy with the Emperors Vespasian and Titus, and was suffocated by the eruption of Vesuvius in 79. There is a detailed and very interesting account of his death by his nephew, Pliny the Younger, in a letter to Tacitus (*Epist.*, vi. 16). He was a very prolific writer, but of his works only the *Historia Naturalis*, in 37 books, is extant, edited in 20 vols. by Panekoucke, with commentaries and notes (Paris, 1829-33), by Sillig (8 vols., Gotha, 1851-58), and by Detlefsen (6 vols., Berlin, 1866-73); translated into English by Philemon Holland (London, 1601), and in Bohn's Classical Library (6 vols., 1855).—His nephew, **GAIUS PLINIUS CÆCILIUS SECUNDUS**, generally called **PLINY THE YOUNGER**, b. 61 or 62 A. D. in *Novum Comum*, was adopted and educated by his uncle; served in the army in Syria; held several high offices (consul 100), but devoted most of his time to literary studies and the practice of law. He was an intimate friend of Tacitus and Trajan. According to Mommsen, he was legate propretor of Bithynia, with consular power in 111 and 112 or 112 and 113, persecuting the Christians there in 112. There is no trace of him after this time. His *Panegyricus* and his *Epistole*, 10 books, were edited, with notes, by G. H. Schäfer (Leipzig, 1805) and G. E. Gierig (Leipzig, 1806); best critical ed. by Keil (Leipzig, 1870); *Epistole*, translated into English by Melmoth (1746), Lord Orrery (1759); summary in *Ancient Classics* (1872). See also Mommsen in *Hermes* (vol. iii., pp. 31-139).

Revised by M. WARREN.

Pliocene Period [*pliocene* is from Gr. *πλεῖον*, more + *καινός*, new]: the division of geologic time following the Miocene Period and preceding the Pleistocene. In the chronological system adopted by the U. S. Geological Survey for the geologic atlas of the U. S., the Miocene and Pliocene periods of earlier classifications are included in the **NEOCENE PERIOD** (q. v.).

Pliohippus: See HORSE, FOSSIL.

Ploce'idæ [Mod. Lat., named from *Ploceus*, the typical genus, from Gr. *πλοκεύς*, weaver, braider, deriv. of *πλέκειν*, twist, braid, weave]: a family of small finch-like birds, com-

prising the weaver-birds which in the tropical regions of the Old World hold the place of the finches of the temperate zone. The bill is strong and conical, the culmen advancing backward on the forehead and arched to the tip, which is entire; the wings are somewhat rounded, with the first quill remarkably short; the tarsi with long scutellæ in front. The family contains about 250 species. See WEAVER-BIRD.

F. A. LOVAS.

Plombières, plōn'bi-är' : a small town in the department of Vosges, France; 14 miles S. of Épinal (see map of France, ref. 4-H). It is beautifully situated in the valley of the Angronne, a tributary of the Saône, and is noted for its thermal springs, much recommended for diseases of the liver, the digestive organs, and the skin. The springs have been used for medicinal purposes since the times of the Romans, but the present elegant bathing establishments were founded by Napoleon III. Pop. (1891) 1,869.

Plot'idæ [Mod. Lat., named from *Plotus*, the typical genus, from Gr. πλωτός, floating, sailing]: a family of water birds belonging to the order *Steganopodes*, and containing the darters. See DARTER.

Plotinus: philosopher; b. at Lycopolis, Egypt, about 205 A. D.; went to Alexandria in 232, and spent there ten years under the tutelage and instruction of Ammonius Saccas. In 242 he accompanied the Emperor Gordianus on his expedition against the Persians, in order to make himself acquainted with the philosophy of Persia and India; but the emperor was murdered in Mesopotamia in 243, and Plotinus repaired by Antiochia to Rome. Here he applied himself to the teaching of philosophy, attracted immense audiences, gained numerous disciples, and enjoyed great respect and confidence. In 269 he retired into solitude. D. at Puteoli, in Campania, the following year. The most famous of his disciples, Porphyrius, collected his works and wrote a biography of him. The collection comprises a great number of treatises on different subjects—on beauty, the immortality of the soul, the supreme good, the genesis of ideas, against the Gnostics, etc.—arranged in six divisions, each consisting of nine books, for which reason they are called *Enneads*. Parts have been translated into German and English (by Thomas Taylor into English, namely, six books of the first *Ennead*, two of the second, four of the third, four of the fourth, five of the fifth, and three of the sixth), the whole into French by Bouillet in 3 vols., with full commentary (Paris, 1857).

The philosophy of Plotinus is a vision rather than a system. The center of all that exists is the One, which is above intellect, if not above the good; in short, a God that does not create in any proper sense; the intellect "emanates" from it, not as its creation. The intellect in turn is of a divine nature, though secondary, and it alone is the creator of lower orders of being. From God emanates the soul of the world; from the soul of the world emanates the soul of man; and in this way the divine descends from sphere to sphere, forming itself into time and space and building up its own body, until at last it arrives at matter. The divine can form matter, but not penetrate it so as to prevent it from collapsing and returning into chaos. Matter is the seat of imperfection and evil; and the aim of life is to return from the polluting contact with it into the One. The connection between the soul and God is much deeper and more intimate than that between the soul and the body. In the third *Ennead*, book viii., chapters iii. and iv., is found the original of those fine poetic sayings attributed to Schelling and Oken, that reason dreams in the plant, feels in the animal, and thinks in man. Although the soul, with its power of vegetative, sensitive, intellectual, and rational life, actuates the body even in the most minute details of life, still it does not form one with it. Otherwise with respect to its union with God. "We move round him like a choral dance; even when we look from him we revolve about him; we do not always look at him, but when we do we have satisfaction and rest and the harmony which belongs to that divine movement. In this movement the mind beholds the fountain of life, the fountain of mind, the origin of being, the cause of good, the root of the soul. There will be a time when this vision shall be continual, the mind being no more interrupted nor suffering any perturbation from the body." For it is the body which disturbs that contemplation of God in which our soul unites with the universal soul, a union which can not be effected by the reason, as the reason is incapable of grappling immediately with things divine, but which must be effected by an immediate intuition, by an

ecstasy, in which "the soul sinks into a deep silence and all around her the tumult of the senses and the agitations of the body grow still." It is this doctrine of a unity transcending the intellect that constitutes the weakness of the Neoplatonistic philosophy. It professes to derive this doctrine from Plato, but it is Plato's merit to have identified God with absolute reason. It is a lapse out of Hellenistic philosophy proper into Orientalism which holds the Absolute to be empty being or unity.

Revised by W. T. HARRIS.

Ploug, plowg. PARMO CARL: poet; b. in Kolding, Denmark, Oct. 29, 1813. Like Hostrup, he began as a students' poet, but later developed into one of the warmest and most effective champions of Scandinavianism and the Danish spirit in Southern Jutland. His influence for these causes was exerted both through his poems and his work as editor of the patriotic paper *Fædrelandet* (1841-87). He was also for many years a member of the *Rigsdag*, and played an important part in the drafting of the constitution (1848). His first collection of poems, *Poul Rytters Viser og Vers* (Paul Rytter's Ballads and Verses, 1847), appeared anonymously, and was followed by *Samlede Digte* (Collected Poems, 1861), containing a number of patriotic poems, and *Nyere Sange og Digte* (Later Songs and Poems, 1869). D. Oct. 27, 1894.

D. K. DODGE.

Plough, or **Plow** [O. Eng. *plōh*; Germ. *pflug*; Dutch *ploeg*]: an implement for breaking up the soil; used, though in a primitive form, as far back in ancient time as history reaches. The Old Testament speaks of ploughs with shares shod with socks of iron or bronze. The Greeks knew the wheel-plough. The modern plough, with its mould-board to turn over the broken-up soil, was invented in the Netherlands in the seventeenth century, but has since been much improved. The first steam-plough was worked in England in 1832.

Plover [from O. Fr. *plorier*, liter., rain-bird; cf. Lat. *pluvia*, rain; so called, perhaps, because it makes its appearance in wet weather, or because its piping cry was thought to portend rain]: a common name for any member of the family *Charadriidæ*, a group of wading birds of the order *Limicolæ*. Plovers have a bill much like that of a pigeon, hard at the tip, covered with soft skin toward the base, reticulate tarsi, long pointed wings, tail of moderate length and usually twelve feathers, toes slightly webbed, the hindermost lacking or very small. The head is rather large and full, neck short, body plump. There are nearly a hundred species distributed pretty much over the world



The golden plover.

The golden plover (*Charadrius dominicus*), a typical and well-known species, is named from its plumage, which in summer is black above, spotted with golden yellow and white; beneath, as well as the sides of the head, about the base of the bill and eyes, black. In winter it is much grayer, for, in common with many other species, there is a considerable difference in the plumage at different seasons. This bird is remarkable for the extent of its migrations, breeding in Arctic North America and moving S. in winter nearly or quite to Patagonia. The European golden plover is *Charadrius pluvialis*. The gray plover (*Charadrius*—or *Squatarola*—*helvetica*) is another wide-ranging species, for it breeds in the northern parts of America, Asia, and

Eastern Europe, and occurs at other times as far S. as Tasmania. The thick-knees (*Edicnemus*) are the largest members of the group, measuring about 14 inches in length. Their plumage of reddish or brownish gray harmonizes well with the barren tracts which they seem to prefer, and the young, when surprised, often escape detection by crouching flat among the pebbles. The killdeer (*Egialitis vocifera*), so named from its note, is the type of a small group of pretty plovers distinguished by black breast-bands. The killdeer is brown above, but the piping plovers belonging to the same genus are light gray, their plumage blending in with the sand and pebbles of the sea beaches. The crook-billed plover (*Anarhynchus frontalis*) of New Zealand is a small species noteworthy from the fact that it is the only bird whose bill is decidedly bent sideways. Some of the large plovers of the genus *Lobivanellus* and allied genera have a well-developed sharp spur on the bend of the wing which forms a rather formidable weapon. The plovers have been made the subject of a monograph by Seebohm (London, 1887). The CROCODILE-BIRD, DOTTEREL, and LAPWING (*q. v.*) are also plovers. F. A. LUCAS.

Plowden, EDMUND: law reporter; b. in 1519 at Plowden, in Shropshire; began the study of law in the Middle Temple in 1539, then studied in Cambridge and Oxford, in which latter place he was admitted (1552) to practice surgery and physic; in 1557 again studied in the Middle Temple, and was made sergeant-at-law Oct. 27, 1558. He was a strict Roman Catholic, and this alone is said to have prevented him from promotion to high office. He was treasurer of the Middle Temple during the rebuilding of the Great Hall, in one of the windows of which his arms, with the date 1576, still remain. D. Feb. 6, 1584, and was buried in the Temple church. His *Commentaries or Reports of law cases*, which were originally in law French, cover the period from 3 Edward VI. to 22 Elizabeth (1550-80), and rank among the best reports of any age. Plowden's grandson was made "Earl Palatine, Governor, and Captain of the province of New Albion in North America." See Wallace, *The Reporters* (Boston, 1882). F. STURGES ALLEN.

Plum [O. Eng. *plūme*, from Lat. *prunum*, later *prūna* (whence Eng. *prune*, *viā Fr.*) = Gr. *προυνον*, earlier *προυνον*, plum]: any tree of the genus *Prunus*, family *Rosaceæ*; characterized by a smooth, usually glaucous fruit (also called plum), with a more or less elongated stem and a flat or flattish stone. The botany of the plums is more complex than that of any other fruit of the northern part of the U. S. The origin of the common plum is itself a matter of dispute, but the fruit was probably originally native to Persia and Anatolia. It is known to most botanists as *Prunus domestica*, but some writers hold that two or more species are concerned in its origin. The only other European or Western Asian species of plum in common cultivation in the U. S. is the myrobalan, or cherry plum, *P. cerasifera* (or *P. myrobalana*). This is used mostly as a stock upon which to bud other plums, although there are two or three fruit-bearing varieties of it. This plum is distinguished from *P. domestica* by a somewhat slower growth, smaller and thinner leaves, very early small flowers, and small, round, cherry-like fruits which have a soft, watery, sweet flesh. It is possible that this myrobalan plum is really of the same species as *P. domestica*, and that it represents a nearer approach to the aboriginal type. The varieties of plums (*Prunus domestica*) are numerous, and several classifications of them, by form or color, have been suggested. It is customary to divide them into plums proper and prunes, although there are no constant differences between these two groups. (See PRUNE.) The damsons are sometimes held to be a distinct type, or even species, but they are simply very small firm-meated plums. In North America these common or European plums (*P. domestica*) thrive best in the States and provinces from Pennsylvania north and east, and westward to Lake Michigan, and upon the Pacific coast.

Another type of plum which is now attracting much attention is the Japanese group, the offspring of *Prunus triflora*, which is supposed to be native to China. This species first reached the U. S. in 1870, when Mr. Hough, of Vacaville, Cal., procured several trees from Japan. A variety was generally introduced or distributed about 1883, under the name of Kelsey, in memory of John Kelsey, of Berkeley, Cal., who first recognized the merits of the fruit, and who first obtained ripe specimens. This variety is adapted only to the warmer portions of the U. S.; but other varieties of this type thrive as well in the North—at least ten are

hardy and productive in New York. The Japanese plums differ from those of the *Prunus domestica* type in a more robust growth, longer, thinner, and glabrous obovate, or broadly oblanceolate leaves, flower buds usually in threes, fruit heart-shaped and often unequilateral, with a very firm flesh and often a thick, tough skin. Most of the Japanese plums are very handsome, and keep long after being picked. They are very valuable for commercial cultivation in the U. S., and appear to thrive equally well where any of the common orchard fruits can endure the climate, and in this respect they are greatly superior to the varieties of *P. domestica*. Their nomenclature is much confused.

A third important group of plums comprises the native types, the offshoots of several indigenous species. The first of these plums to attract wide attention was the Wild Goose, which was introduced from Tennessee about 1850. About 200 varieties have been described, the greater number being chance varieties found in woods and copses. These native plums belong chiefly to three species: *Prunus americana*, characterized by dark, rough growth, large obovate, and more or less jagged dull leaves, and red or red-marked, mostly flattened fruits, with a very heavy bloom, tough skin, and sweet, firm flesh; *Prunus hortulana* (Wild Goose type), with a smoother and more peach-like growth, narrowly ovate or lance-ovate, smooth, shining, finely toothed leaves, and very bright, slightly speckled slender-stemmed red or yellow fruits with a soft, juicy flesh and a very thin bloom; and *Prunus angustifolia*, the Chickasaw plums, with a slender, zigzag growth and narrower conduplicate leaves, and fruit much like that of the Wild Goose type. As a whole, these native plums are adapted to almost every climate in the U. S. The varieties of *P. americana* thrive in all the Northern States, even in the Dakotas, and also as far S. as Delaware, and some varieties are recommended even for Texas. The Wild Goose, or *P. hortulana* type, is adapted to the Southern and Middle States, and some forms thrive in New York and Illinois. The true Chickasaws are not adapted to cultivation much N. of Mason and Dixon's line. Other native plums in cultivation are the beach-plum (*P. maritima*), the sand-plum of the plains (*P. watsoni*), and the Pacific coast plum (*P. subcordata*). The native plums are inferior to the *P. domestica* and *P. triflora* types, but their great hardiness and adaptability strongly recommend them.

The Simon or Apricot plum (*Prunus simonii*) is a distinct Chinese species, which was introduced into the U. S. by way of France about 1880 or a little earlier. It is peach-like in botanical characters, the fruit being closely sessile and the leaves long. The fruit is maroon red and very handsome, flattened endwise, with a strong suture. The habit of the tree is very strict, and the leaves are strongly conduplicate. In the eastern parts of the U. S. the tree is unproductive, and the fruit usually has an unpleasant, bitter-almond flavor; but upon the Pacific slope the species has distinct commercial value.

Plums thrive best, as a rule, upon rather heavy soils, particularly upon those containing clay. All varieties can be budded upon the peach, although this method of propagation is not common in the northern parts of the U. S., except perhaps for the Japanese type. The commonest stock is the myrobalan, but because of its slow growth it tends to dwarf the tree, and it suckers badly from the root. The ideal stock for the common plum is undoubtedly its own seedlings, particularly the seedlings of the half-wild and consequently little variable forms. The buds are usually set in the second summer following the sowing of the seed, and the trees are ready for sale when the tops are two or three years old.

The chief insect depredator of the plum is the curculio, the same insect which infests the peach, apricot, and cherry. The beetle lays its eggs under flaps or crescents, which it raises on the surface of the young fruits, and the larvæ are the "worms" of the stone fruits. The only accepted method of fighting the insect is to jar the beetles on to sheets in early morning, before they begin to fly.

Plums are attacked by many kinds of fungi. One of the most serious is the shot-hole fungus or leaf-blight, which perforates the leaves and causes them to fall. This disease is held in check by spraying with Bordeaux mixture. (See FUNGICIDE.) Another fungus causes PLUM POCKETS (*q. v.*). The fruit-rot, which causes the death and decay of the fruit while it still hangs on the tree, and which may also kill the fruit-spurs, is kept in check by the use of Bordeaux mixture aided by the destruction of diseased fruits. The black-knot,

or plum-burg, is a fungous disease affecting the branches or even the trunk. (See PLUM KNOR). In some of the U. S. laws for the suppression of this disease have been passed.

Some of the leading varieties of plums are the following:
Prunus domestica.—Lombard, Bavay Green Gage, Braclshaw or Niagara, Coe's Golden Drop or Silver Prune, French and Shropshire Damsons, German Prune, Fellenberg, Guei, Moore's Arctic, Green Gage, Prune d'Agen, Hungarian Prune, Copper, Jefferson, Imperial Gage, Quackenbos, Yellow Egg, Washington, French Prune.

P. trilobata.—Kelsey, Burbank, Abundance, Satsuma, Chabot, Maru, Ogon, Red Nagate.

P. americana.—Weaver, Wolf, Quaker, De Soto, Rollingstone, Purple Yosemite, Forest Garden, Deep Creek, Cheney.
P. hortulana.—Wild Goose, Golden Beauty, Missouri Apricot, Moreman, Reed, Roulette, Wayland, Miner.

P. angustifolia.—Newman, Arkansas Lombard, Caddo Chief, Lone Star, Jennie Lucas, Pottawattamie, Robinson.
 L. H. BAILEY.

Plumbago: See GRAPHITE.

Plumbing [deriv. of *plumb*, liter., seal or repair with lead, from Lat. *plumbum*, lead]: the art of casting and working in lead or other metals and applying them to various purposes connected with buildings, especially to purposes of water-supply and drainage. In the earlier ages lead was the material most used for these purposes, on account of the facility with which it can be worked by simple means. The progress of the arts has taught the ready manipulation of iron, and it has to a great extent supplanted the softer metals in works of this nature. Lead pipes were used by all the celebrated nations of old. In the ancient cities of Asia, Egypt, Greece, Syria, etc., they were used for conveying water under pressures too great for pipes of earthenware. In the earlier ages lead pipes were made from sheets of lead rolled into the form of cylinders and soldered at the edges. They were rarely subjected to pressure. Ancient cities were usually supplied with water by aqueducts, and the distributing pipes seldom rose above the ground floor. The Romans, however, used lead pipes in their aqueducts in some cases in crossing deep valleys where bridging was difficult. Several pipes were generally put in, of small size, so that they could be more easily made to withstand the pressure, and in such a way that a break in one of them would not entirely cut off the supply. Corfield cites a case where there were ten of these leaden siphons in one aqueduct. He cites cases where the pressure was about 200 lb. per square inch.

The perfection of pumping-machinery, and especially of that class of pumping-machinery designed to pump against heavy pressures, modern high buildings, and the modern system of fire-protection, unite to modify the ancient methods of plumbing. Distributing-pipes are now often subjected to a pressure of 100 to 200 lb. per square inch. In a majority of cases distributing-pipes are continuously under a pressure, and no reservoir is needed. In some districts the pressure is periodically raised so as to fill the pipes, and tanks are necessary to maintain a constant supply. In some cases where the street-mains are under a high pressure, pressure-reducing valves are inserted in the service-pipes to modify the pressure on the pipes within the houses.

Street-mains are now usually constructed of cast iron with leaded joints; into these cast-iron pipes are screwed brass stopcocks to which the service-pipes supplying buildings are attached. Service-pipes are usually made of lead or wrought iron. The capacities of different sizes of service-pipes in gallons per minute are given in the following table, compiled by J. N. Tubbs:

DIAMETER IN INCHES	HEAD IN FEET.									
	10.	20.	30.	40.	50.	60.	70.	80.	90.	100
1.	0.92	1.30	1.59	1.84	2.06	2.26	2.44	2.61	2.76	2.91
1 1/4.	1.89	2.68	3.27	3.78	4.23	4.63	5.00	5.34	5.67	5.98
1 1/2.	2.30	4.68	5.72	6.61	7.39	8.09	8.74	9.34	9.90	10.44
2.	5.21	7.37	9.03	10.42	11.65	12.77	13.79	14.74	15.64	16.48
2 1/2.	7.66	10.84	13.27	15.32	17.14	18.77	20.27	21.67	22.97	24.21
3.	10.70	15.13	18.33	21.30	23.92	26.28	28.39	30.30	32.02	33.58
3 1/2.	14.36	20.31	24.57	28.72	32.61	36.28	39.74	43.02	46.13	49.08
4.	18.68	26.43	32.29	37.41	42.57	47.79	52.82	57.56	62.09	66.49
4 1/2.	23.72	33.23	40.41	47.53	54.53	61.42	68.12	74.57	80.74	86.66
5.	29.48	41.65	50.58	59.65	68.72	77.78	86.83	95.88	104.93	113.93

The average amount of water supplied to each consumer per day in cities of the U. S. is about 100 gal., this excessive use being due to wastefulness. In European cities the supply is usually less than 50 gal. The practice in Germany is

to allow 40 gal. per day per person. In Great Britain it is customary to allow 34 gal. The waste of water can be best checked by meters set in the supply-pipe of each consumer.

The purposes for which water is used in buildings are constantly increasing, and as a consequence the plumbing is constantly becoming more intricate. An ordinary modern dwelling is usually supplied with water-closets, urinals, bathtubs, laundry-tubs, slop-sinks, washstands, hot-water boiler, etc.

The distributing-pipes within buildings should be arranged so that by means of a stop and waste cock they can be completely emptied. To accomplish this it is necessary that the main pipe and each branch pipe taken off from it shall be continuously ascending. If there are pockets or depressions in the system they will retain water, and when the building is unoccupied the pipes will be liable to injury from freezing.

Whenever the water-supply is used for flushing water-closets, urinals, etc., or for any purpose where a back flow of water might contaminate the supply used for drinking and culinary purposes, the water should first be received into a special tank or the pipes otherwise disconnected, so that a back flow will not be possible.

House-drainage.—In the arrangement of pipes and appliances for house-drainage or the removal of water which has been fouled (sewage), more care and ingenuity are required on the part of the plumber than in the pipes and fixtures pertaining to water-supply; for sewage is a constant menace to health.

In the system of pipes intended for the removal of sewage from buildings a complete barrier should be interposed against the passage of air currents into the building. To maintain a proper barrier at all times and under all conditions of use and disuse is a somewhat difficult matter. The method in use, and about the only practical one, is by traps or depressions in the pipe, whereby the passage of air is opposed by a head of water. The head is necessarily slight, however, and it is necessary to protect the traps from pressure and from siphonage by ample vents which maintain the pressure within the pipes at the normal atmospheric pressure. The fouled water should be immediately and completely removed from the vicinity of the building. Any system which contemplates the retention of any portion of it for any length of time is imperfect. The main drain for buildings should be from 4 to 6 inches in diameter, except in extreme cases, and laid with as much descent as possible. The inclination should not be less than one in fifty. The method of connecting the main drain with the soil-pipe depends on the method of ventilation. The simplest method is to extend the main drain upward and out through the roof, unbroken by a trap in any portion. In this case it serves the double purpose of soil- and ventilating-pipe, and the air which passes into the street sewers at man-holes supplies the draft upward along the street sewers and out through the house ventilating-pipes and their upward extensions. In this case the isolation of the interior of buildings from sewer air depends solely upon the trap under each fixture. When the street sewers are properly constructed on the "separate" system (see SEWERAGE) and properly cared for, this method has proved entirely satisfactory. It has advantages in simplicity and facility of arrangement. Where the sewers are built on the combined plan a trap on the house sewer combined with a fresh-air inlet is to be preferred. This diverts the foul-air currents from the interior pipe and provides a supply of fresh air for the upward current through the soil and ventilating pipe. If the street sewers are not properly ventilated at frequent intervals, either by the upward extension of exterior or interior unobstructed pipes or otherwise, there may be reason to believe that an isolated one may draw from too wide a territory and prove offensive. In this case it is advisable to dispense with any vent-pipe communicating directly with the sewer.

The main drain within or under the house and for a few feet outside of it should be of iron, with lead-calked joints. It is better to fasten it along the wall by iron brackets or hangers above the cellar bottom, giving it as great an inclination as is possible. Fixtures in the basement should be avoided. Removable hand-holes or brass cleaning-screws should be provided at intervals through which obstructions can be removed. All iron pipes and fittings should be thoroughly coated outside and inside with coal-pitch varnish applied hot.

It is customary to make waste-pipes, particularly short ones, of lead, for the reason that it is much more easily

manipulated than iron. The proper method of connecting lead pipes to iron is by means of a brass thimble soldered to the lead pipe and calked into a hub on the iron pipe.

It is best to have soil-, waste-, and ventilating-pipes exposed as much as possible. When inclosed within partitions they are not readily accessible for inspection or repair. Plumbing fixtures should be confined to the bathroom, where special means of ventilation can be employed, and to the kitchen, laundry, and similar rooms. A fixture rarely used is a greater source of danger than one used frequently.

Particular care should be used in arranging the ventilation of a building so that the air currents tend to pass outward from the group of rooms containing plumbing fixtures, fresh air being admitted to other portions of the building. The facility with which this can be accomplished, and also the proper grouping of the fixtures and the simplicity of the system of pipes, will depend largely upon the architect. Ample means should be provided for flushing all portions of the soil- and waste-pipes and all fixtures. This is most effective when special flushing cisterns are supplied. Every fixture should be provided with a trap, and since the object of the trap is to isolate the fouled interior surface of the waste-pipe from the air of the room, it is evident that the trap should be as close to the fixture as possible. Notwithstanding many efforts to introduce a trap whose seal can not be broken by siphonage, and which will be self-cleansing, the plain running trap of uniform bore is still in general use. This trap is liable to have its seal broken by siphonage, and to prevent this it is necessary to resort to a back air-pipe which is connected with the crown of the trap on the downward side and passes to the roof independently of the ventilating-pipe proper, or is connected with it above the highest fixture. This back air-pipe should be of ample capacity to preserve the normal air-pressure when considerable quantities of water are flowing down the soil-pipe. The system of back air-vents is open to the following objections: It considerably complicates the system of piping, especially when fixtures are not closely grouped. There is a possibility of the pipes being fouled at their junction with the crown of the trap. It adds to the expense. Back air-vents tend to increase the interior circulation of air considerably. This is beneficial so far as the purity of the interior of the pipes is concerned, but it also increases the evaporation from traps. This will do no harm if the fixtures are in constant use. On the other hand, if special anti-siphoning traps are used there will be little circulation of the outer purifying air through the waste-pipes.

When the soil-, waste-, and ventilating-pipes are all in position, and before the fixtures are put in place, a test of the thoroughness of the work should be made. This can be done as follows: Close up the main drain where the iron pipe terminates outside the house wall, also the exposed ends of all pipes where fixtures are to be connected, and the fresh-air inlet if there is any. The ends of lead pipes should be left somewhat longer than necessary, so that this can be conveniently done by flattening them and closing with solder. When all openings in the entire system of pipes are tightly closed below, fill the system of pipes with water nearly to the top and mark the height at which the water stands. The entire work should be inspected while under pressure, and joints recalked where necessary.

If roof water is admitted to the sewers, the rain-water leader should connect with the main soil-pipe directly above the main trap. No waste- or soil-pipe should be connected with the rain-water leader. The following table gives the requisite size of house drains for roof areas of the dimensions given (calculated by Robert Moore):

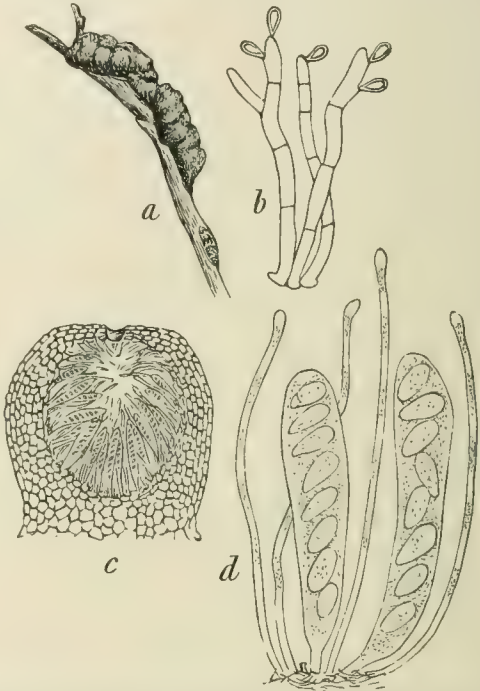
SIZE OF LOT IN FEET.	FALL PER HUNDRED.				
	1".	1½.	2".	2½.	3".
	Diameter in inches.	Diameter in inches.	Diameter in inches.	Diameter in inches.	Diameter in inches.
20 x 150	3.5	3.12	3.0	2.87	2.75
25 x 150	3.74	3.5	3.25	3.12	3.0
30 x 150	4.0	3.75	3.5	3.37	3.25
35 x 150	4.25	4.0	3.75	3.62	3.5
40 x 150	4.5	4.25	3.87	3.75	3.62
45 x 150	4.75	4.37	4.12	4.0	3.87
50 x 150	5.0	4.5	4.2	4.12	4.0
60 x 150	5.37	4.87	4.62	4.37	4.25
70 x 150	5.62	5.25	4.87	4.75	4.5
80 x 150	6.0	5.5	5.25	5.0	4.87
90 x 150	6.25	5.75	5.5	5.25	5.0
100 x 150	6.5	6.0	5.75	5.5	5.25

In nearly all cities plumbing is governed by rules and regulations defining specifically the class of work to be done, sizes of pipes of various kinds for particular purposes, class of fixtures, etc. The work is permitted to be done by licensed plumbers only, and in the larger cities they are under the surveillance of expert inspectors in the employ of the city.

GEORGE S. PIERSON.

Plumes: See FEATHERS.

Plum Knot: the *Plowrightia morbosa*, a parasitic fungus of the order *Pyrenomycetæ* and family *Dothidiaceæ*, which lives upon twigs of plums and cherries, producing black, knot-like masses, 2 to 4 inches long and $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter (a, reduced). The threads of the parasite penetrate the living tissues of the host in spring and early summer, producing a considerable swelling of the tissues. The surface of the young knot now becomes covered with a velvety coating of dark-colored vertical threads, which produce minute spores (conidia, b). As winter approaches other reproductive



a, plum knot, reduced; b, conidia on threads; c, perithecium, with spore-sacs; d, spore-sacs and spores (b, c, d, much enlarged).

structures develop; the surface becomes covered with minute hollow, wart-like bodies (perithecia) within which are produced a number of spore-sacs, each with eight ascospores (c, d). Plum knot may be reproduced from the conidia or the ascospores, but it is often perennial, the parasitic threads growing down each year from the old knot into previously unaffected tissues.

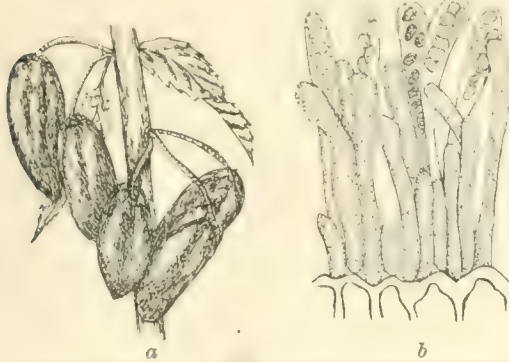
This disease is sometimes quite harmful. All knots should be cut off and burned as soon as they appear. The thorough washing of the tree in early spring with poisonous solutions, as of copper or iron sulphate, will doubtless destroy many spores and tend to prevent the spread of the disease.

CHARLES E. BESSEY.

Plum Pockets: a disease of plums in which they are swollen, hollow, and distorted (a). It is caused by a parasitic fungus, *Exoascus pruni* (family *Gymnoascæe*), which penetrates the tissues of the young plum and finally produces spore-sacs upon the surface. Each spore-sac at maturity contains about eight ascospores (b).

"The pockets make their appearance soon after the flowers have fallen, attain full size, and drop from the tree toward the middle or last of June. At first they are more or less globular in shape, but as they grow older they become oblong or oval, and frequently more or less curved. They vary in size, but as a rule are from 1 to 2 inches in length and from $\frac{1}{2}$ to 1 inch in diameter. When young they are nearly smooth, and can be distinguished from the healthy fruit by their pale-yellow or reddish color. As they grow older the color changes to gray, the surface appearing

as though it had been sprinkled with fine powder, and at the same time the pockets become wrinkled. Finally they turn black or dark brown, and rattle like bladders when brought in contact with any hard substance. They remain



a, plum pockets; b, a mass of spore-sacs, highly magnified.

on the tree in this condition for two or three days, then fall to the ground and perish."—*Galloway*. This disease may be considerably reduced by the early removal and destruction of all the diseased plums. For an exhaustive account of plum pockets and the fungus producing the disease, consult B. T. Galloway's paper in the *Annual Report of the Department of Agriculture for 1888*. CHARLES E. BESSEY.

Plump'tre, EDWARD HAYES, D. D.: clergyman and author; b. in London, Aug. 6, 1821; was educated at University College, Oxford; became fellow of Brasenose College 1844; chaplain at King's College, London, 1847; Professor of Pastoral Theology in that institution 1853; prebendary of St. Paul's 1863; professor of exegesis of the New Testament 1864; rector of Pluckley 1869; vicar of Bickley 1873, and Dean of Wells 1881. He was preacher at Lincoln's Inn and Boyle lecturer (1866-67), and was one of the Old Testament company of revisers. Author of several volumes of sermons, addresses, and classical translations—*King's College Sermons* (1859); *Lazarus, and other Poems* (1864); *Sermons on Theology and Life* (1866); *Christ and Christendom* (1867); *Biblical Studies* (1870); *Respite, Aspic, Prosopope, and the Law of Progress in Theology* (1876); *St. Paul in Asia Minor and at the Syrian Antioch* (1877); *A Popular Exposition of the Epistles to the Seven Churches of Asia* (1877); translations of Sophocles and Æschylus; *The Spirits in Prison, and other Studies on the Life after Death* (1885), etc.—of many articles in Dr. Smith's *Dictionary of the Bible*, of *Biblical Studies* (1870), and editor of the *New Bible Expositor* (1875). His latest work was a *Life of Bishop Kerr* (1886). D. at Tunbridge Wells, Feb. 1, 1891.

Revised by W. S. PERRY.

Plunket, WILLIAM CONYNGHAM, BARON: orator and statesman; b. at Enniskillen, Ireland, in July, 1765; graduated at the University of Dublin; studied law at Lincoln's Inn; was called to the Irish bar 1787. He became king's counsel 1798; was elected to the Irish Parliament in the same year; was in 1803, as solicitor-general, prosecuting attorney in the trial of Emmet; was attorney-general for Ireland 1805-07. He sat in Parliament 1807-22, where he favored Catholic emancipation; became again attorney-general for Ireland 1822; chief justice and baron 1827, and was lord chancellor of Ireland 1830-41. D. in County Wicklow, Jan. 4, 1854.

Pluralism [from Lat. *plus*, *pluris*, more]: in canon law, the possession of more than one ecclesiastical benefice by the same person at the same time. In the earlier times of the Christian Church pluralism was considered unlawful, and it was forbidden by many councils, as, for instance, by those of Chalcedon (451) and Nicæa (787). Later, however, it became one of the most common and most vicious practices in the Roman Catholic Church, and in order to screen its unlawfulness very subtle distinctions were made by the canonists. Benefices were divided into compatible and incompatible—that is, such as could be held together and such as could not. Incompatibility might arise, for instance, from the duty of residence: thus it would be impossible for the same man to be Bishop of Palermo and Trondhjem at the same time, because it was a bishop's duty to reside in his diocese; but then the pope could grant a

dispensation from the duty of residence, and thereby the two benefices became at once compatible. At one time it was very common to find Italian clergymen living at the court of Rome and enjoying the revenues of different benefices in Spain, France, Germany, and Scandinavia. In modern times this evil has disappeared almost entirely in the Roman Catholic Church.

The English law before the Reformation in the main coincided with the canon law, and the legislation of Henry VIII. generally preserved the same spirit, only substituting the dispensing power of the crown for that of the pope. By 13 and 14 Victoria, c. 98, it is provided that no incumbent of a benefice shall take and hold together with it another benefice—the word "benefice" in this sense comprising any perpetual curacy, endowed public chapel, parochial chapelry, or district chapelry—unless the churches are within 3 miles of one another by the nearest road and the annual value of one of them does not exceed £100; nor can two benefices be held together if the population of one exceeds 3,000 and that of the other 500. A dispensation or license can be obtained from the archbishop, however, so as to allow two benefices to be held together; and if the archbishop should refuse his license, the party may appeal to the privy council. A special provision prohibits the head ruler of any college or hall in the Universities of Oxford and Cambridge from taking any cathedral preferment or any other benefice. If any person holding a benefice accepts another benefice contrary to the statute, the first benefice becomes *ipso facto* void. Pluralism has almost died out in the Church of England. It does not obtain in the other branches of the Anglican communion. In Ireland no dispensation to hold two benefices can be granted. In Scotland no minister of the Established Church can hold two or more charges, but it is possible for a minister also to hold a chair as professor in a university provided that his charge is in the same city as the university. If a country minister accepts a chair as professor, he must resign one of the offices within a certain time after the appointment.

Revised by W. S. PERRY.

Plush [from Fr. *pluche*, *peluche*: Ital. *peluzzo* < Late Lat. **pilu*-ceus, hairy, shaggy, deriv. of Lat. *pilus*, hair]: a fabric which differs from velvet in not being shorn, and in having a long pile or shag. It is sometimes all worsted, sometimes worsted with a mohair pile, and most frequently of cotton with a silk pile. This kind last mentioned is used for hat-making. The loops of the pile are cut with a long needle-like knife.

Plutarch (in Gr. Πλούταρχος): Greek biographer and essayist; b. at Chæronea in Bœotia, 46 A. D. He belonged to a wealthy and distinguished family, and lived a long life of study and of honorable employment both in the service of the empire and in the service of Bœotia. A model husband and father, he practiced the noble doctrines that he preached. There was no more amiable character in the history of his times, no more sympathetic and generous soul. D. about 120 A. D. His works, which are many, fall into two classes, historical and ethical, the latter dealing with philosophical, moral, and miscellaneous subjects and commonly referred to roughly as *Moralia*. Of his historical works the most famous is the collection of *Parallel Lives* Βίοι παράλληλοι, forty-six lives in twenty-three pairs, a Greek life being set over against a Roman. Nineteen of the pairs are followed each by a comparison. Besides these *Parallel Lives* four isolated lives have been preserved. Plutarch is not an historian, he is a moralist, and thinks more of the lesson conveyed by the facts than of the facts themselves. Everything is welcome to him that will illuminate the character he is drawing, that will point to the moral he is teaching. Anecdote, jest, quotation, nothing comes amiss; and while the free and easy handling of his material gives many problems to historical critics, Plutarch has been the delight of all succeeding generations, and is still to be reckoned among the greatest of biographers. His treatises called *Moralia* have not been so popular as they deserve to be, especially of recent years, but they are full of interesting anecdotes, happy quotations, fine reflections, odd bits of recondite learning, a perfect treasure-house of wisdom and knowledge. Plutarch is not a philosopher of the first order any more than he is an historian of the first order; he is not a consecutive thinker; he is not a vigorous writer, nor a soaring genius, but he is a man of sweet and pure nature, whose vast reading is lighted up by true humanity.

EDITORS.—The text with Latin translation most conven-

iently accessible is in the Didot collection (5 vols., Paris, 1846-55); Reiske (Leipzig, 1774-82). The *Lives* were edited by Koraës (6 vols., Paris, 1809-14); *Morals*, by Wyttenbach (8 vols., Leipzig, 1796-1834). There is a critical edition of the *Lives*, by Sintenis (Leipzig, 1852-55), in the Teubner collection, and of the *Morals* in the same by Bernadakis. Dr. Holden's editions of Plutarch's *Demosthenes* and of the *Gracchi*, of *Nicias*, *Sulla*, and *Timoleon* are very serviceable. A famous old English translation after the French of Amyot is by North (1579). There is a later rendering by the Langhorns (1770), revised by Clough (1859). An old English translation of the *Morals* by several hands has been revised and corrected by W. W. Goodwin (5 vols., Boston, 1870). See *A Popular Introduction to Plutarch*, by Archbishop R. C. Trench (London, 1873), and R. Volkmann, *Plutarch* (Berlin, 1869). B. L. GILDERSELEEVE.

Pluto (in Gr. Πλούτων): the name used among the Romans for HADES (q. v.), though it originated with the Greeks, who called him by that name because, as the god of the lower world, he was lord over all wealth, both vegetable and mineral, that is concealed by the earth from which all wealth springs. J. R. S. S.

Plutus [= Lat. = Gr. Πλούτος, liter., wealth]: in ancient mythology, the personification of riches, much used by the poets and often represented by art, but never worshiped. Zeus is said to have blinded him in order that he might not bestow his favors on righteous men only, but that he might distribute his gifts blindly and without any regard to merit. At Thebes there was a statue of Fortune, at Athens one of Peace, and at Thespiae one of Athene the Worker, and in each of these cases Plutus was represented as the child of those divinities, symbolically expressing the sources of wealth. He seems to have commonly been represented as a boy with a cornucopia. Revised by J. R. S. STERRETT.

Plymouth: town; in the county of Devonshire, England; on the northern shore of the sound of the same name; at the mouth of the Plym; 246 miles W. S. W. by rail of London, and 128 S. W. of Bristol (see map of England, ref. 15-D). Taken in its largest sense, it comprises what are called the "three towns"—Plymouth proper on the E., Stonehouse in the middle, and Devonport on the W. Beside the citadel, an obsolete fortification built by Charles II. at the eastern end of the bold headland called the Hoe, there is a chain of forts of great strength mounted with guns of heavy caliber, which form a complete line of defense by land and sea. The town is irregularly built, but great improvements have been made. Among the principal buildings are the new Guildhall, in the Gothic style, opened in 1874; the Proprietary Library, in which there is the Cottonian collection of pictures; and the Athenæum, which contains a library, lecture-hall, museum, and art gallery. The parish church of St. Andrew, in the Perpendicular style, dates originally from 1430, but was completely restored in 1875 by Sir Gilbert Scott. In 1888 the Marine Biological Laboratory was opened.

As a great naval station Plymouth owes its pre-eminence to the spaciousness and extent of Plymouth Sound, within which the whole British navy might anchor with safety. To protect the interior of this estuary the Plymouth breakwater was constructed. (See BREAKWATER.) The eastern harbor, Sutton Pool, is an anchorage for the shipping employed in the fisheries and general trade. The Great Western Docks include a floating basin of over 13 acres, a tidal harbor of 35 acres, and a graving-dock. The port has a considerable trade, and is used by lines of passenger steamers to South Africa, the East, and Australasia. There is also a large coasting trade. There are some manufactures of chemical compounds, biscuits, soap, manures, etc.

Plymouth was used as a port by the Black Prince, and in the reign of Elizabeth it was the principal port of England. In the wars with Napoleon it was the rival of Portsmouth in naval activity. Plymouth returns two members to Parliament. Pop. of Plymouth proper (1893) 86,701; with Stonehouse and Devonport (1891) 154,417. R. A. ROBERTS.

Plymouth: town; capital of Plymouth co., Mass. (for location, see map of Massachusetts, ref. 4-J); on Massachusetts Bay and the Old Colony division of the N. Y., N. H. and Hart. Railroad; 37 miles S. E. of Boston. It occupies a strip of 18 miles along the coast varying from 5 to 9 miles in width, is the oldest town in New England, and has a healthful climate, the heat of summer seldom being oppressive or the cold of winter intense. It has public waterworks and sewer system, gas, electric plant for light and

power, electric street-railway, 2 national banks with combined capital of \$410,000, 2 savings-banks with aggregate deposits of \$3,276,892, a co-operative bank, 9 churches, public library, and 2 weekly newspapers. The industries comprise the manufacture of woolen cloth, cotton sail-duck, insulated wire, patent bedstead joints, boots and shoes, cordage, tacks, rivets, wire nails, stoves, hollow-ware, steel shanks, zinc and copper electrical supplies, and other articles. Plymouth is celebrated as the landing-place of the Pilgrim Fathers on Dec. 11 (Dec. 21, n. s.), 1620. The rock on which they first stepped is in Water Street, and is now covered with a fine granite canopy. Pilgrim Hall contains numerous relics of the Pilgrims, and many interesting antiquities. Cole's Hill and Burial Hill are points of much interest, because of the burial there of many of the Pilgrims. The corner-stone of a national monument to the Pilgrims was laid Aug. 1, 1859, and the structure was dedicated Aug. 1, 1889. It is 81 ft. high, cost about \$150,000, and is surmounted by a statue of Faith, in granite, 36 ft. high, the largest granite statue in the world. Four immense monolithic statues, weighing about 16 tons each, and representing Morality, Law, Education, and Freedom, with beautiful marble bas-reliefs beneath each, are seated on the buttresses of this monument. Pop. (1880) 7,093; (1890) 7,314; (1895) 7,957.

C. C. DOTEN, EDITOR OF "OLD COLONY MEMORIAL."

Plymouth: town; one of the capitals of Grafton co., N. H.; at the junction of the Pemigewasset and Baker's rivers, and on the Concord and Montreal Railroad; 50 miles N. by W. of Concord, the State capital (for location, see map of New Hampshire, ref. 6-E). It is in a region much frequented by tourists and widely known for its beautiful scenery, and contains the State Normal School (opened in 1871), the Holderness School for Boys (Protestant Episcopal), a national bank with capital of \$75,000, a weekly newspaper, and manufactories of gloves, shoes, and leather. Pop. (1880) 1,719; (1890) 1,852.

Plymouth: town, seaport, and capital of Washington co., N. C.; on Albemarle Sound; about 100 miles E. of Raleigh (for location, see map of North Carolina, ref. 3-J). It is in an agricultural region, ships large quantities of cotton, lumber, and vegetables, and contains a State normal school (opened in 1886), lumber and cotton mills, and a weekly newspaper. Pop. (1880) 836; (1890) 1,212.

Plymouth: borough; Luzerne co., Pa.; on the Susquehanna river, and the Del., Lack. and West. Railroad; 4 miles S. W. of Wilkesbarre, the county-seat, 20 miles S. W. of Scranton (for location, see map of Pennsylvania, ref. 3-H). It is in a coal-mining region, and contains a high school, 4 public-school buildings, public-school property valued at over \$50,000, a national bank with capital of \$100,000, and 3 weekly newspapers. Pop. (1880) 6,085; (1890) 9,344.

Plymouth Brethren: a Christian body holding in the main Calvinistic views, but peculiar in that it rejects all ecclesiastical organization and insists on the complete parity of all believers. Hence it has no presiding officers in its public meetings, nor any clergy. It was started in Dublin in 1827, mainly through the exertions of John Nelson Darby, from whom the sect gets its best-known name, *Darbyites*; in 1831 it took a fresh hold at Plymouth, England, whence its name, *Plymouth Brethren*, again under Darby, and largely by his writings and personal service spread over the British Isles, the Continent, Canada, and the U. S. Darby was born in London, Nov. 18, 1800; graduated at Trinity College, Dublin, 1819; was first a lawyer, then a clergyman, 1825, but in 1827 he left the Established Church. He died at Bournemouth, England, Apr. 29, 1882. His writings were collected and edited by W. Kelly (32 vols., London, 1867-83). The brethren are now divided into several parties, but all agree in rejecting creeds, an ordained ministry, and a separate organization, and in meeting in halls or private houses instead of having churches. According to the census of 1890 there were in the U. S. four such parties, with an aggregate of 6,661 communicants. S. M. JACKSON.

Plymouth Sound: an inlet of the English Channel on the southern coast of England, between the counties of Devon and Cornwall. It is 3 miles long, 4 miles broad, and forms, with the estuaries of the Plym and the Tamar, the harbors of Plymouth and Devonport, well known as one of the principal naval stations of Great Britain. See DEVONPORT and PLYMOUTH.

Plympton, GEORGE WASHINGTON: scientist; b. at Waltham, Mass., Nov. 18, 1827; graduated at the Rensselaer

Polytechnic Institute at Troy, N. Y., 1847; was Professor of Engineering and Architecture at Cleveland University 1852-53; of mathematics in the State Normal School, Albany, N. Y., 1853-55, and again 1858-60, and in the State Normal School, Trenton, N. J., 1860-63; became Professor of Physical Science at the Brooklyn Polytechnic Institute 1863, and of Chemistry and Toxicology in the Long Island College Hospital in 1864, and of Physics at Cooper Institute, N. Y., 1869. He was appointed director of the night schools of the Cooper Union in 1879. In the practice of engineering he was chief engineer of water-supply and drainage of Bergen, N. J., from 1867 to 1869; commissioner of electrical subways for the city of Brooklyn 1885 to 1889; and member of the board of experts to improve transportation over the East River bridge. He has been a member of the American Society of Civil Engineers since 1868. He is the author of *The Blowpipe* (1859), *The Starfinder* (1878), *The Aneroid* (1880), and translator of Jannetaz's *Determination of Rocks* (1877). He was editor of Van Nostrand's *Electric Engineering Magazine* 1870-86.

Pneumatic Dynamite Gun: See ORDNANCE.

Pneumatics [from Gr. *πνευματικός*, relating to wind or air, deriv. of *πνεῦμα*, *πνεύματος*, wind, air, breath, spirit, deriv. of *πνέειν*, blow, breath]: that department of physics which deals with the properties of gases.

In this article the influence of pressure is particularly considered, together with the means of producing changes of pressure and of measuring the same.

The principal phenomena of pneumatics depend upon what is known as the *law of Mariotte (or Boyle)*, a law which expresses the relation between the pressure of a gas and its volume. This law, which applies rigorously only to what is known as a "perfect gas," is given in the simple formula

$$v.p. = v.p.,$$

which states the fact that pressures p , p and volumes v , v are inversely proportional to one another.

For the verification of Mariotte's law the two pieces of apparatus, shown in Figs. 1 and 2 respectively, are commonly used.

Fig. 1, which gives the essential features of the apparatus for moderate pressures greater than one atmosphere, shows a glass tube with two arms, one of which, the shorter, is closed above, while the other is open.

When the open arm of the apparatus is partly filled with mercury, a certain amount of air is entrapped in the closed portion of the tube, and the volume of this air depends upon the

pressure to which it is subjected. The pressure is measured by the difference in the height of the columns of mercury in the two arms, plus the barometric pressure. A stop-cock at the bottom of the tube facilitates the withdrawing of mercury.

The contents of the closed arm, per unit of length, having been carefully determined, pressure is applied by the introduction of mercury until the volume reaches a desired value. By further adjustment of the mercury and determination of the corresponding volumes, the law of Mariotte may be verified through a considerable range of pressures.

Below one atmosphere the apparatus is given the form shown in Fig. 2, in which C is a deep cistern of mercury into which an inverted tube of glass, *t*, previously nearly filled with the same liquid, is inverted. As the inverted tube is raised and lowered the column of air therein expands and contracts in accordance with the law under discussion. The volumes are determined by calibration of the tube; the pressures from the barometric pressure, minus the elevation of the mercury in the inner tube above the level of that within the cistern. The figure shows the apparatus with the inverted tube in three positions (Fig. 2).

Marked divergence from Mariotte's law occurs in the case of all known gases, as we approach a certain temperature (the so-called critical temperature) which is fixed for each particular gas. Hydrogen, nitrogen, oxygen, air, methane,

and carbon monoxide have critical temperatures so low that they can only be reached by processes of artificial refrigera-

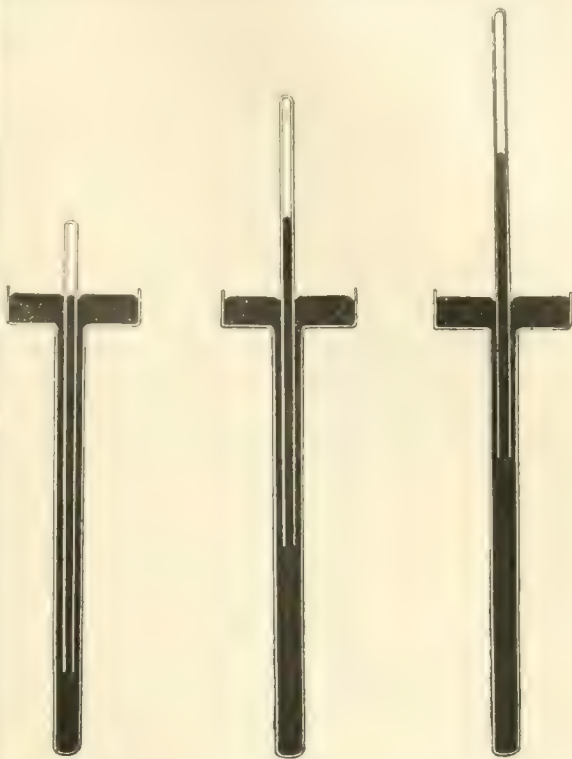


FIG. 2.

tion. (See LIQUIDS.) They are known as the permanent gases, an appellation which is justified under all usual conditions, since they obey Mariotte's law approximately under whatever pressures may be brought to bear.

Gases, as sulphur dioxide, which have a critical temperature higher than the temperature of experimentation are capable of being liquefied by pressure alone. Such gases show a divergence from Mariotte's law which is always in the direction of too great compressibility. The presence of such vapors in admixture with a permanent gas will also cause appreciable deviation from the law on the part of the mixture.

The behavior of a gas remote from its boiling-point, and consequently obedient to Mariotte's law, and that of a gas near the point of liquefaction, and therefore exhibiting deviations from the law, are shown graphically in the diagrams of Figs. 3 and 4, in which ordinates are pressures and abscissas are volumes.

The peculiarity of the lines in the former diagram, which are hyperbolic, is that upon any line the product of the or-

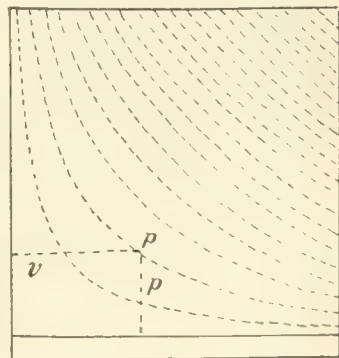


FIG. 3.

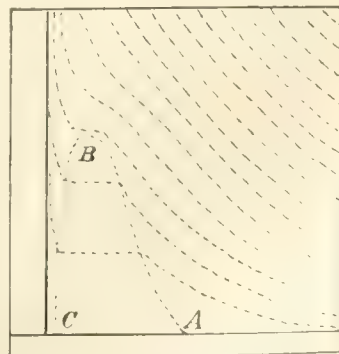


FIG. 4.

dinates (vp) is a constant. Each line describes the changes of volume corresponding to the variations of pressure for a given temperature. The temperatures rise with increase in the ordinates. Fig. 4 gives the corresponding lines in the case of a vapor. At the highest temperature shown, those for the lines in the upper right-hand corner, the divergence from Mariotte's law is inconsiderable. For lower temperatures a tendency is developed which shows itself in double curvature of the lines. Finally, certain lines, those, namely, which cross the dotted area $A B C$, suffer discontinuity of curvature. Temperatures corresponding to these lines are below the critical temperature. The breaks in them indicate the points at which liquefaction begins and is completed.

Researches by Regnault, Amagat, Natterer, Cailletet seem to show that even the permanent gases do not fulfill the definition of a perfect gas mentioned above. The divergence from the law of Mariotte does not, however, consist simply in the exhibition of greater and greater compressibility with increasing pressure, as is the case with vapors. It is more complicated in character. Amagat, using a modification of the method of Cailletet, found for nitrogen the product pv , which for perfect gases should be constant, the following values all of which are referred to the value of that product at a pressure of one atmosphere.

TABLE I.			
Pressures.	pv .	Pressures.	pv .
27.29 atm.....	0.9894	168.81 atm.....	1.0255
46.50 ".....	0.9876	208.64 ".....	1.0520
62.03 ".....	0.9858	251.13 ".....	1.0815
73.00 ".....	0.9868	290.93 ".....	1.1218
80.58 ".....	0.9875	332.04 ".....	1.1625
90.98 ".....	0.9893	373.30 ".....	1.2070
109.17 ".....	0.9940	430.77 ".....	1.2696
126.90 ".....	1.0015		

The values for this and for the other gases tested, with the exception of hydrogen, show a too great compressibility up to a maximum in the neighborhood of sixty atmospheres (corresponding to the minimum value of pv in the foregoing table). The compressibility then diminishes again, so that at the pressure of about 100 atmospheres the value of pv becomes unity and at higher pressures takes increasingly large values. Hydrogen alone shows for all pressure a degree of compressibility smaller than those demanded by Mariotte's law.

Of importance, likewise, are the densities of gases and their behavior when subjected to changes of temperature. The densities of some of the more important gases and vapors are given in Table II.

TABLE II.—DENSITY OF GASES AND VAPORS.		
GAS.	Density (compared with air).	Weight of one liter, grammes.
Ammonia (NH ₃).....	0.589	0.761
Chlorine (Cl ₂).....	2.449	3.167
Hydrochloric acid (HCl).....	1.259	1.628
Methane (CH ₄).....	0.553	0.715
Carbon monoxide (CO).....	0.967	1.251
Carbon dioxide (CO ₂).....	1.51968	1.96503
Oxygen (O ₂).....	1.10521	1.42908
Sulphur dioxide (SO ₂).....	2.313	2.861
Nitrogen (N ₂).....	0.9701	1.2544
Hydrogen (H ₂).....	0.069234	0.089523
Steam (H ₂ O).....	0.62182	0.80405
Air.....	1.0000	1.293052

Influence of Temperature.—This is expressed by the law explained in HEAT ($q. v.$), which may be written

$$pv = p_0v_0 \left(1 + \frac{t}{273}\right).$$

Taking into consideration the deviations from Mariotte's law and analogous deviations from the law of Gay-Lussac, numerous attempts have been made to find an equation which will express completely the behavior of an actual gas. Van der Waals (1873) gave as the complete formula of condition,

$$\left(p + \frac{a}{v^2}\right)(v - b) = \frac{p_0v_0}{273} T,$$

in which a and b are small constants and T is the absolute temperature.

The usual instrument for producing changes of pressure is the air-pump (invented by Otto von Guericke about 1650). The term is usually applied also to pumps used for the production of a vacuum and to compression-pumps.

Vacuum-pumps, in their earlier forms, were modifications

of water-pumps, and the forms still in use in the production of ordinary vacua are constructed with valves.

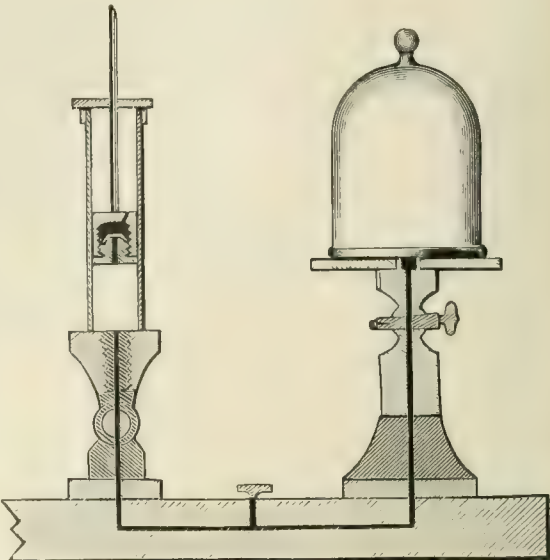


Fig. 5. One of the simplest and best-known types of vacuum-pump is shown in Fig. 5. This pump contains only one

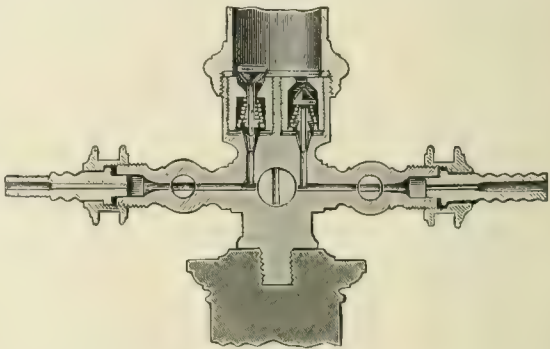


Fig. 6. valve which is placed within the piston. Another form (that of Silbermann), Fig. 6, contains two valves, one working upward and the other downward, situated in the base of the cylinder. The piston is solid.

Many other varieties of the mechanical vacuum-pump have been devised. The general principles, applicable to all forms, are given here: (1) Since gases are of small density the volumes displaced should be relatively much larger than in the case of water-pumps. (2) The valves should be capable of action under the smallest possible differences of pressure. This point is of great importance where the production of high vacua is desired. (3) Joints must be as nearly perfect as regards the matter of gas-leakage as it is possible to make them.

These two last factors limit the usefulness of air-pumps with valves, since the highest degree of exhaustion which can be obtained with such a pump is either that at which the valves cease to work or at which the rate of leakage equals the rate of exhaustion.

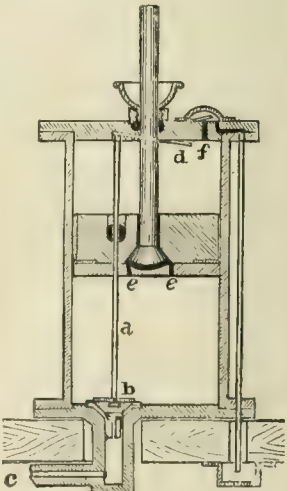


Fig. 7.

The latter is the more important, since the failure of valve-action may be remedied by supplanting the movements due to differences of pressure with movements which follow positively and at the proper instant those of the piston.

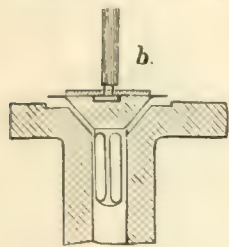


FIG. 8

at the beginning of the stroke without reference to the differences of pressure.

The arrangement of the lower valve in Ritchie's pump is shown in more detail in Fig. 8. It consists of a conical plug which is carefully fitted to the tapering end of the tube which leads from the exhausted receiver to the lower end of the pump-cylinder. This plug is attached to the end of a rod carried by the piston, as above described. A disk of oiled silk completes the closure.

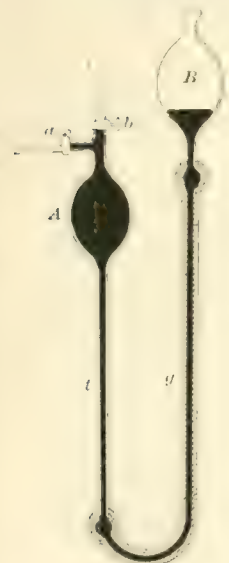


FIG. 9.

which is capable of holding about two liters. These are connected by means of the long vertical glass tube *t*, which must somewhat exceed the barometric column in height, and the strong flexible tube *g* attached to the lower end of *t* and to the movable bulb *B*. There must be, further, two tubes connecting the fixed bulb *A* respectively with the outer air and with the vessel which is to be exhausted. These must be provided with stop-cocks.

The process of pumping with apparatus of this type consists (1) in closing the stop-cock *a*, which leads to the receiver and opening *b*, which gives egress to the outer air, the movable bulb *B* being raised to a height such as to cause the mercury to flow over into *A*, completely filling it, and driving the previously contained air out through the egress-tube. (2) This operation being completed the stop-cock *b* is closed: the bulb *B* is lowered to a position at least 760 mm. below the bottom of the bulb *A* and the stop-cock *a* is opened. The result of the second operation is an influx of air from the receiver to the bulb *A*, which is then expelled by a repetition of operation (1). By continued alternations of the two operations the pressure may be reduced to any desired point within a limit lying much below that attainable with valve-pumps.

In practice, there are attached to the Geissler pump various accessory parts not shown in the figure, such as drying-tubes between the vessel to be exhausted and the bulb *A*, and mercury-traps between the latter and the outer air.

The operation of the Geissler pump is a laborious one,

since it involves the repeated lifting of a large mass of mercury through a vertical distance of about a meter. Where such pumps are in continual use, as in the pump-rooms of incandescent-lamp factories, it is usual to drive the mercury into and out of the bulb *A* by pneumatic pressure, leaving to the manipulator only the task of turning the stop-cocks.

In these cases the apparatus consists of a mechanical pump driven by power, and capable of maintaining a reduc-

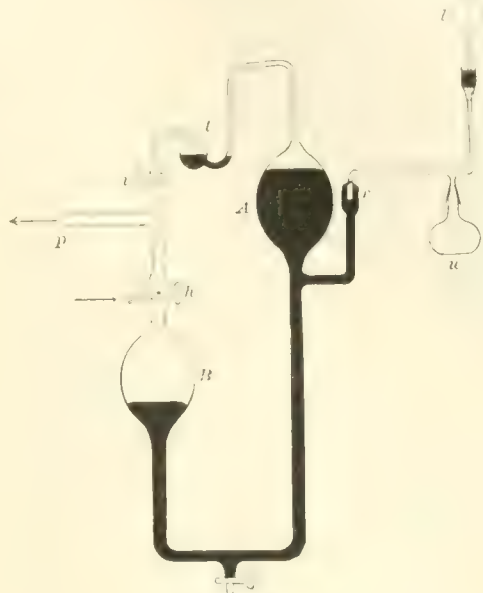


FIG. 10

tion of pressure of 700 mm. The Geissler pump, also, is modified to suit the conditions of working. The bulb *B* is fixed, its position with reference to *A* being that shown in Fig. 10, which gives the arrangement of one of the simplest of this type of pumps.

In the use of such a pump the tube *p* is connected with the mechanical pump, and the stop-cocks *h* and *i* are turned so as to bring the atmosphere within *B A*, the connected vessel *w* (drying-flask), and *l* to the low pressure produced by the action of the latter. The two-way stop-cock *h* is then turned so as to admit air from without to *B*, whereby the mercury rises into *A*, driving the air before it through the mercury-trap *t*. A glass valve, *r*, rises upon the surface of the mercury during this operation until it closes the contraction in the tube, which it has been ground to fit. The restoration of the stop-cock *h* to its first position empties the bulb *A*, and produces further exhaustion of *l* in proportion to the additional space thus provided.

(b) *The Sprengel pump* is a mercury pump based upon a different principle from that of Geissler. The principle was really due to Bunsen, who, in 1868, described a water-jet pump for hastening the filtration processes of the analytical chemist. Sprengel made use of a mercury column flowing downward through a vertical tube of small bore. Fig. 11 shows a simple form of the Sprengel pump, designed by Weinhold. The long vertical tube *a*, enlarged at *c*, is fed with mercury from the tube *b*, which is given the form shown in the figure to prevent loss of vacuum in case the supply of that liquid is not continuously maintained. The mercury flowing from the narrow tube, at a rate which is regulated by the height of the reservoir, *R*, forms drops in the wider upper portion of the pump-tube *a*. Each of these, as it falls into the contracted part, entraps a bubble of air and carries it down into the lower reservoir *r*, whence it escapes to the

FIG. 11.

outer atmosphere. This process is a continuous one, and when the apparatus is properly proportioned and clean, and when clean mercury is used, the pump will frequently continue in action until a pressure of less than the millionth of an atmosphere is attained. For vacua of a still higher order many special precautions must be taken.

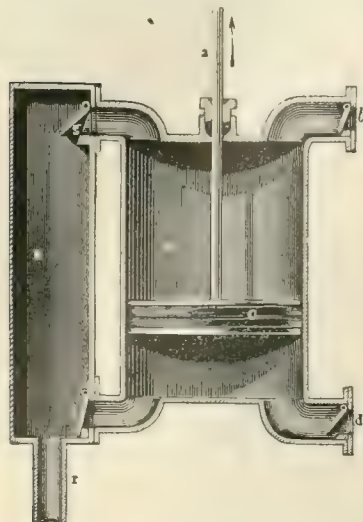


FIG. 12.

of the cylinder and of the valves. There are, as a rule, two sets of valves, so that both the up and the down stroke are effective. When pumps are to be used for the production of high pressures, rather than for the supply of large quantities of air, they are made, as a matter of necessity, with thick walls and small apertures. Figs. 12 and 13 show typical pumps for the production of a blast; Fig. 14 a fan in which the rapid rotation of floats within a cylindrical compartment takes the place of the piston-motion, and, by centrifugal action, produces a continuous and powerful draught.

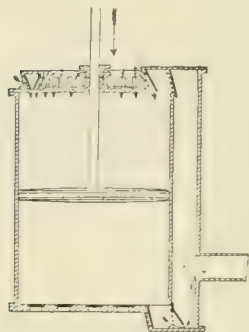


FIG. 13.

flexible closed box or tube (pressure-gauges). The last-named class corresponds to the aneroid barometer, of which indeed it is only a suitable modification.

Fig. 15 shows the essential parts of an "open-tube" manometer for moderate pressures; Fig. 16 of a "closed-tube" manometer with cylindrical bore; and Fig. 17 an instrument of the same class in which the tube is conical. The object of this modification in which the scale will remain open is for high pressures. Fig. 18 presents the essential features of a well-known type of pressure-gauges.



FIG. 14

For the measurement of high vacua a special form of "closed-tube" manometer is used. This instrument, which is known from its inventor as the McLeod gauge, is shown in its essential features in Fig. 19. It consists of a bulb of glass mounted upon a glass tube somewhat longer than a barometer tube. Into the top of this bulb is inserted, by the glass-blower's process, a capillary tube, closed above, the contents of which, for each centimeter of its length, is known in terms of the contents of the bulb. A side-tube inserted below the mouth of the bulb connects the apparatus hermetically with the receiver the vacuum of which is to be measured. To the bottom of the long vertical tube an open reservoir of mercury is attached by means of a strong flexible tube similar to that used in the Geissler pump.

The process of measuring a vacuum with the McLeod gauge is as follows: During the exhaustion the reservoir of

mercury is kept in a position so far below the bulb of the gauge that the manometric column formed by the atmos-

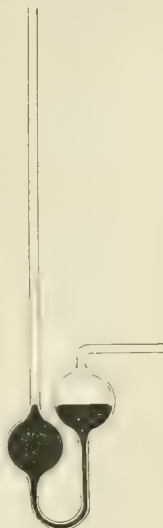


FIG. 15.

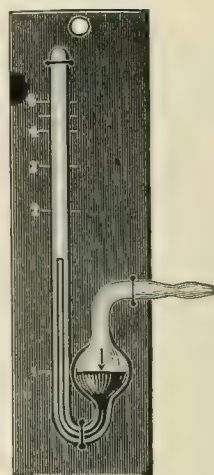


FIG. 16.

pheric pressure without will not reach the side tube. (See Fig. 19.) When it is desired to measure the vacuum, the reservoir is raised until the mercury reaches the side-tube,

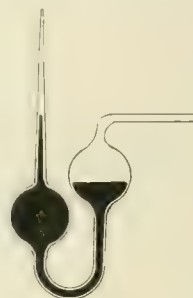


FIG. 17.

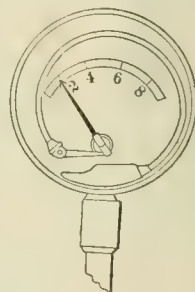


FIG. 18.

thus isolating the body of extenuated gas within the bulb. The reservoir is then raised still farther, and the air within the bulb thus caused to contract under the increasing pressure until, if the vacuum be one sufficiently high to be measured in this way, the mercury has entirely filled the bulb and has driven the air into the capillary tube. The final operations consist in adjusting the mercury within and without to the same height, and in observing the volume of the compressed air. A comparison of its volume with that at which it existed at the beginning of the experiment affords data for computation of the initial pressure.

Appliances based upon the behavior of gases under pressure are numerous. Within the limits of this article it is possible to refer very briefly only to a few familiar examples.

The properties of compressed gases afford a means of storage of energy. Sometimes this is for short intervals, as between the strokes of a force-pump, where the air compressed in the receiver maintains the velocity of efflux during the periods when there is no direct impulse. In other cases the storage is on a much

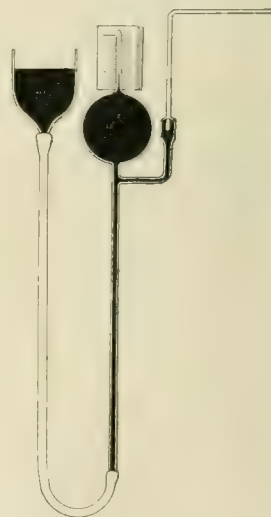


FIG. 19.

larger scale, as in the case of compressed-air motors. In the city of Berne, for instance, a street-railway is operated by means of the energy stored at a pumping-station at one end of the line, where a cylinder upon the car is filled with air at high pressure. One such filling serves to drive the car to the other end of the road and back again. On account of the thermal losses involved, such systems are never of high economical efficiency. They can be used to advantage only where power which would otherwise go to waste can be utilized, as in the case of abundant water-power.

Compressed air is extensively used in the building of bridge piers, of tunnels, and of foundations, where water or quicksand is to be excluded. It is also used for the transmission of small parcels, etc., through tubes, at high speed. (See PNEUMATIC TRANSMISSION.) The fact that pressure is transmitted through gases at a velocity equivalent to that of a sound-wave has led to the use of pneumatic systems of signaling, in which change of pressure at one point in a system of closed tubes is made to operate some signaling device at a distance.

E. L. NICHOLS.

Pneumatic Transmission: a method of transmitting written messages and packages of goods through tubes by the pressure of the atmosphere or the action of compressed air. The operation of the apparatus may be illustrated by inserting one end of a small tube of glass or metal, containing a pellet of moistened paper, in the mouth. Upon forcing air into the tube the pellet will move from the experimenter, but if the air is drawn out of the tube the pellet will move toward the experimenter. These methods are used in all apparatus for pneumatic transmission, a compression or exhausting air-pump being used for controlling the air and a hollow piston of leather or other suitable material for containing and carrying the messages; but there is a variety of special apparatus for regulating the speed and for inserting and removing the piston with its freight of messages from the tube.

In 1687 Denis Papin first suggested the idea of apparatus for pneumatic transmission, but there is no evidence that his plan was tried. In 1792 *Le Dictionnaire Encyclopédique des Amusements des Sciences*, published in Paris, gave a graphic account of an experiment in pneumatic transmission, a round wooden box containing a paper being propelled by a powerful blast of air through an underground pipe for a distance of three-quarters of a mile. This, however, was only for amusement. The industrial aspect of pneumatic transmission was investigated in 1810 by Medhurst, a Danish engineer, who issued a pamphlet entitled *A New Method for Transporting Parcels and Letters by Air*. He followed this by another in 1812 entitled *Some Calculations and Remarks Tending to Prove the Possibility of the New Method for Transporting Letters and Parcels by Air*. Nothing practical was developed from the proposal of Medhurst. In 1824 Valoric proposed a wooden tube 6 ft. 6 in. in diameter for carrying passengers between London and Brighton; carriages were to be blown through the tube, but the suggestion was never carried out. In 1827 Medhurst again proposed a method of pneumatic transmission by means of a piston propelled in a tube by air-pressure, the piston being connected with a carriage exterior to the tube by means of a rod passing through a slot covered by a valve which the rod opened and closed as the piston moved forward. As the air-pressure was obtained from the atmosphere (the air being exhausted in front of the traveling piston and allowed to enter the tube behind it), this system was called the atmospheric railway.

Although Medhurst's proposals were not carried out practically, the idea of pneumatic transmission, by which the movement of the load transmitted was accomplished in carriages outside of the tube in which the piston moved, originated with him, and was in reality the first system which was commercially employed. Medhurst's invention has been made the foundation of upward of fifty British patents (ranging in date from 1827 to 1850), most of which relate to modifications of the valve covering the slit in the top of the tube, or to mechanism for opening and closing it. This system was first tried in 1842 on a half mile of line at Weymouth Scrubs, near London, and a speed of 30 miles an hour was obtained. This experiment led to the employment of the system on the Kingstown and Dalkey Railway, a line of 1½ miles near Kingstown, Ireland, on which trains were run at the rate of 45 miles per hour. Several short lines were constructed in England, and in 1847 the line from Paris to St-Germain was built. This road was worked on the pneumatic plan for over twenty years, and outlived all its pneu-

matic predecessors. At present there is no pneumatic transmission system using a slit tube and an exterior carriage.

In the system of pneumatic transmission employed in all the large cities of Europe and in many places in the U. S. the articles to be conveyed are always within the tube, which extends from one station to another. This method of pneumatic transmission was first carried out on a commercial scale by Latimer Clark in 1853 between the Central and Stock Exchange stations of the Electric and International Telegraph Company in London. The tube connecting the stations was 1½ inches in diameter and 660 feet long. Carriers containing a number of messages were sucked through (in one direction only) by creating a partial vacuum at the delivery end of the tube. C. F. Varley, in 1858, improved the system by using compressed air to force the carriers in one direction, a partial vacuum being used to draw them in the opposite; this is known as the radial system of pneumatic transmission, for the reason that a large number of tubes can radiate in all directions from a single station. This system has been brought to great perfection in connection with the telegraph department of the British post-office, with thirty-six tubes in London alone. Another method of working, used in Paris and other large continental cities, is called the circuit system. In this stations are grouped on circular or looped lines, around which carriers travel in one direction only. The pressure used in the tubes of the British post-office is 10 lb. per square inch of compression, or 7 lb. of vacuum, and the time of transit through a tube 2½ inches in diameter is 1 minute for a distance of 3,000 feet and 5½ minutes for 9,000 feet.

The first application of pneumatic transmission to the conveying of mails and parcels was made in 1863 by the Pneumatic Dispatch Company of London, which constructed a line of D-shaped tube (the convex side uppermost) beneath the surface of the ground from the terminus of the Northwestern Railway at Euston to the district post-office in Eversholt Street, a distance of about 1,800 feet. The dimensions of the tube were 2 ft. 8 in. wide and the same in height. The carriages were cradle-like boxes made to conform to the shape of the tube (although not touching it) and mounted upon four wheels. These carriages were made to travel in the tube at the rate of 17 miles per hour, and regularly transmitted fifteen mails per day each way. The result of the working of this line was so satisfactory that in 1872 a line with a pair of D-shaped tubes, 4 feet wide and 4 ft. 6 in. high, was laid from Euston station to the General Post-office, a distance of 14,214 feet. The time usually occupied in transit is 12 minutes, and 10 or 12 tons are drawn up grades of 1 in 14 without difficulty.

With a view of demonstrating the applicability of the principles of pneumatic transmission to passenger traffic, the Pneumatic Dispatch Company had constructed at the Crystal Palace, Sydenham, a brick tunnel about 10 feet high by 9 feet wide, capable of admitting the largest carriages used on the Northwestern Railway. This tunnel was 1,800 feet in length. The gradients were 1 in 15 (352 feet per mile) and the transit was made in 50 seconds with a pressure of but 2½ oz. per square inch. The motion was said to be smooth and agreeable, and stoppages were made gently and without jerk. In 1869 Alfred Beach began the construction of a pneumatic railway under Broadway, New York. The internal diameter of the tunnel was 8 feet, and the portion of the line completed extended from Warren to Barclay Streets. Some experimental work was done on this line, but the enterprise was abandoned owing to a variety of reasons not at all connected with the principle of pneumatic transmission.

Notwithstanding the success of pneumatic transmission in connection with the postal service of European nations, it was not until 1892 that the U. S. Government decided to give the system a trial, and a plant was laid down in Philadelphia, extending from the General Post-office at Ninth and Chestnut Streets to the sub-station on Chestnut Street between Third and Fourth Streets, a distance of 2,928 feet. There are two tubes of iron, bored to an internal diameter of 6½ inches and made in sections of 12 feet in length. This plant was put in operation on Feb. 17, 1893, and has been so successful that it is proposed to establish an extended system of pneumatic transmission covering the whole city. Pneumatic tubes have been used for many years by the Western Union Telegraph Company to convey messages from sub-stations in New York to the general office, and they have also been largely employed in commercial establishments to convey change from a central office to the

several sales-counters; but pneumatic transmission has not reached a development in the U. S. equal to that in Europe.
W. F. DUFFEE.

Pneumogastric Nerve [*pneumogastric* is from Gr. *πνεύμων*, lung + *γαστήρ*, stomach; so called from its distribution to the lungs and stomach]: the tenth cerebral nerve, though largely a spinal nerve. Its nucleus of origin is a mass of ganglion-cells lying deep in the posterior part of the medulla oblongata, in the floor of the fourth ventricle, and its fibers escape from the side of the medulla. It issues from the skull by the jugular foramen, at which point there is a ganglionic enlargement of the nerve. It then descends with the carotid artery to the chest, and after entering the thorax lies upon the œsophagus. Upon the lower part of the œsophagus the two nerves conjoin, pass through the diaphragm, and are distributed to the stomach and solar plexus. At the level of the jugular foramen the pneumogastric is joined by branches from motor nerves—the facial, hypoglossal, spinal accessory, etc. The branches of the pneumogastric are sent to the pharynx, to the larynx (superior laryngeal nerve, which is sensory, inferior laryngeal, which is motor), to the heart, lungs, œsophagus, and stomach. From its origin to its ganglion (analogous to posterior root of spinal nerves) the pneumogastric nerve is purely sensory, and its most important function—viz., the regulation of breathing by the transmission of sensations through its pulmonary branches to the medulla (center of respiration)—is performed by that property. Below the ganglion it is a mixed nerve. The motor properties of the inferior laryngeal (actions of breathing and voice) are derived chiefly from the branch of the spinal accessory nerve, and the pharyngeal branch derives its motor power from the nerves which join the pneumogastric below the ganglion. The action of the pneumogastric on the heart (through cardiac branches and cardiac plexus) is checking or inhibitory, paralysis of the pneumogastric producing excessive rapidity of the heart's action (and slow respiration), while irritation of the nerve slows or stops the cardiac movements. The movements of the œsophagus and stomach are under the control of the motor fibers of the pneumogastric.

Revised by WILLIAM PEPPER.

Pneumonia [= Mod. Lat. = Gr., deriv. of *πνεύμων*, lung]: inflammation of the lung, of the lining of the air-sacs, and of the interstitial framework of the lung. Pneumonia has been classified into (1) catarrhal pneumonia, when only the air-sacs are involved, filled with products of catarrhal inflammation, extending from the bronchial tubes; (2) croupous pneumonia, when the air-sacs are filled with solid lymph exuded from their inflamed walls; (3) interstitial pneumonia, a slow and chronic inflammatory infiltration and consolidation of the fibrous structures which surround the air-sacs and minute bronchial tubes. As commonly used, however, in Great Britain and the U. S., the term pneumonia means the croupous form only, an inflammation of the air-sacs, which are the functional elements of the lung for the oxygenation of the blood and the liberation of carbonic acid gas. This form, popularly known by the name of "lung fever," is usually confined to one lung and often to one lobe, though it sometimes attacks the lobes successively. Accordingly, it is further designated as "lobar pneumonia." Primary pneumonia in healthy persons occurs more often in the right lung, beginning, as a rule, at the base of the lung and progressing upward toward the apex. In old and feeble persons it may begin at the apex, but pneumonia when local or beginning at the apex is usually tuberculous in nature and the beginning of a chronic phthisis. Pneumonia is a disease chiefly of adults, and more often of males. It results from infection by a specific micro-organism, the *Pneumococcus* or *Diplococcus pneumoniae*, when the system is rendered susceptible by chilling, exposure, fatigue, and similar causes. Pneumonia is therefore an infectious disease, and to a degree it is also contagious. House and institution epidemics have frequently been observed. The disease is announced by a heavy chill, high fever, rapid respiration, frequent pulse, flushed cheek—on the side of the affected lung; in severe cases by delirium and symptoms of a typhoid nature. There is acute pain in the side, due to congestion of the pleura, and a duller, heavier pain or soreness of the side, with sense of weight, due to excess of blood and the solid products of inflammation in the lung. There is cough, with expectoration of mucus tinged with blood or rust-colored, and in grave cases brownish or dark sputa, resembling tobacco-juice or prune-juice, and indicative of a

decomposed state of the blood, and the exuded elements filling the vesicles. The contents of the vesicles are gradually softened and expectorated, and the lung restored to its normal state. Acute pneumonia of adults, although grave in its symptoms, is usually curable, and, contrary to popular apprehension, seldom leads to subsequent consumption.

Pneumonia in children is usually acute catarrhal inflammation of the minute bronchial tubes and air-sacs, occurring in one or many lobules of both lungs. It is liable to leave portions of lung-substance inactive, collapsed, or consolidated, and develop the catarrhal form of phthisis; but many of the cases in which it is supposed that phthisis has followed catarrhal pneumonia are really *tuberculous catarrhal pneumonia* from the first.

Pneumonia is variously treated. Locally, cold water and ice-bags may abort or limit the inflammation at its beginning. When established, warm applications, as poultices, warm anodyne fomentations, cotton-batting, and oil-silk afford the greatest comfort and favor resolution and removal of the exudation from the air-sacs. Carbonate and muriate of ammonia are used as diffusive stimulants and to liquefy the exuded lymph; calisaya bark or quinine, alcoholic stimulation, and rich liquid diet to sustain strength are also employed. At the very onset bleeding is at times a useful measure of treatment.

Revised by W. PEPPER.

Po [Lat. *Padus*, or, poetically, *Eridanus*; Gr. *Ἑριδανός*]: the largest river of Italy. Rising on the east flank of Monte Viso, at a height of 6,560 feet above the sea, it flows N. E., receiving many affluents in its course, till its junction with the Dora Baltea near Chivasso, thence a little S. of E. to the Adriatic, into which it discharges by several mouths; length, 360 miles; drainage area, 27,000 sq. miles. In the first 20 miles of its course it descends 5,300 feet to a point near Revello, and though here a large stream its bed is sometimes left dry for a considerable distance. At Valenza, about one-third of the whole distance from its source to its outlet, it reaches the level of some 600 feet above the sea, and from this point it flows chiefly through its own alluvion to the Adriatic, and is navigable for vessels of 130 tons.

The Po is diked continuously from near Cremona to the marshes at its outlet. The levees do not follow the smaller windings of the river, but in many places leave a space of even miles between them. An embankment running along the margin of the channel is called *argine a froldo*, or simply *froldo*. When it recedes sensibly from the river it is called *argine a golena*. The *golene*, or spaces between the levee and the channel, are frequently protected by low dikes and cultivated, but in every considerable rise of the river the natural banks are overflowed and the *golene* submerged.

The river receives fully four-tenths of its volume from a chain of lakes lying at the foot of the Alps, extending E. and W. about 150 miles, and with a total area of more than 300 sq. miles. The mean discharge into the Adriatic is 60,745 cubic feet to the second, which appears to differ little from the delivery of the Rhône and of the Rhine, and equals about one-eleventh of that of the Mississippi. Its waters are usually at their lowest stage twice in the year, about the summer and winter solstices, and at their highest in May and October.

Besides its vast discharge proportionally to the extent of its basin, the enormous amount of mineral matter ground down to fine silt deposited by its waters at and near its outlet—a consequence of the fact that most of its tributaries are mountain-torrents—is a noteworthy feature in the physical character of the Po. In floods this is calculated to equal 30th part of the total delivery in volume, or almost ten times the mean proportion of solid matter borne down by the Mississippi. The deposit extends the delta of the Po into the Adriatic at a rate of advance not greatly inferior to that of the Mississippi, or more than 200 feet per year, though the lateral spread of the sediment is less than at the mouth of the American river.

GEORGE P. MARSH.

Abridged by M. W. HARRINGTON.

Pocahontas: daughter of Powhatan, a powerful Indian chief of Virginia; b. about 1595. According to the *True Relation* of Capt. John Smith, she in 1607 rescued the latter from death when he was taken prisoner by the Indians. The rescue, according to Smith's narrative, took place at Werowocomoco (now Shelly), Gloucester co., Va., near the junction of Carter's creek and York river. In 1609 she visited Smith with news of an intended Indian attack, and she several times supplied the hungry colonists of Jamestown with corn. In 1612 the chief Japazaws sold her to Argall, and her

father offered a ransom for her release, but could not agree with her captor on the terms. In 1613 she married Thomas Rolfe, afterward secretary and recorder-general of Virginia. She was baptized as Rebecca, went to London, and was presented at court. D. at Gravesend, England, Mar., 1617, leaving a son, Thomas Rolfe, from whom the Randolphs, Guys, Hemmings, and other leading families of Virginia trace their descent. See Doyle's *English Colonies in America* (1882).

Pocock, Edward, D. D.: Orientalist; b. at Oxford, England, Nov. 8, 1604; graduated there in 1622; was fellow of Corpus Christi College in 1628, and devoted himself to the study of Eastern learning. He was chaplain to the English factory at Aleppo, Syria, from 1630 to 1636, when he returned to Oxford to take the professorship of Arabic, then just founded by Archbishop Laud. After giving one course of lectures he went back to the Orient, and was in Constantinople from 1637 to 1640, collecting manuscripts and coins and ardently pursuing his favorite studies. He returned to England in 1640, and in 1643 his college gave him the living of Childrey in Berkshire, near Oxford. In 1648 he was appointed to the chair of Hebrew, and became canon of Christ Church the same year. A staunch though not intemperate royalist, he would have lost his professorships in the time of Cromwell but for the remonstrances of John Owen and John Selden. The restoration of Charles II. in 1660 multiplied and secured his honors. D. in Oxford, Sept. 10, 1691. He published, besides other works, *Version from the Syriac and Notes on the Epistles of St. Peter, St. Paul, and St. John, and Jude*, omitted in the Pesbto (1636); *Specimen Historiarum Arabum* (1648); *Poeta Moses* (1655); *Annals of Eutychius* (1658); *Arabic Version of Grotius de Veritate* (1660); *Abulfaragii Historia Dynastiarum* (1663); and English Commentaries on Micah (1677), Malachi (1677), Hosea (1685), and Joel (1691). See his *Works and Life*, in 2 vols., by Leonard Twells (London, 1740).

Revised by S. M. JACKSON.

Pococke, Richard, LL. D.: traveler; b. at Southampton, England, in 1704; graduated at Oxford in 1731; took the degree of LL. D. in 1733; traveled in the East 1737-42; published his *Description of the East and some other Countries* (2 vols., fol., with 178 plates; vol. i., *Observations on Egypt*; vol. ii., part i., *Palestine, Syria, Mesopotamia, Cyprus, and Candia*—part ii., *Islands of the Archipelago, Asia Minor, Thrace, Greece, etc.*) in 1743-45; a German translation appeared (Erlangen, 1754-55, 3 parts), and a French one (Neuchâtel, 1772-73, 7 vols.). He was made Archdeacon of Dublin in 1745, Bishop of Ossory in 1756, and in 1765 Bishop of Meath, and died at Charleville, near Tullamore, on Sept. 15 of that year. He wrote his *Travels in Scotland* (edited from original MS., with memoir by D. W. Kemp, Edinburgh, Scottish Historical Society, 1887), in *Ireland* (edited by G. T. Stokes, Dublin, 1891), and in *England* (2 vols., London, Camden Soc., 1888-89). He was the author of some papers in the *Philosophical Transactions* and in the *Archæologia*, but his fame rests upon his work on Palestine, which Robinson pronounces "one of the most important," although he knew but little Arabic and his scholarship was more classical than biblical.

Revised by S. M. JACKSON.

Po'comoke River: a river which rises in the Cypress Swamp of Sussex co., Del., and flows 60 miles S. and S. W., mostly in Maryland, to Chesapeake Bay. The tide ascends 22 miles, and it is navigable 20 miles, to Snow Hill, Md.

Podes'ta [Lat. *potestas*, power]: a municipal magistrate in Italian cities. The name was formerly applied to the chief magistrates of Italian towns, appointed in troubled times with full dictatorial powers. He was usually a stranger to all the local factions, and during his term of office was prohibited by law from forming any intimate connection with the citizens over whom he ruled. He was appointed for a term of years, but he sometimes became a permanent despotic ruler. The name was probably first given to the German magistrates whom Frederick Barbarossa appointed over the Lombard cities.

Podgoritz (city under the hill): town; situated on the Moratcha in territory ceded to Montenegro by the Treaty of Berlin (1878); strategically important as commanding Northern Albania. It was founded in the fifteenth century by Mohammed II., and built from the neighboring ruins of Dioclea, where Diocletian was born. Every Sunday a great bazar or market is held, thronged by Albanian and Monte-

negrin mountaineers when not engaged in war. It carries on a large trade in honey, skins, wax, and wool. Pop. 6,000.

E. A. GROSVENOR.

Podiciped'idæ [Mod. Lat., named from *Podiceps*, the typical genus; Lat. *po'dex*, *po'dicis*, rump + *pes*, *pe'dis*, foot]: a family of swimming birds, including the grebes, distinguished by their rudimentary tail, flattened tarsi, broadly lobed toes, of which the outermost is the longest, and flattened nails. The body is short, plumage close and silky, legs placed far backward. The name is sometimes written *Podicipidæ*. See GREBE.

F. A. L.

Podiebrad, pol-ya-brăd, GEORGE: King of Bohemia; b. in Apr., 1420, of a noble and wealthy Bohemian family belonging to the moderate section of the Hussite party; joined the Utraquists after the election of Albert of Austria to the Bohemian throne in 1438, and distinguished himself greatly by compelling Albert to raise the siege of Tabor. As leader of the whole Hussite party he became governor of Bohemia in 1444, during the minority of Albert's son, Ladislaus the Posthumous, and on the death of Ladislaus he was elected king himself, and crowned at Prague Mar. 2, 1458. It was his great aim to reconcile the Hussites and the Roman Catholics among his subjects, and he acted with wisdom, and with some success; but the pope excommunicated him as a heretic, preached a crusade against him in Germany, incited his son-in-law, Matthias Corvinus, King of Hungary, to attack him, and even instigated his own Roman Catholic subjects to revolt against him. Podiebrad suppressed the insurrection, routed the German crusaders, defeated the Hungarians several times, and, in order to strengthen the anti-papal and anti-Hungarian party in Bohemia, he induced his countrymen to elect Ladislaus, heir of the Polish crown, as his successor, while his two sons retired into the ranks of the nobility. D. Mar. 22, 1471. See Richter, *Georg von Podiebrad's Bestrebungen* (1863); Jordan, *Das Königthum Georgs von Podiebrad* (1869); and Bachmann, *Ein Jahr böhmischer Geschichte* (1876). Revised by F. M. COLBY.

Podo'lia: government of European Russia; bounded W. by Galicia (Austria) and S. by the Dniester. Area, 16,224 sq. miles. The surface is mostly level, the soil fertile, and the climate mild. Grain, hemp, flax, hops, and tobacco are grown, and the vine and the mulberry are extensively cultivated. Large herds of cattle and sheep are reared, and there are important manufactories of beetroot sugar, distilleries, and sugar-refineries. Pop. (1890) 2,604,800.

Podophyllum and Podophyllin: See MAY-APPLE.

Podu'ra [Mod. Lat.; Gr. *ποῦς*, *podōs*, foot + *οὐρά*, tail]: a genus of insects of the order *Thysanura*, interesting from the fact that the scales with which the body is covered are sometimes used as test-objects for the microscope.

Poe, Edgar Allan: author; b. in Boston, Mass., Jan. 19, 1809; son of David Poe and Elizabeth Arnold, an English actress. His parents, who pursued the vocation of actors, having died in his early childhood, Edgar was adopted by a wealthy citizen of Richmond, Va. (John Allan), by whom he was sent to school at Stoke Newington, near London, England, from 1815 to 1820; entered the University of Virginia, at Charlottesville, in 1826, but was removed within a year, probably on account of addiction to the gaming-table. In 1827 he went to Boston, and issued there his first volume, *Tamerlane and other Poems*; enlisted in the U. S. army as a private under an assumed name, and was admitted a cadet at West Point 1830, but was dismissed Mar. 6, 1831. In 1833, while living at Baltimore, Md., he took a \$100 prize by his story *A Manuscript found in a Bottle*, and this led to his appointment as editor of *The Southern Literary Messenger*, Richmond, Va. While occupying that position Poe married his cousin, Virginia Clemm, and led for two or three years a life of considerable regularity, devoting himself to study and writing many tales, reviews, essays, and brief poems. Having at length quarreled with his publisher, Poe removed to New York Jan., 1837; earned a precarious living for a year by writing occasional articles in several papers; published in 1838 his first prose volume, *The Narrative of Arthur Gordon Pym*; went to Philadelphia; was editor of Burton's *Gentleman's Magazine* from May, 1839, to June, 1840, and of *Graham's Magazine* from Apr., 1841, for about a year; published *Tales of the Grotesque and Arabesque* (2 vols., Philadelphia, 1840); gained a prize of \$100 offered by *The Dollar Newspaper*, in 1843, with his tale *The Gold Bug*; removed to New York in the autumn of 1844, where the appearance of his best-known production,

The Raven, in Colton's *Whig Review* for Feb., 1845, gained him a wide reputation, and procured him the post of sub-editor on Willis's and Morris's *Home Journal*; was associated with C. F. Briggs in the management of *The Broadway Journal* 1845-46; contributed to *Godey's Lady's Book* May to July, 1846, the biographical and critical sketches entitled *The Literati of New York City*; resided about this time in a cottage at Fordham, Westchester County, and fell into such poverty that an appeal to public charity in his behalf was made by N. P. Willis in *The Home Journal*; lost his wife, who had clung to him with fond devotion, in Jan., 1847; delivered at the Society Library, Feb., 1848, a lecture, published soon after under the title *Eureka, a Prose Poem*. D. in Baltimore, Oct. 7, 1849. A monument to his memory was erected in the Westminster churchyard, Baltimore, Oct., 1875, by a subscription raised by the school-teachers of that city. The works of Poe have been repeatedly republished since his death, both in the U. S. and in England, and have attained an immense popularity in a French translation. They were first edited in New York (4 vols., 1850) by Poe's "literary executor," Rufus Wilmot Griswold, who prefixed a defamatory *Memoir*, many of the allegations of which have been successfully refuted by later biographers, such as Mrs. Sarah Helen Whitman in her *Edgar A. Poe and his Critics* (1860), John H. Ingram in a *Memoir* prefixed to Poe's *Works* (Edinburgh, 1874), and Richard Henry Stoddard in a memoir accompanying a new edition of the *Poems* (New York and London, 1875). The best biography of him is that written by George E. Woodberry and published in the American Men of Letters Series (1885). Revised by H. A. BEERS.

Poe, ORLANDO METCALFE: soldier; b. in Ohio, Mar., 1832; graduated at the U. S. Military Academy, and entered the topographical engineers July, 1856; captain of engineers 1863; colonel July, 1888. He was engaged upon lake-survey duty until the outbreak of civil war in 1861, when, after serving as chief engineer in the department of the Ohio and on the staff of Gen. McClellan, he was (Sept., 1861) appointed colonel of the Second Michigan Volunteers, and served with the Army of the Potomac until Dec., 1862, having been appointed brigadier-general Nov. 29, 1862; subsequently served as chief engineer of the Twenty-third Corps of the Army of the Ohio, and of Gen. Sherman's army in the invasion of Georgia and march to the sea, gaining the successive brevets from major to brigadier-general for gallant and meritorious services. Returning to duty with the Corps of Engineers at the close of the war, he was (1865-70) engineer secretary of the U. S. lighthouse board; in 1870-73 constructed the lighthouse on Spectacle Reef, Lake Huron. He was aide-de-camp on the staff of the general of the army 1873-84, member of the lighthouse board 1874-84, and has been since 1883 member of various engineer boards charged with the construction of river and harbor works on the northern and northwestern lakes, including the new lock at the Ste. Marie's Falls Canal. Revised by JAMES MERCUR.

Pœcilop'oda [Mod. Lat., from Gr. ποικίλος, many-colored, manifold + πούς, πόδς, foot]: a term sometimes used as equivalent to MEROSTOMATA (q. v.).

Poetics: See POETRY.

Poet-laureate [*laureate* is from Lat. *laureatus*, crowned with laurel, deriv. of *lau'rea*, laurel (in both ancient and modern times a symbol of triumph)]: a title bestowed at universities and by sovereigns at various courts. The Greeks and Romans, in their public ceremonies, sometimes crowned their poets with symbolical chaplets of the bay-tree sacred to Apollo. It was in imitation of this ceremony that Petrarch was laureated on the Capitol in Rome, on Easter Day, 1341. The title, during the Middle Ages, was commonly an academic and not a courtly distinction; it was conferred by the universities for skill in Latin verse, and was of the nature of a degree. It was in that scholastic sense of the term that John Skelton was made *poeta laureatus* at Oxford in 1489.

The fact that the king united with the university in the bestowal of the honor indicates the way in which the laureateship finally became a regular court appointment. In Germany the custom of crowning poets with laurel was an imperial prerogative, but was sometimes delegated by the emperor to the counts palatine and the universities. In Spain the custom was established at the University of Seville. France was seemingly the only country of mediæval Europe in which the title was not known.

During the reigns of the Norman kings of England there

had frequently been attached to the royal household an officer called the *versificator*, or king's poet, who celebrated his lord's achievements in Latin verse, and received an annual stipend. The circumstances under which the title of poet-laureate was transferred to these court poets are somewhat obscure. Robert Whittington, who received the laurel at Oxford in 1512, is described as the last of the university laureates. The first king's laureate of whom any mention is made was John Kay, who was poet to Edward IV. The second was Andrew Bernard, who held the title under Henry VII. and Henry VIII. He had a salary of ten marks. His *Epithalamia*, New Year's verses, and other official performances are in Latin, thus continuing the tradition of the university laureates. Then follow a number of poets who have been termed volunteer laureates. These were Richard Edwards, Edmund Spenser, and Samuel Daniel. They all held court appointments of one kind or another, and received grants of money or of land, but they were not officially styled poets-laureate.

Ben Jonson was the first in the line of officially appointed poets-laureate. He was appointed by James I. in 1616, at an annual salary of 100 marks (£67), which was raised by Charles I. to £100, with a tierce of canary wine. The written instrument granting this increase of pension is dated Mar., 1630, and is the first regularly issued patent for the office of poet-laureate.

After his death in 1637 the laureateship was conferred upon Sir William Davenant (Dec. 13, 1638). From the outbreak of the civil war and during the Commonwealth (1642-60) the office was in abeyance. Davenant was a royalist, was active in the king's cause, and was several times imprisoned by the Parliament. After his death in 1668 John Dryden succeeded to the laurel (1670), and was also made historiographer royal. The salary of the two offices amounted to £200, with the annual tierce of canary. His salary was shortly increased to £300, with a further annual pension of £100 to be dependent on the king's pleasure. He wrote no laureate odes, but composed an elegy, *Threnodia Augustalis*, on the death of Charles II. in 1685. James II. continued to Dryden the title and emoluments of the office, but omitted the butt of canary from his perquisites. In 1686 he was granted an additional pension of £100 a year. At the revolution of 1688 Dryden was deposed from his office, which was given to his old enemy, the "true blue" Protestant and Whig poet Thomas Shadwell, whom he had lampooned unmercifully in his satire *Mac Flecknoe*.

From the time of Dryden to the time of Southey the English laurel was worn by a succession of poetasters. Poets like Pope, Prior, Goldsmith, and Cowper were passed over, and the honor bestowed upon Tate, Eusden, and Pye. "The bays" became a sure badge of mediocrity and a target for universal scorn in lampoon, epigram, caricature, and parody. The names of these laureates and the dates of their incumbency are as follows: Thomas Shadwell, 1688-92; Nahum Tate, 1692-1715; Nicholas Rowe, 1715-18; Lawrence Eusden, 1718-30; Colley Cibber, 1730-57; William Whitehead, 1757-85; Thomas Warton, 1785-90; Henry James Pye, 1790-1813. Shadwell began the fashion, which was continued by his successors down to the time of Southey, of composing anniversary odes on the king's birthday and on New Year's Day. These were set to music by the court composer, and sung in the royal chapel or the state drawing-rooms. During the reign of Queen Anne the appointment of the poet-laureate was vested in the lord chamberlain; and Tate, who had served under William and Mary, was formally reappointed in 1714 by that functionary, in whose hands the bestowal of the office has remained ever since.

Of the eighteenth-century laureates, Tate is remembered chiefly by his (and Brady's) versions of the Psalms in meter, and Rowe by his edition of Shakspeare. Cibber, the manager of Drury Lane theater, was a man of wit and a successful playwright, but a small poet. Thomas Warton was a respectable appointment. He was an antiquary and critic, a scholar of elegant tastes, and a genuine though by no means a great poet. In Eusden and Pye the laureateship touched the lowest point in the history of the institution. On Cibber's death the laurel had been offered to Gray, who declined it. During Pye's tenure of office the annual tierce of canary was commuted for a money payment of £27.

In 1813 the laureateship, which had been offered Sir Walter Scott and by him declined, was given to Robert Southey, who made it a condition of his acceptance that he should be expected to write official odes only upon occasions

of his own choosing. A number of such performances, composed at irregular intervals, are among his writings. Southey's poems on public events are not of his happiest, and his unfortunate *Vision of Judgement*, composed on the death of George III., brought upon him a terrible punishment in the shape of Byron's wicked and brilliant satire of the same title. Southey was by no means the best poet in England, but his worth and abilities rescued the office of poet-laureate from the general contempt in which it was held.

After his death in 1843 the laureateship was most fittingly bestowed upon William Wordsworth, the first great poet who had received it since Dryden. It was expressly stipulated that nothing should be required from him in the way of official verses, and nothing of the kind came from his pen during the seven years of his incumbency.

On Wordsworth's death in 1850 the honor was conferred upon Alfred Tennyson, the foremost living English poet, who inherited, in his own words,

This laurel, greener from the brows
Of him who uttered nothing base.

As in the case of his two immediate predecessors, Tennyson's official verses were strictly voluntary. Among them may be mentioned the dedication of his *Idyls of the King* to the memory of Prince Albert, the dedication to the Queen of his 1851 volume of poems, and the *Welcome to Alexandra* (1863). Since Tennyson's death in 1892 the office has been vacant. See *The Lives of the Poets Laureate*, by W. S. Austin and J. Ralph, London, 1853; *The Poets Laureate of England*, by Walter Hamilton, London, 1879. H. A. BEERS.

Poetry [from O. Fr. *poëterie*, deriv. of *poëte* < Lat. *poëta* = Gr. *ποιητής*, maker, the creator of a poem]: according to Aristotle (*Poetics*; i, 1), the imitation, by means of rhythm, words, and melody, of the actions of men. To the modern inquirer, however, this definition seems somewhat far-fetched and decidedly inadequate. In trying to frame a better one there is an inevitable confusion, owing to the fact that the mind, as it strives to define, oscillates between realization of the process of poetic creation, or making, and recollection of what has in fact been created by poets. The creative arts are really closely akin, and the term "making" fits one almost as well as another; but we do not call painting and sculpture poetry, and although the prose novel is imitation of the actions of men, and often implies the act of making or creating, yet we do not denominate even this poetry. We are, in fact, even in the field of literature, forced back upon a purely empirical definition, and we can probably do no better than to adopt the test which is popularly employed for determining whether a literary work is or is not poetry. This is, and perhaps always has been, the presence of rhythm or meter.

It seems to be certain that this addition of rhythmical or metrical effect is what in the first place made any form of literature possible. Language first gained distinction and became something with an existence apart from the speaker through the imposition upon it of a form unused in ordinary intercourse between men. There were several ways in which this imposition could occur. One of the most primitive of human impulses is that to rhythmic motions of the body—i. e. to the dance; and it is inevitable that words uttered in accompaniment to the dance should partake of its rhythmic character. Then, modulated utterance, or song, may fairly be called instinctive in the human race, and this necessarily brings with it rhythm in the words sung. The extension of music to instruments, even the most barbarous, carries the same result. The very memory, with its demand for regularity in the form of what is remembered, tends in the same direction. Thus many forces must have co-operated to give to language at certain times and on certain occasions a quality which ordinarily it has not. Here was the beginning of poetry; and it was inevitable that in time all the sentiments and emotions, all the memories, traditions, and intellectual interests of mankind that are at all removed from the gross needs of daily life, should find utterance in poetical form.

The varieties of poetry are numerous and not rigidly distinguishable from one another. At the same time each has in a sense an organic life of its own, and corresponds with some accuracy to a human interest or function. The reader will find the character and history of the chief poetic forms discussed in the following articles: BALLAD POETRY, DIDACTIC, DRAMA, EPIC POETRY, EPIGRAM, GOSPEL, GREEK POETS, HYMNODOLOGY, LYRIC POETRY, ODE, PASTORAL POETRY, ROMANCES, SATIRE, SONNET, and THEATER. See also FINE ARTS.

Of inquiries into the nature and function of poetry, Aristotle's *Poetics* is, despite its incompleteness, still the best. The *Ars Poetica* of Horace has a practical rather than theoretic purpose, and this is true of the numerous treatises that Horace has inspired—e. g. the *Ars poetica* of Vida, Boileau's *Art Poétique*, and Pope's *Essay on Criticism*. As a rule, however, poetry has been systematically discussed chiefly by writers engaged with some theory of aesthetics. These have rarely taken the trouble to base their conclusions on a careful investigation of the history of poetry in its several kinds. Two brief treatises in English in defense of poetry contain interesting hints upon the inner nature of the art. These are Sir Philip Sidney's *Defense of Poesy* and Shelley's essay with the same title. Wilhelm Scherer's *Poetik* (Berlin, 1888) and F. B. Gummere's *Handbook of Poetics for Students of English Verse* (Boston, 1885) are also helpful and suggestive.

A. R. MARSH.

Poge, Cape: SEE CAPE POGE.

Pog'gendorff, JOHANN CHRISTIAN: physicist; b. in Hamburg, Germany, Dec. 29, 1796; was educated at the University of Berlin, where he became Professor of Physics in 1834; attained great distinction as an observer of magnetic and electrical phenomena; published a *Treatise on Voltaic Electricity* (1821), and in 1824 became editor of the renowned *Annalen der Physik und Chemie*, and with Liebig edited the *Wörterbuch der Chemie*; wrote important works on biography and on the literature of the physical and mathematical sciences. D. Jan. 24, 1877.

Poggio, Bracciolini, pod jō-brakāt-chō-lo-nē, GIOVANNI FRANCESCO: humanist; b. at Terranuovo, near Arezzo, Italy, in 1380; apostolic secretary 1403-53, in which year he was elected chancellor of Florence. D. in 1459. On his diplomatic missions he employed his leisure in looking for MSS., and his search was rewarded by the discovery of a complete Quintilian, seven speeches of Cicero, twelve hitherto unknown comedies of Plautus, Ammianus Marcellinus, Aratea, Silius Italicus, Manilius, Petronius, Columella, Frontinus, Nonius, Probus, parts of Lucretius, Valerius Flaccus, Priscian, Vitruvius, Statius's *Silvae*, and it is due to his unflinching enthusiasm and perseverance that the *Dialogus* and *Germania* of Tacitus and the fragment of Suetonius, *De grammaticis et rhetoribus*, were rescued from destruction in a German monastery. Poggio also did good service in preserving the ruins of ancient Rome, and his collection of inscriptions, only rivaled in extent by those of his contemporary Kyriacus, prove him to have been fully alive to the paramount historical importance which attaches to epigraphic documents. See Voigt, *Wiederbelebung des class. Alterthums* (i., pp. 237-262, ii., 254, ff., 329-342); I. A. Symonds, *Renaissance in Italy* (ii., pp. 134, ff., 230-246); Henzen, in the *Corpus Inscript. Latin.* (vi., 1); W. Shepard, *The Life of Poggio* (2d ed. London, 1807). A. GUDEMAN.

Pogo'din, MIKHAIL PETROVICH: writer and archæologist; b. in Moscow, Russia, Nov. 23, 1800. Even before graduating from the university he had begun to establish a reputation by his articles on *The Chronicle of Nestor* and by translations of German works. In 1823 he published his dissertation on *The Origin of the Russians*. In 1825 he was made instructor and in 1830 professor at the Moscow University, where he remained until 1844, when he resigned in order to devote himself entirely to his other tasks. During this time he attempted various kinds of literature, including translations from the German, an historical tragedy, *Marfa the Possadnitsa* (1831), stories (3 vols., 1833), and a dramatized *History of the False Demetrius* (1835), besides editing works of various kinds. He was one of the editors of the *Moskovskii Vestnik* (Moscow Messenger, 1827-30) and the *Russian Observer*. His chief interest, however, was the early history of his country. He was an ardent Slavophil, though he defended the memory of Peter the Great, and he was one of the founders of the Moscow Slav Committee, which labored to prepare the way for Pan Slavism. Although he never completed his great history of Russia (1846-54, 7 vols., fragmentary disquisitions rather than a connected account), he wrote much of value. In 1841 he founded *Moskvitianin* (The Muscovite), an historical magazine that came out for fifteen years. D. in Moscow, Dec. 8, 1875. Among the best-known of his works are *The Character of Ivan the Terrible* (1828); *The Complicity of Godunov in the Murder of Demetrius* (1829); *The Historical Basis of Serfdom* (1858); and *The First Seventeen Years of the Reign of Peter the Great* (1875).

A. C. COOLIDGE.

Poinsett, JOEL ROBERTS, LL. D.: statesman; b. at Charleston, S. C., Mar. 2, 1779, of a Huguenot family; spent his early childhood in England; educated at Greenfield Hill, Conn., under Timothy Dwight 1793-94; went again to England 1796; studied medicine at Edinburgh, and entered the military academy at Woolwich; returned to Charleston and studied law 1800; went again to Europe 1801; traveled in Asia Minor and in Russia; returned home in 1809; was sent to Chili by President Madison to report on the revolution in that country, and there acquired great popularity; was in Congress from South Carolina 1821-25; U. S. minister to Mexico 1822 and 1825-29, filling a position then very difficult and important; U. S. Secretary of War 1837-41; founded the Academy of Fine Arts, Charleston, S. C., and liberally endowed the National Institution; author of *Notes on Mexico* (Philadelphia, 1824) and of various published essays and discourses, and was a strong opponent of the extreme States-rights view. D. at Statesburg, S. C., Dec. 12, 1851.

Point Alphabet: See BLIND, EDUCATION OF THE.

Point de Galle: a town of Ceylon. See GALLE.

Pointe-à-Pitre, La: largest town and principal port of Guadeloupe, French West Indies; at the southwestern corner of the island of Grande Terre, near the narrow channel which separates it from Basse Terre (see map of West Indies, ref. 7-M). The harbor, sheltered by the two islands, is one of the best in the West Indies. The town is well laid out. There is a fine shaded promenade, and many of the dwellings are surrounded by beautiful gardens. The most important export is sugar. Pointe-à-Pitre was destroyed by an earthquake in 1843, and has suffered severely from fires. Pop. about 20,000. HERBERT H. SMITH.

Point Edward: See SARNIA.

Pointer: one of a breed of dogs much used by sportsmen; so called because they stop and *point* toward the game which they scent. This habit has been so developed by training and breeding as to have almost become an instinct. Pointers are short-haired dogs, and should have a wide head, with very apparent occipital crest; ears thin, soft, and long, hanging flat at the side of the head; deep chest, strong loins, and tapering tail, thick at the root. The pointer is one of the hound group, and it is believed the breed originated in Spain. See DOGS. F. A. LUCAS.

Point Levi: See LEVIS.

Poison: See TOXICOLOGY, JURISPRUDENCE, MEDICAL; and LEAD-POISONING.

Poison-ivy: See RHUS.

Poison of Serpents: a poison with which certain serpents are provided, and which is formed by a pair of glands which lie back of and below the eye on each side. Each gland discharges its secretion through a duct which leads to a reservoir and finally to the base of a hollow fang. When the mouth is closed the fangs lie in a horizontal position against the upper jaw, but when open and the serpent is about to strike, muscular fibers connected with the roots of the fangs contract and throw the latter almost at right angles to the jaw. When the prey is seized the fangs are driven into the flesh of the victim, and muscular fibers connected with the venom-reservoirs are simultaneously rendered active, so that the poison is forced through the gland-ducts and hollow fangs into the wound. The quantity discharged varies from a part of a drop to over a teaspoonful, depending chiefly upon the size and activity of the serpent, the climate and season of the year, and the lapse of time intervening since the last discharge.

The venom of all serpents is a thin yellowish (occasionally colorless) fluid which is composed chiefly of albuminous matters in solution, and bears certain general resemblances to the saliva of higher vertebrates. It contains about 25 per cent. of water, and when dried breaks up into bright translucent pieces which closely resemble crystals. Many attempts have been made to isolate its poisonous principles, which for a long time were believed to be of the nature of alkaloids, especially ptomaines, but Mitchell and Reichert, who were the first to isolate them, have shown that they are represented in the albuminous substances above referred to. These they have found may be divided into two classes, which they have termed *venom-globulins* and *venom-peptones*. Their researches render it probable that all venoms contain one or more representatives of each of these classes. In some as many as four venom-globulins and one venom-

peptone have been isolated, thus proving the existence of as many as five distinct poisons in a single specimen. Venom belongs to the group of virulent poisons, a quarter of a drop being sufficient to kill a pigeon, and a few drops to kill a dog.

The effects are divisible into local and general, immediate and remote. The venom having been injected under the skin by the fang, the first effect is a general feebleness, in which the heart shares, and which is sometimes accompanied by nausea and vomiting. If the amount be large, the animal or man dies within a time which varies from a few minutes to hours; if the early depression passes over, recovery is often sudden, or else the creature poisoned enters the second stage of the poisoning. This is characterized by blood-changes, and by a general degradation in the nutrition of every tissue, so that all suffer in some degree. The series of changes begins with lessened or lost power of the blood to clot; at the same time the texture of the smaller vessels is so altered as to allow the escape of the incoagulable blood, which, if the animal survive long, finds its way into the tissue of nearly every organ, thus causing symptoms which vary according as the organ most affected is the brain, spinal cord, liver, lungs, or kidneys. These changes result, therefore, in bleeding from the mucous surfaces of the breathing and digestive organs, and in oppressed respiration, bloody stools, or bloody urine, and finally in coma or convulsions and death. The local symptoms vary with the snake, but vary in degree only. First, there is thrown out about the fang-track a vast amount of blood, which, as it can not clot, soaks through the tissues, and even stains the bones. The adjacent muscles soften, and at last inflammation comes on, with great swelling and pain, and finally local death of the part.

There is no antidote that is efficient when administered internally. A solution of permanganate of potassium and the liquor chloride of iron are powerful local antidotes; that is, when they are brought in contact with the venom in the wound they chemically destroy the poison and thus render it inert. The permanganate is for all venoms the better, since it destroys both globulins and peptones, while the chloride of iron is destructive only to the globulins, and but slightly impairs the toxicity of the peptone. The proper treatment of snake-bite is at once to tie a ligature above the part bitten (or, better, put an elastic bandage around the whole limb), immediately lay open the wound in the line of the fang-mark, and thoroughly wash out the part with a solution of permanganate of potassium, encouraging bleeding by pressure toward the incision. In case no antidote such as permanganate of potassium or chloride of iron is at hand, it is useless to apply any local dressing save to put the part in hot water, wash it, and provoke bleeding. Next, alcohol should be given until the heart is excited, when the ligature may be loosened a little, so as to admit to the general circulation some of the poison, which soon or late must reach it unless destroyed by some local antidote or removed by bleeding, etc. Should the heart begin to fail the ligature should be tightened again and more stimulant given, so that any poison that might remain may be fought in detail. Alcohol is an antidote of uncertain value. It is but a stimulant to carry a suddenly enfeebled system over a time of weakness. For the second stage there is little to do but to ease pain.

Rattlesnake-bite is rarely fatal; cobra-bite is often fatal, as is attested by the fearful death-rate in India from this cause. Cobra-bite is more deadly partly on account of the venom being a stronger poison, and partly because of the generally larger size of the snakes and of the speed with which in hot climates the serpents accumulate venom, the severity of the symptoms being, in a large measure, directly as the dose of the poison. Sewall has shown that animals subjected to repeated small doses of venom gradually acquire immunity from what would be under ordinary circumstances fatal doses. Snake-venom does not affect plants, but to all life above these it is fatal when inoculated in sufficient amount, although it does not seem to have much power to injure when swallowed, so that pigeons have even been fed on it to the extent of twenty or thirty drops a day for a week without harming them. Mixture with gastric juice alone does not destroy its power, but it is altered below the stomach, and seems unable to enter the blood in a virulent form by this channel. Warm-blooded animals die easily from venom—cold-blooded creatures slowly, unless kept very warm.

The authorities on serpent-venom are Fontana's *Poisons*;

Weir Mitchell, *Venom of the Rattlesnake*; Fayrer, *The Poisonous Serpents of India*; Weir Mitchell and Edward T. Reichert, *Venoms of Poisonous Serpents*; and Wall, *Indian Snake-poisons*. Revised by EDWARD T. REICHERT.

Pois'son, SIMÉON DENIS: physicist; b. at Pithiviers, department of Loiret, France, June 21, 1781; was educated at the École Polytechnique, and became professor in that school in 1802; member of the bureau of longitudes in 1808; counselor of the university in 1820; peer of France in 1837. D. Apr. 25, 1840. His principal works are *Traité de Mécanique* (2 vols., 1811); *Théorie nouvelle de l'action capillaire* (1831); *Théorie Mathématique de la chaleur* (2 vols., 1835-37); *Sur l'incorruptibilité des moyen mouvements des grands axes planétaires*, besides about 300 memoirs in scientific journals, mostly on mathematical physics.

Poitiers, Fr. pron. pwaä ti-ä: chief town of the department of Vienne, France; on the Clain, at its junction with the Boivre (see map of France, ref. 5-D). It is old and irregularly built, but it has a celebrated lyceum, a theological seminary, a public library with 30,000 volumes and 400 MSS., and other educational institutions. The Cathedral of St. Peter was begun by Eleanor of Guienne in 1162, on the ruins of a Roman basilica, and completed in the fifteenth century. The Church of St. John, originally a baptistery (about 700), is the oldest Christian building in France. In 1882 the remains of an entire Gallo-Roman town were discovered here; they comprise a temple, baths, and streets, spread over 14 acres. Breweries, distilleries, spinning-mills, glass-works, and tanneries are in operation, and an active trade is carried on in grain, wine, hemp, wool, wax, honey, and leather. Called Limonum at the time of the Roman conquest, it took the name Poitiers, from the Pictones or Pictavi. Christianity was introduced in the third century, and St. HILARY (q. v.) was the first bishop. Near here Edward the Black Prince defeated and captured King John of France in 1356. Pop. (1891) 37,497.

Poitiers, Diana of: See DIANE DE POITIERS.

Poitou': an old province of Western France, now divided into the departments of Deux-Sèvres, Vendée, and Vienne. It became an English possession in 1152, on the marriage of Eleanor, the Countess of Poitou, and Henry of Anjou, afterward Henry II. of England. In 1204 Philip Augustus took it from England, and although it once more reverted to that country in 1360 by the Peace of Brétigny, it was soon after reconquered, and finally incorporated with the possessions of the French crown. It contains some of the most fertile tracts of French soil, and is remarkably well cultivated.

Poke: See GARGET-ROOT and POKEWEEF FAMILY.

Poker: a game at cards, played with a full pack by from two to six persons. Five cards are dealt each player, one at a time. The eldest hand (age) deposits a certain number of chips (tokens which represent money, unless the game is played merely for amusement), called the *ante*; the others in turn either deposit twice this amount (i. e. *go in*), or withdraw from the hand (*pass*). If they all pass, the eldest hand takes back the ante and deals a new hand; otherwise he either doubles his original stake or withdraws, forfeiting his ante. (Another, more common, method is for all the players to go in each hand by contributing the ante.) The players who have gone in then in turn discard as many cards as they wish, and receive the same number of new cards from the pack. The player at the left of the eldest hand then bets any amount not exceeding a limit previously agreed upon, or passes out and forfeits the stake already in the pool. The next player either *sees* him (bets a like amount), *goes better* (bets in addition to this a sum not exceeding the limit), or passes out. This continues till one player forces the others out and takes the pool, or until all the other players in see the last raise (none going better), and *call*. They then show their hands and the strongest hand wins the pool.

Hands rank in strength as follows, beginning with the highest: 1, *straight flush* (sequence of five cards in the same suit); 2, *four of a kind* (accompanied, of course, by a card of different denomination); 3, *full*, or *full house* (a triplet and a pair); 4, *flush* (five cards of the same suit); 5, *straight* (five cards in sequence); 6, *triplet*, or *three of a kind*; 7, *two pairs*; 8, *one pair* (two cards of the same denomination, the other three being of different ones). The denominations of cards rank in value as in whist (except that in the straight and straight flush the ace may rank either above

the king or below the deuce); as between two or more straights or straight flushes, the one beginning with the highest card wins. Four aces form the highest four of a kind, four deuces the lowest; and so for triplets and pairs. In deciding between two fulls, only the triplets are considered; between two hands each containing two pairs, only the higher pair in each, unless these are alike. As between flushes, that containing the highest card wins; if cards of the same denomination lead each, the cards second highest are considered, and so on. Sometimes it is necessary to decide between two hands, each containing (1) two pairs, pair and pair alike, (2) one pair of the same denomination, or (3) not even a pair. In this case the highest single card wins; of hands remaining tied in this respect also, each counts its next highest card (the highest winning), and so on.

The game above described is the simplest form of draw-poker. Variations from it, especially in the manner of forming the hand and of betting, are innumerable. In *straight poker* no discard is made, and all the players must stake the ante. In *whisky-poker* an extra hand is dealt, and the players strive to improve their hands by exchanging cards with it in turn.

Pokeweed Family: the *Phytolaccaceæ*; dicotyledonous herbs or shrubs, rarely trees, with alternate leaves; flowers mostly perfect; perianth regular, usually single; pistil one, simple or compound; ovules usually solitary; seeds with copious endosperm, and a large peripheral curved embryo. The species number about fifty-five, and are very widely distributed throughout sub-tropical and temperate regions. In the U. S. there are four species of *Phytolacca*, *Petiveria*, and *Rivina*. The common pokeweed or GARGET-ROOT (q. v.), *Phytolacca decandra*, is grown for ornamental purposes in Europe, as are also the other species indigenous to the U. S.

(CHARLES E. BESSLEY.)

Po'la: town; near the southern extremity of the Peninsula of Istria, Austria; 54 miles S. of Trieste (see map of Austria-Hungary, ref. 9-C). It is the most important naval station of Austria-Hungary; it has a deep and spacious harbor, almost completely landlocked, an arsenal, docks, artillery stores, etc. The hills surrounding the harbor are crowned with forts and batteries. Pola has also a considerable shipping-trade, exporting fish, timber, and the sand used in making Venetian glass, and importing coal and provisions. Besides the citadel, which overlooks the town and the bay, the chief buildings are the cathedral (fifteenth century), the Franciscan convent (thirteenth century), and the infantry barracks. There is a naval observatory, founded in 1871, where twenty-eight planetoids were discovered (1874-80) by I. Palisa. In the suburb of San Policarpo there is a fine park with a monument to the Emperor Maximilian of Mexico. Pola occupies the site of the ancient *Pietas Julia*, of which it contains several interesting remains, a well-preserved amphitheater, which could accommodate 20,000 spectators, a triumphal arch, etc. Pop. (1890) 39,273. R. A. ROBERTS.

Po'land [*Pole*, Polack + *land*]: a former kingdom of Europe, the Polish *Polsko*. About the middle of the seventeenth century it extended from the Baltic to the Carpathian Mountains; was bounded on the W. by the Prussian provinces of Pomerania, Brandenburg, and Silesia, and on the N. and E. by the Russian governments of Livonia, Pskoff, Smolensk, Chernigoff, Poltava, and Kherson. Its area was about 282,000 sq. miles (a little larger than Texas). This territory belongs to the central plain of Europe, and is crossed by only one range of hills, which form a watershed between the rivers flowing into the Baltic and the Black Sea. Large tracts are covered with swamps, sand and forests, but generally the soil is a light loam, well suited for agriculture and pasturage. For many centuries large herds of cattle, horses, and swine have been reared here; and cereals, hemp, timber, honey, and wax have been produced. There are extensive mines of salt, and a few of iron, copper, and silver. The bulk of the present inhabitants consists of Poles, but there are several other races, including Germans, Lithuanians, and Jews, each of which numbers over 2,000,000. The Poles are chiefly Roman Catholics. The members of the Greek Church come next in numbers, and the Germans are mostly Protestants.

The Poles belong ethnologically to the Slavic family. They appeared first in history in the fifth century under the name of Poliani; they occupied the plain between the Oder and the Vistula along with other Slavic tribes, which in the course of time they partly subdued and absorbed. Their

history does not cease to be fabulous, however, until the time of Mieczyslas (962-992). He was converted to Christianity, and so brought his country in contact with the south and west of Europe. His son, Boleslas I. (992-1025), extended his frontiers to the Saale, the Dnieper, and the Danube, and received the royal crown from the pope. These rulers belonged to the Piast dynasty, which became extinct with Casimir III. in 1370. On the death of his successor, Louis of Hungary, the latter's daughter married Jagiello, Grand Duke of Lithuania, who united that country with Poland. In 1572 the dynasty of the JAGELLONS (*q. v.*) became extinct with Sigismund II., and Poland became an elective monarchy. This principle was one of the chief causes of the national downfall. The people saw in the elective monarchy a guarantee of their liberty, but overlooked the fact that it threatened their existence as a nation. There were other defects in their political organization, as, for instance, the *liberum veto*. By this principle the decision of the Polish Diet did not depend upon the majority but the unanimity of the votes, so that any one member, by his veto, had it in his power to render the diet's proceedings ineffective. Further, there were grave defects in the social organization. Trade and commerce were almost entirely in the hands of the Jews, who were avaricious and the objects of popular contempt; they never ranked as an important branch of the business of the people. Literature and art were the only serious occupations of the nobility. The nation consisted of two classes only—the nobles, who owned the soil and strove to gain an illusory freedom from the crown; and the serfs, who cultivated the soil to which they were tied. There was no third estate. In several cases the peasants sided with the oppressors of the Polish nation, and fell on their countrymen who were fighting for the freedom of their fatherland. In 1573 25,000 Polish noblemen assembled on the field of Wola to elect their new king. Henry of Valois, the most worthless of the candidates, was chosen, but shortly afterward fled from the country. Stephen Bathori (1575-86), voivode of Transylvania, one of Poland's best kings, followed. He organized the Cossacks into regiments, and fought successfully against the Russians. Then came three princes of the Swedish Vasa dynasty (1587-1668), SIGISMUND III., LADISLAS IV., and CASIMIR JOHN II. (*q. v.*). Then followed Michael Wisniowiecki (1669-73) and John III., Sobieski (1674-96), and next two electors of Saxony, AUGUSTUS II. and AUGUSTUS III. (*q. v.*). Every new ruler caused new wars with new enemies, and internal dissensions split the nation into as many parties as there were claimants to the throne, while bribery, intrigue, treachery, and violence flourished. On the death of Augustus III. in 1763 a party called monarchists or reformers, and headed by the Czartoryski family, desired to abolish the *liberum veto* and establish an hereditary constitutional monarchy, and with this object they secured the support of Catharine II. of Russia. With her aid they placed Stanislaus Augustus PONIATOWSKI (*q. v.*) on the throne (1764). The work of reform began, but Catharine, seeing that in this way Poland would fall out of her grasp, changed her policy. There was another party, headed by the family of Potocki, who maintained the old oligarchical institutions. They had adopted the Polish principle of religious toleration, while the Czartoryskis were fanatical Roman Catholics. Catharine elected to support religious toleration, and, opposing her former favorite Poniatowski, had a number of his adherents exiled to Siberia. The Confederation of Bar (in Podolia) was now formed; an army was assembled, and an alliance made with the Turks. Catharine already had a large army in the country, and in 1772 Prussian and Austrian armies also entered Poland, when the first partition was effected. Russia took an area of 42,000 sq. miles, Prussia took POSEN (*q. v.*) with an area of 13,000 sq. miles, and Austria took GALICIA (*q. v.*) with an area of 27,000 sq. miles. The whole country was now aroused to a sense of danger. The *liberum veto* was formally suppressed and many reforms were made; but some of the nobles were discontented at the loss of their privileges, and formed the Confederation of Targowitza (1792). At their instigation Russian troops entered Poland again. Prussia now joined the Russians, and a fruitless resistance, headed by Joseph PONIATOWSKI (*q. v.*) and Kosciusko (*q. v.*), resulted in a second partition. Russia took 96,000 sq. miles and Prussia 22,000 sq. miles. A general rising in all the Polish provinces was the consequence, and the Russians and Prussians were compelled to retreat; but at the critical moment Austria came upon the scene and turned the balance. Kosciusko was taken prisoner at the battle of Maciejowice, Warsaw capitulated to

Suwarow, the king resigned his crown, and the third partition (1795) put an end to the political existence of Poland. Russia took 43,000 sq. miles, Prussia 21,000 sq. miles, including the capital, Warsaw, and Austria 18,000 sq. miles. The subsequent wars of the French with the enemies of Poland and the promises of Napoleon rallied the Poles around him; but all that Napoleon accomplished was the formation of the duchy of Warsaw by the Treaty of Tilsit (1807), with a liberal constitution and the King of Saxony at its head. It was chiefly composed of the greater part of the Prussian and Austrian portions of the later partitions. By the Congress of Vienna in 1815 the division of Poland was re-arranged. The share of Austria was diminished, and Prussia received less than it had after the second partition. The greater part of the duchy of Warsaw was united, as the kingdom of Poland, to the Russian empire, but only by the bond of a common monarch. Thus finally Russia obtained 220,500 sq. miles, viz., the kingdom of Poland and the governments of Courland, Vitebsk, Grodno, Minsk, Moghilev, Volhynia, Kieff, and Podolia. Of these, however, Kieff had been conquered and held by Russia since 1669, while Courland had had no close connection with Poland since 1710. (See BIREN.) The population of this territory, excluding the two latter provinces, in 1890 was about 19,000,000. Prussia obtained 26,000 sq. miles, viz., Posen and about half of East and West Prussia, with a population (1890) of over 3,000,000; and Austria obtained 35,500 sq. miles, viz., Galicia, Bukowina, and some small districts (see CRACOW), with a population (1890) of over 7,000,000.

The so-called kingdom of Poland received from Alexander I. a constitution with a responsible ministry and a separate army; but there was still a spirit of discontent which developed into an insurrection in 1830. After several sanguinary engagements this was suppressed the following year, and in 1832 Poland was declared an integral part of Russia. After another unsuccessful insurrection (1863-64) Poland was deprived of its last remnant of independence. Finally, by a ukase of the emperor, dated Feb. 23, 1868, the government of Poland was incorporated with that of Russia, and since then the ten governments—Kalisz, Kielce, Lomja, Lublin, Piotrkow, Plock, Radom, Siedlce, Suwalki, and Warsaw—into which it is divided have been grouped with those of Russia. Their area is 49,157 sq. miles, and their population, exclusive of the military, was, in 1890, 8,256,562.

R. A. ROBERTS.

Polar Circles : See ANTARCTIC and ARCTIC.

Polar Clock : an instrument invented by Wheatstone, which, when accurately adjusted, indicates the apparent solar time within a very few minutes. It will operate even when the sky is overcast with clouds, provided there be an unobscured spot at the pole through which the blue sky may be seen. It applies the fact that the plane of polarization of sky light is always 90° from the sun.

Polarization [deriv. of *polarize*, deriv. of *polar*] : a term applied in optics to certain modifications in the character of the wave-motions to which light is due. These modifications arise under certain conditions from reflection, refraction, etc. They are the source of some of the most beautiful and interesting phenomena in the domain of light.

Polarization is a question, primarily, of the plane of vibration of light-waves. (See LIGHT.) Light-waves possess a period of vibration so brief (509,000,000,000 vibrations per second for yellow light) that the shortest period of time which can be isolated and dealt with experimentally will contain millions of oscillations. Even the wave-length lies almost beyond the range of direct observation. Our knowledge of the motions which constitute light is therefore almost entirely indirect. There is an abundance of indirect evidence that the wave-motion is transverse, but in the case of ordinary light, as it comes to us from the sun or from artificial sources, there appears to be no plane of vibration which remains fixed long enough to enable us to determine its position. On the contrary, the ray behaves as though composed of components vibrating in every plane. This is an effect which might be produced, as was long since suggested by Fresnel, by a plane transverse wave, the plane of vibration of which revolves with a rotational period small in comparison with appreciable time-intervals. Such a ray is said to be *unpolarized*. Any process which will serve to give a ray a fixed plane of vibration is termed a *polarizing* process; the apparatus is called a *polarizer*.

Polarization by Double Refraction.—An important example of the production of polarized light occurs when a

ray is made to pass through any substance the elasticity of which is not in all directions the same. In such media the velocity of waves vibrating in a single plane depends upon the position of that plane. Many crystals possess the above property, and when a ray of light is transmitted by them it is resolved into two plane waves, which travel, in general, with different velocities. See MINERALOGY (*Optical Properties*).

The simplest method of attacking the problem is that adopted by Huyghens 200 years ago. This consists in finding the form of the wave-surfaces in the case of a wave emanating from a point within the crystal.

From the optical point of view, doubly refracting crystals may be grouped as follows:

- (1) *Uniaxial negative* crystals (calcite, tourmaline, sodium nitrate, etc.).
- (2) *Uniaxial positive* crystals (quartz, zircon, ice, etc.).
- (3) *Biaxial* crystals (aragonite, selenite, potassium nitrate, sugar, and all crystals which do not belong to the cubic or the hexagonal systems).

In uniaxial crystals a ray from without, in the direction of the optical axis, suffers no double refraction, and therefore all waves due to vibrations at right angles to the axis travel with the same velocity.

If o , Figs. 1 and 2, be a center of radiation within a uniaxial crystal, two waves will be propagated. The first of these is due to vibrations always perpendicular to the axis, and its surface is a sphere. It is called the ordinary wave. The other wave is due to vibrations at various angles with

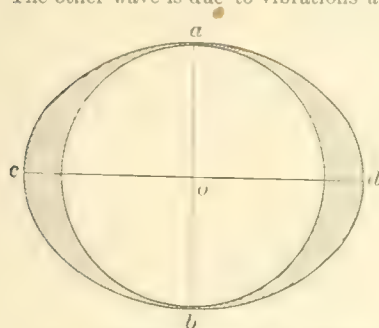


FIG. 1.—Wave-propagation in a negative uniaxial crystal.

surfaces of revolution produced by the rotation of the sphere and ellipse in Fig. 1 upon the axis $a b$. The ellipsoid which forms the surface of the extraordinary wave incloses the sphere.

In positive uniaxial crystals waves produced by vibrations parallel to the axis possess a minimum velocity. The ellipsoidal surface of the extraordinary ray has its major axis coincident with the optical axis of the crystal, and the two wave-surfaces are those generated by the revolution of the circle and the inscribed ellipse of Fig. 2. It will be seen that the extraordinary ray in negative crystals possesses the higher velocity, except in the direction of the axis, where it attains the velocity of the ordinary ray

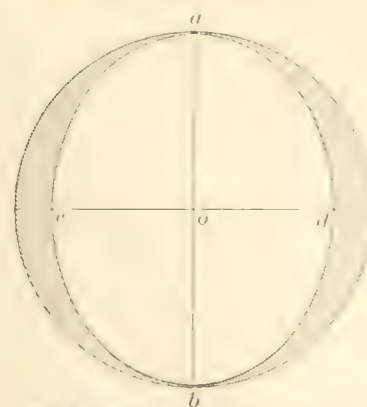


FIG. 2.—Wave-propagation in a positive uniaxial crystal.

as a minimum limiting value. In positive crystals the velocity of the extraordinary ray, however, is always less than that of the ordinary, excepting in the axial direction, where it reaches its maximum value.

The application of the above-described properties of anisotropic media to the case of a ray entering a uniaxial negative crystal, such as calcite, obliquely from without, is as follows:

A bundle of rays is represented by $a b, c d$, Fig. 3, of

which the wave-surface is plane and normal to the direction-lines. Such a wave-surface, $b e$, impinges obliquely

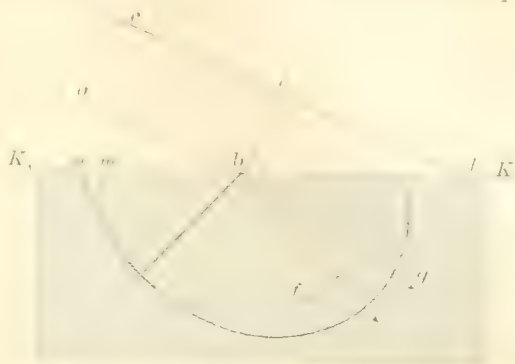


FIG. 3.

upon the surface of the crystal ($K_1 K_2$) at b . During the time in which the wave in air passes over a distance, $e d$, two waves within the crystal are being propagated. Of these, we need to consider only the elements which may be regarded as arising from the point b . The two wave-surfaces within the crystal having b as their origin will be a sphere and an ellipsoid, represented in the figure by the circle (m) and the ellipse (n), respectively. At the instant when the wave in air reaches d the position of the two waves within the crystal will be defined by the radius $b f$ and radius vector $b g$, respectively. These have lengths determined by the relations of the velocities of the ordinary ray $b f$ and the extraordinary ray $b g$ to the velocity in air. The direction of the two rays is determined by drawing tangents to the circle and ellipse from the point d . The ordinary ray, being most retarded, is most bent from its course. The law of its refraction is that of Snell. See REFRACTION.

The passage of a ray through a rhombic piece of calcite is shown in Fig. 4, in which i is the incident ray and o and

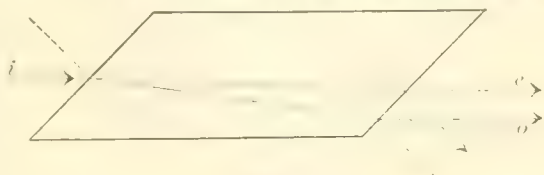


FIG. 4.

e are the emergent ordinary and extraordinary rays. It is evident, since these are completely polarized, that any device which would suppress one of them would afford a single ray of polarized light. Such a device is the Nicol prism, the best-known and most useful of polarizers.

The Nicol prism, described in 1841 by William Nicol, consists of a block of calcite (Fig. 5), cut through at right angles to its end-faces and cemented in the section by means of Canada balsam. The angles of the rhomb are such that the ordinary ray meets the cemented layer at an angle greater than the critical angle of total reflection, and is therefore entirely diverted to the side wall of the prism. To the ordinary ray, therefore, the Nicol prism is opaque. The extraordinary ray reaches the cemented interfaces at an



FIG. 5.

angle less than that at which total reflection begins. It, therefore, is transmitted. When we throw a beam of unpolarized light through the prism, we obtain after transmission a completely polarized ray, the intensity of which is equal to one-half that of the incident ray, less the sum of the losses by reflection and absorption.

The *Polarizing Prism*.—Various modifications of the Nicol prism have been made, all of which, however, make use of the essential principle of the original form—the suppres-

sion of one component by total reflection. The best known of these modifications is that devised by Foucault, in which

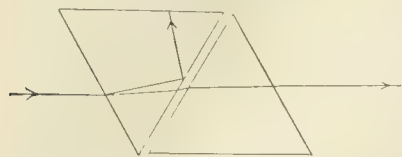


FIG. 6.

the layer of Canada balsam is supplanted by an air-space between the halves of the divided rhomb. See Figure 6.

Polarization by Reflection.—

The nature of the phenomena of polarization would lead one to expect that polarization of a ray might be obtained by causing the same to be reflected. If we consider an ordinary ray to be resolved into two components, vibrating at right angles to one another, and suppose the ray obliquely incident to a plane mirror so placed that one of the components will vibrate parallel to its face, it is evident that the two components will meet the mirror under different conditions. In point of fact the mirror does not reflect both components equally well, save when the incidence is normal, under which condition both rays are vibrating parallel to its surface. As the angle of incidence increases, the components whose vibrations make an angle with the mirror are less and less strongly reflected, whereby the resultant becomes *partially polarized*. At a certain angle, known as the *angle of complete polarization*, the above-mentioned component ceases to be reflected, and the reflected ray consists of completely polarized light, vibrating at right angles to the plane of incidence and reflection.

Brewster's Law.—The angle of complete polarization, as was pointed out by Malus, who discovered the phenomenon of polarization by reflection in 1810, depends upon the refractive index of the material of which the mirror is made. Brewster gave definite expression to the relation (1815), as follows:

The angle of complete polarization is the angle of incidence for which the reflected ray is perpendicular to the refracted ray.

In Fig. 7 we have from Snell's law $\frac{\sin i}{\sin r} = n$, which at the angle of complete polarization, when $i + r = 90^\circ$, becomes $\frac{\sin i}{\sin r} = \frac{\sin i}{\sin (90^\circ - i)} = \frac{\sin i}{\cos i} = \tan i = n$.

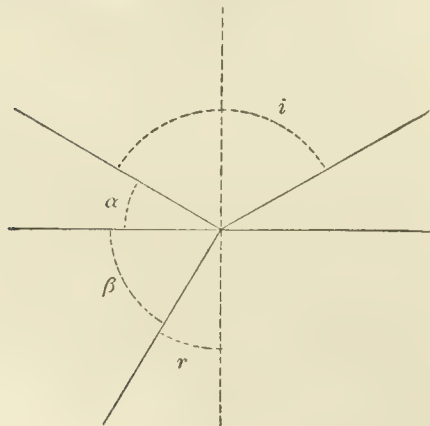


FIG. 7.

This affords another statement of Brewster's law, viz.:

The angle of complete polarization is that angle of incidence the tangent of which is equal to the index of refraction of the mirror.

The above statements refer to the reflection from the first surface, and not to internal reflection. They apply to non-metallic surfaces only. To obtain plane polarized light therefore by a single reflection we must use a non-metallic mirror, and must suppress all those rays which, entering the substance of the mirror, might be reflected from its second surface. The material commonly used is an opaque black glass.

Polarization by Ordinary Refraction.—An inquiry which follows directly upon the statement of polarization by reflection is that concerning the condition of the refracted ray. That component of the incident ray which ceases to be re-

flected at the angle of complete polarization we should expect to find transmitted by the medium as a refracted ray, unless the vibrations were destroyed at the surface with transformation of energy. Experiment shows that this polarized component always forms a part of the refracted ray, but never the whole of it, since the other component is partly refracted and partly reflected at every angle of incidence. By ordinary refraction, then, partial polarization in a plane perpendicular to that obtained by reflection is produced, the degree of polarization reaching a maximum at the angle of incidence for which $\tan i = n$. By passing this partially polarized ray at the proper angle through a series of parallel glass plates the unpolarized portion can be reduced indefinitely, so that by successive transmission an almost completely polarized ray can be obtained.

Polarization by means of Tourmaline.—The crystalline mineral tourmaline possesses a molecular structure which adapts it peculiarly to the production of polarization by transmission. A plate of this mineral, cut in such a manner that the principal axis of the crystal is parallel to the surface, will transmit only those vibrations which are perpendicular to the direction of the axis. To waves vibrating parallel to the axis such a plate is opaque. The objection to this method of obtaining polarized light is the strong selective absorption to which rays passing through tourmaline are subjected. The best specimens are far from colorless or transparent.

Polariscopes.—In the study of polarized light it is necessary, in addition to the production of a polarized ray, to be able to test the character of radiation as to the plane of its vibrations. To these ends two polarizing devices, such as the black glass mirror, the Nicol prism, or the plate of tourmaline, must be used together. Such a combination is called a *polariscope*.

The essential parts of a reflecting polariscope are two mirrors, M_1 , M_2 , Fig. 8, affording reflection from their first surfaces only. These are so mounted that the incident ray i will always strike M_1 at the polarizing angle, and the reflected ray r will strike M_2 at the same angle. The latter mirror (M_2) is called the *analyzer*, in contradistinction to the *polarizer* (M_1). The same terms are used to designate the corresponding parts of any polariscope.

The reflecting polariscope is frequently given the form shown in Fig. 9, an arrangement due to Nörremberg, in which the lower mirror is a plate of clear unsilvered glass. Rays of light reaching the mirror from the direction a are polarized by reflection, and thrown downward upon the mirror c , whence they are returned vertically upward through A B to the analyzer S , which is a mirror of black glass. The analyzer revolves within a graduated circle by means of which its position can be determined. An adjustable platform between the two mirrors supports objects the behavior of which when subjected to polarized light is to be studied.

Since the angle of complete polarization depends upon the index of refraction, and since the latter is a function of the wave-length, it follows that no reflecting polariscope can give complete polarization excepting in monochromatic light. On that account and for other reasons polariscopes making use of double refraction are to be preferred. Such instruments consist of two Nicol prisms, or equivalent devices, mounted one behind the other in the path of the ray which is to be polarized and analyzed. The analyzer (A , Fig. 10), and sometimes the polarizer (P , Fig. 10) also, is free to revolve in the axis of the ray. Divided circles enable the observer to



FIG. 8.

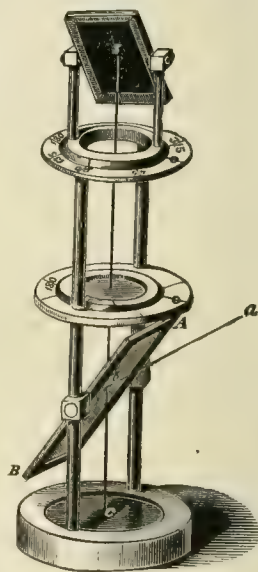


FIG. 9.

ascertain the angle which their polarizing planes make with one another.

The performance of two Nicol prisms mounted as above follows directly from what has already been stated with reference to this method of producing polarized light.

Rays transmitted by P in the direction of the axis of the instrument will be completely polarized in the principal

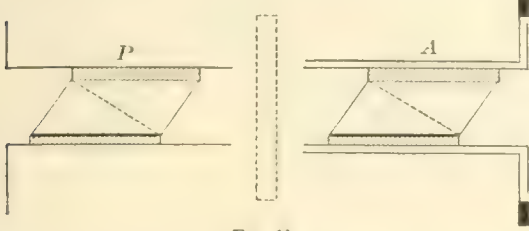


FIG. 10.

plane of the prism, with loss of something more than half of the initial intensity. The polarized ray upon entering the prism A will be resolved into two components vibrating at right angles to and in the principal plane of A. The former of these components, which is the ordinary ray, is suppressed by total reflection, while the extraordinary ray is transmitted.

The relative intensity of the two components depends upon the angle α between the principal planes of the prisms P and A, a relationship which may be expressed as follows:

$$\begin{aligned} I &= I \sin^2 \alpha, \\ I_r &= I \cos^2 \alpha, \\ I_o + I_e &= I(\sin^2 \alpha + \cos^2 \alpha) = I. \end{aligned}$$

I is the ray incident upon A, I_o and I_e the ordinary and extraordinary components of the same.

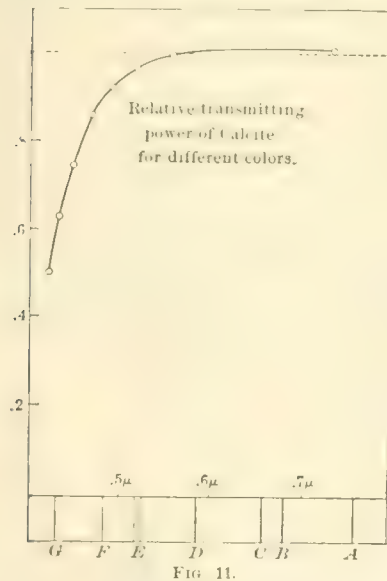


FIG. 11.

purposes the best of all types. The chief disadvantages are costliness of the material, calcite, of which the prisms are made, and the smallness of the apertures of the instrument. Small dimensions are a matter of necessity in Nicol prisms on account of the giving out of the supply of large crystals of transparent calcite. Prisms, like those exhibited by Spottiswoode at an exhibition of scientific apparatus in London, which had a clear aperture of 9 cm., are no longer to be obtained.

Another disadvantage in the use of calcite lies in its failure to transmit all wave-lengths of the visible spectrum with equal freedom. Measurements of the losses experienced by a ray of white light in traversing a pair of Nicol prisms were made by the writer and Prof. B. W. Snow in 1891 (*Philosophical Magazine* (5), vol. xxxii., p. 379). The results, which are given graphically in Fig. 11, show diminishing transparency throughout the green and blue of the spectrum, until at wave-length 0.4μ relatively less than half as much light is transmitted as at wave-length 0.6μ .

Tourmaline Polariscopes.—The property which tourmaline possesses of absorbing one of the polarized components

of rays traversing it at right angles to the principal axis makes it practicable to construct a simple form of polariscope out of two plates of that material. Two tourmaline plates (A B and C D, Fig. 12) placed one over the other with axes parallel will transmit light with losses due only to reflection and ordinary absorption; the latter source of loss is unfortunately an important one, greatly diminishing in optical work the usefulness of tourmaline. When placed with axes crossed as in Fig. 13 the plates A B, C D are completely opaque. The usual form of the tourmaline polariscope is that of Fig. 14. The two plates are mounted in a tongs-shaped clamp, with freedom of rotation upon a common axis. Specimens to be examined in polarized light are placed between them. Tourmaline plates also serve as eye-pieces in many forms of polarizing apparatus.

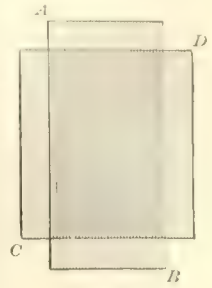


FIG. 12.

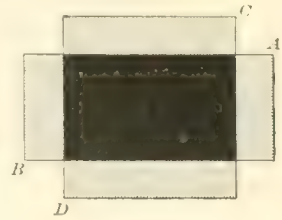


FIG. 13.

Polarization in Biaxial Crystals.

—In the discussion of the passage of light through anisotropic bodies we have considered, thus far, crystals in which only a single direction could be found for which double refraction did not exist. All crystals of the *rhombic*, *monoclinic*, and *triclinic* systems, however, possess two such directions, from which fact they are called biaxial crystals. Polarization-phenomena in such crystals are necessarily more complicated than in crystals with one axis. They can be discussed only very briefly here. In biaxial crystals there is no ordinary ray. Neither of the two components into which rays traversing such crystals are divided follows the law of refraction for isotropic media. The two rays are polarized at right angles, and they travel at velocities depending upon the elastic structure of the crystal.

Fresnel's method of finding the wave-surface in a biaxial crystal, stated in a few words, consisted in establishing three axes (Fig. 15): one ($a b$) in the direction of greatest elasticity, one ($c d$) in the direction of least elasticity, and a third perpendicular to these. Upon these axes an ellipsoid is to be imagined, taking the length of each axis proportional to the elastic quality for light-vibrations in the direction in question. The velocity of the two light-waves propagated in any desired direction from a source at the center of the ellipsoid can be found by taking a plane section of the ellipsoid through the center of the same and at right angles to the line along which the velocities are required. The major

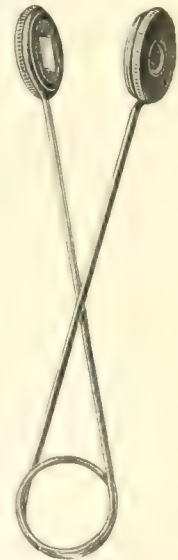


FIG. 14.

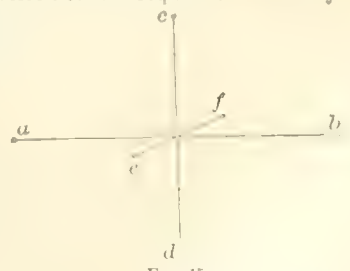


FIG. 15.

and minor axes of the ellipse which forms the section of the ellipsoid, as mentioned above, give the velocities of the two waves. By means of this procedure the surface can be fully determined. This surface can be represented only by means of a three-dimensional model. Cross-sections of it in the planes $a b$, $c d$; $a b, c f$; and $c d, e f$, are shown in Figs. 16, 17, and 18.

Applications of polarized light are made in the study of crystalline forms, in which field many very beautiful phenomena occur; in the microscopic detection of various cal-

lular structures, as, for example, in distinguishing between the various forms of starch; and, what is very important

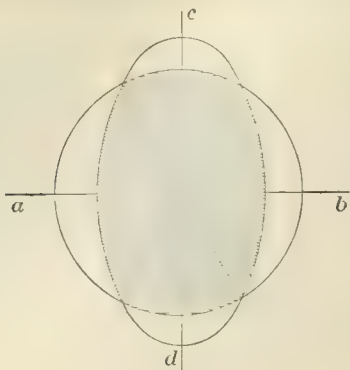


FIG. 16.

from an industrial point of view, in the determination of the strength of sugar-solutions. The last-named application has led to the development of a special class of apparatus and of special methods of work. See SACCHARIMETRY.

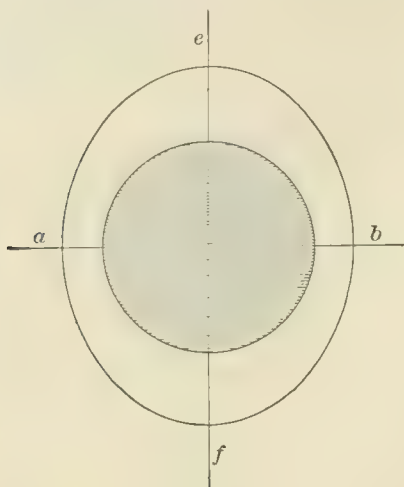


FIG. 17.

In the study of crystals under the polariscope the specimen is placed between crossed nicols, and is viewed by transmitted light. If double refraction takes place the result is the restoration of light to the hitherto dark field of

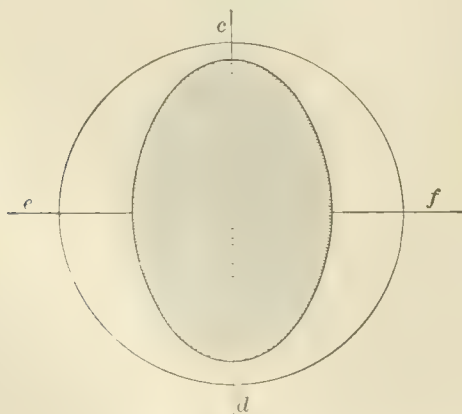


FIG. 18.

view and the production of color effects, the nature of which depends upon the character of the specimen and the kind of illumination to which it is subjected. The most important of these color effects may be classified as follows:

(1) *Thin plates of uniaxial or biaxial crystals* cut parallel to the axis or axes. When viewed by parallel rays

between crossed nicols they show in general a brilliant color, which depends upon the thickness of the plate and the positions of polarizer, analyzer, and specimen with reference to each other.

This phenomenon, which is the simplest with which we have to do in chromatic polarization, is due to the same causes as the more complicated cases to be mentioned later. The plane polarized ray from the first prism is, in general, resolved into two components within the specimen. These vibrate at right angles with one another, and, traveling at different velocities within the crystal, issue with difference of phase. In the second nicol each of these components is again resolved, and those components of each which move in the polarizing plane are transmitted. After passage of the second nicol we have then all the conditions necessary for the production of color by interference (see INTERFERENCE and THIN PLATES, COLORS OF), viz., two rays traveling along the same path, with difference of phase but with the same plane of vibration. A tint will therefore be produced, of which the intensity depends upon the relative amplitudes of the transmitted components, and the color upon the difference of phase. If the plate be of uniform thickness, the tint will be uniform over its surface; if wedge-shaped, it will be crossed by interference-bands, etc.

(2) *Uniaxial crystals cut perpendicularly to the axis, and viewed by convergent light between crossed nicols.*

In this case, which can be tested in a simple manner by placing a properly cut piece between the plates of the tourmaline tongs and holding the same close to the eye, one sees a beautiful set of colored rings, either with a bright center and cut by a dark rectangular cross (Fig. 19), or with a dark center and bright cross (Fig. 20), according to the relative positions of the part of the apparatus.

(3) *Biaxial crystals cut at right angles to the median line and viewed by convergent light between crossed nicols.* The system of rings and brushes is that shown in Fig. 21, when the planes of the optical axes are at 45° with the polarizing planes of the nicols. This goes over into the pattern of Fig. 22 when the planes of the optical axes coincide with that of one of the prisms.

The above are among the most important of the numerous cases which the crystallographer has occasion to observe and to analyze. The color effects in all are due to the same cause, the interference of the polarized rays after emergence from the second Nicol prism.

Temporary and Artificial Double Refraction.—Isotropic media can be rendered doubly refracting by any process which produces internal strains. A rectangular block of glass, for instance, when placed between crossed nicols does not restore light to the field of view, but when pressure is

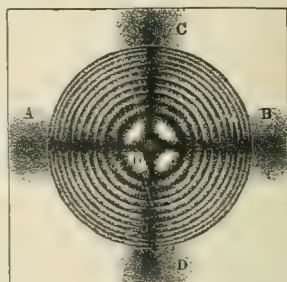


FIG. 19.

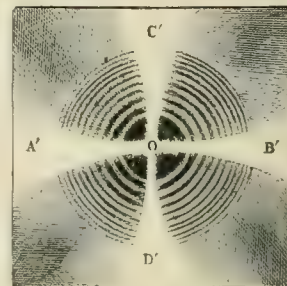


FIG. 20.

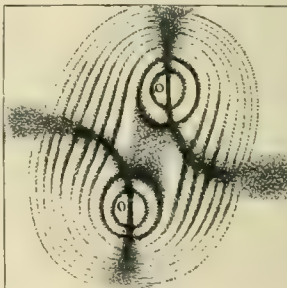


FIG. 21.

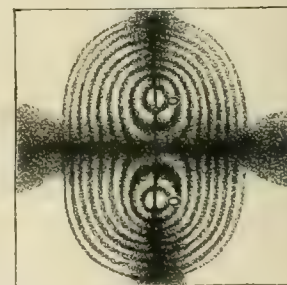


FIG. 22.

applied by means of a clamp, like that shown in Fig. 23, temporary double refraction is produced and color-effects

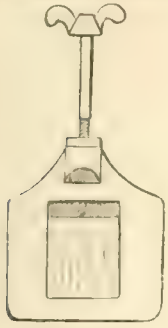


FIG. 23

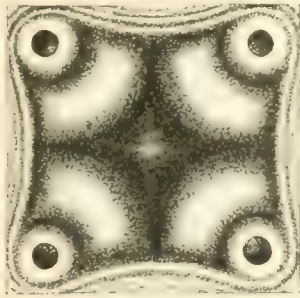


FIG. 24

analogous to those in crystals occur. The sudden cooling of heated glass produces permanent strains, the presence of which gives figures of great symmetry and beauty. Fig. 24 shows such a pattern produced by polarized light in a rectangular plate of chilled glass.

In the foregoing account many phenomena have been altogether neglected. Such are those connected with the passage of light through quartz, the rotation of the plane of polarization in that substance and in various liquids, the rotation of the plane of polarization in the magnetic field, and the question of circular and elliptical polarization. For a discussion of these the reader is referred to the larger treatises on experimental optics and to the proper chapters in the manuals of physics. Among the best known of such books are Fresnel's *Œuvres*; Verdet, *Traité d'Optique*; Mascart, *Traité d'Optique*; Wüllner, *Lehrbuch der Physik*; Müller-Pouillet, *Lehrbuch der Physik*; Violle, *Cours de Physique*; Winkelmann, *Handbuch der Physik*; Preston, *Light*; Spottiswoode, *Polarization of Light*, a popular treatise.

E. L. NICHOLS.

Polar Research [*polar* is from Lat. *polaris*, pertaining to the poles, deriv. of *polus*, pole = Gr. *πόλος*, pivot, hinge, axis, pole, deriv. of *πείλειν*, move, go]: exploration of the regions about the poles of the earth, and investigation of the various questions concerned therewith. This is the greatest unsolved problem in geography, and on its solution turn many theories of terrestrial physics and even some of those of astronomy. The older attempts at its solution were only partial in design, being devoted to finding a northeast or northwest passage, or to reaching the geographic or magnetic pole. They were unsuccessful, except in finding the magnetic pole, and they did not add greatly to knowledge, although full of hardship and disaster. The later idea of residence in the polar region and gradual advance has proved so much more successful and less perilous that we may now safely reckon on eventual and complete success in the solution of all questions depending on polar research.

History of Arctic Exploration.—The different relations of the two poles to the distribution of land and water and to the zone of maritime and geographic enterprise have caused the exploration of the Arctic and Antarctic regions to follow quite different courses.

The earliest recorded attempt at Arctic research was one to find a commercial maritime route to China and India by the north of Europe and Asia. The first expedition was that of Sir Hugh Willoughby, who left the Thames with three ships in 1553. Two of the ships appear to have reached Kalguev island, but were never heard from afterward. The third reached the mouth of the Dwina, and its company crossed over by land to Moscow. As a result the White Sea was opened to British commerce. A later expedition under Stephen Burroughs reached Vaygach island, and in 1580 Pet and Jackman penetrated the Kara Sea. The expeditions so far were British; the work was now taken up by the Dutch. Under Barents an expedition reached Nova Zembla in 1594 and the Kara Sea in 1595. In 1596 Barents discovered Spitzbergen and reached a latitude of at least 80° N. In the seventeenth century Franz Joseph Land was apparently reached by a whaler named Roule. In the succeeding centuries many attempts, mostly by Russians and Norwegians, were made to penetrate along the northeast passage farther E. than Nova Zembla and the Kara Sea, but all were unsuccessful until in 1878-79, when the passage was successfully made by Nordenskjöld on the *Vega*.

Spitzbergen had probably long been known to the Russian and Norwegian fishermen, but, brought once to the attention of geographers by Barents, it became a point of departure for farther polar exploration, and in these explorations all the nations of Northern Europe have taken part. Departing from this archipelago in 1607 Hudson discovered Jan Mayen. It was soon found that the sea to the N. of Spitzbergen was usually blocked by ice, and numerous expeditions were undertaken on sledges. They have all been relatively unsuccessful, and the highest latitude reached in this way was 82° 45' N. by Parry in 1827.

An easy access to the pole seems to be afforded by the great expanse of ocean between Greenland and Spitzbergen, but efforts in this direction have been especially barren of useful results. This part of the Arctic Ocean is encumbered by ice apparently brought down by a current from the N. The east coast of Greenland is more inhospitable than the west coast.

The greatest activity in Arctic exploration has been to the N. of the American continent in the Arctic Archipelago, and especially along the west coast of Greenland. This coast had long been known to the Northmen, and was apparently visited by Nicolas and Antonio Zeno, two Venetian noblemen, in the fourteenth century. It also offered the problem of the northwest passage, corresponding to that of the northeast, already described. Sebastian Cabot unsuccessfully searched for this passage in 1498, and was followed in 1576 by Frobisher. The search was actively continued by Davis, Hudson, Ross, Parry, Richardson, Franklin, and others until, on his return in 1833, Ross announced that a practicable northwest passage could not exist. Nevertheless in 1845 Franklin was sent out with two ships and 168 men under instructions to find this passage at all hazards. As time passed and nothing further was heard from this expedition, intense interest in its fate was aroused throughout the civilized world, and expedition after expedition was sent under the auspices of Great Britain and the U. S. in its search. Among the leaders of these were Ross, Collinson and MacClure, Belcher, Kennedy, McClintock, Rae, and Kane. The search continued for more than thirty years before the fate of the Franklin expedition was finally determined, and this was done by a young U. S. lieutenant named Schwatka, who, following the indications of McClintock and the reports of natives, found the graves of the last remnant of the force and other mementoes in the desert expanse between Great Fish river and Hudson Bay. The geographic results of the search for Franklin were very rich. The great complicated and ice-covered Arctic Archipelago was explored, adding from 4,000 to 5,000 sq. miles to the area capable of being mapped with fair accuracy.

Hayes, who had accompanied Kane, was convinced that an open sea exists about the geographic pole. He returned in 1860, and reached the latitude of 81° 35' N. by way of Smith Sound, but did not find the open sea. Hall repeated the expedition in 1871, and reached lat. 82° 16' N. Hall died the following winter, and the remnants of the expedition were rescued from a field of ice on which they had been floating 186 days and on which they had traveled 1,700 miles. In 1875 Nares took the same course, and in 1876 a party of his men under Markham traversed the frozen surface of the polar sea to the N. of Grinnell Land and reached the latitude of 83° 20' N. For the winter 1882-83, by international co-operation, stations were established at many points near or within the Arctic and Antarctic Circles, chiefly to carry on meteorological and magnetic observations. The most northerly of these was that established at Lady Franklin Bay, on the eastern coast of Grinnell Land, in lat. 81° 44' N., under the charge of Greely. The party was established in Aug., 1881. It retreated S. to Camp Clay in Aug., 1883, and was rescued in June, 1884, having only seven survivors out of thirty-two men. The northernmost point reached was on the north coast of Greenland, in lat. 83° 24', and was gained by a small party under Lieut. Lockwood. This is the northernmost point reached by civilized man up to Dec., 1894. The idea of residence in polar latitudes has since been carried out by Lieut. Peary, who has spent two winters with his family, and without serious hardship, on the west coast of Greenland above lat. 75°.

The New Siberian islands were discovered in 1770 by a Russian merchant named Liakhof. The abundance of fossil ivory on Kotelnyi (one of these islands) attracted commercial attention to the southern members of this group, and they were often visited. Bennett island was discovered by De Long in his perilous escape from the *Jeannette* in

1881, as well as two small islands farther W. but belonging to the same group.

There have been but few expeditions by way of Bering Straits, and they have been unsuccessful. A modification of the plans heretofore employed is that of NANSEN (*q. v.*), who believed that a general ocean current sweeps over the polar region from the vicinity of the New Siberian islands to the eastern and western coasts of Greenland. To this hypothetical current, and in a ship made for the purpose of being fastened in the ice and drifting with it, he intrusted himself in the summer of 1893. In Aug., 1896, he returned without mishap, and reported that he had reached 86° 14' N. lat. before turning southward. See *Furthest North* (London and New York, 1897).

History of Antarctic Exploration.—The lands of the Antarctic region were unknown and unsuspected until 1773–75, when they were discovered by Cook. Previous searches for a *terra australis* seem to have related only to Australasia and isolated islands far N. of the Antarctic Circle. On a second cruise Cook circumnavigated the globe in the vicinity of the Antarctic Circle, and showed that the southern continent was isolated and almost entirely within that circle. In 1819 an English whaler, William Smith, was driven S. of the Falkland islands to South Shetland, and in 1819–21 the Russian navigator Bellingshausen passed westward from South Shetland within the Antarctic Circle and discovered two small islands which he named Alexander I. and Peter I. In 1823 the whaler Weddell penetrated to the parallel 74° 15' S. in the longitude of Cape St. Roque, and reported little serious obstacle to navigation. In the early part of the nineteenth century the Messrs. Enderby, of London, interested in whaling, instructed their captains to explore as far southward and as thoroughly as possible. Their Capt. Briscoe in 1831 discovered Enderby Land, about one-third of a circle eastward from South Shetland and forming the second angle of the triangular southern continent. In 1832 he discovered and landed on Adelaide island, which lies S. W. of South Shetland and near Graham Land. He was apparently the first man to set foot on the southern continent. In 1833 Capt. Kemp discovered the eastern extremity of Enderby Land. In 1838 their Capt. Balleny discovered the third angle of this continent in what is now known as Wilkes Land. In 1839–43 the Antarctic region was visited by a U. S. expedition under Wilkes, a French one under d'Urville, and a British one under Ross. Many discoveries were made by each, but the most successful was the last named. Ross penetrated to 78° S. in the latitude of New Zealand and discovered the mountainous district of Victoria Land, terminating to the southward in the active volcano Mt. Erebus, 12,000 feet high. Since this date only occasional sealers or whalers have penetrated to the southern continent, the most notable of these cruises being that of three Dundee whalers (Donald, Bruce, and Murdoch) in 1893–94. No noteworthy additions to the knowledge of Antarctic lands have been made since the expeditions of 1839–43.

Results.—Each terrestrial pole is covered by a cap of continuous ice, which remains unbroken on the land-areas and apparently over the smaller inclosed water-areas of extreme high latitudes, and these caps vary in size with the season and with the year. Greenland is covered with an unbroken ice-sheet, and so probably is also the southern continent. Around the margin of these caps is an area of variable width covered with floating ice, either derived from the frozen surface of the ocean when it forms the pack, the ice-fields or the floebergs, or derived from the sheet of land-ice when it forms icebergs. This area is more or less open, and at its outer margin is very open, irregular, and variable. Floating ice extends farther toward the equator in the Atlantic Ocean than elsewhere. In the North Atlantic it may float as far S. as lat. 42° N. and in the South Atlantic to lat. 39° S.

In general the surface-currents of the ocean flow away from the ice-caps. An exception is found in the Antarctic field, where S. of New Zealand a current sets in toward the great bay in this field which was found by Ross. Another is in the Arctic field, where the Gulf Stream extended enters the Arctic Ocean to the N. of Scandinavia.

Of the climate of the Antarctic regions little is known, but a fairly accurate picture of the succession of seasons can be made for the Arctic. The entire Arctic area (extending far S. in Siberia and North America) has a mean annual temperature of 32° or lower, except the northeast coast of Norway and a coastal strip of small size on Eastern Greenland. The region of lowest mean annual tempera-

tures appears to extend over a strip reaching from Grinnell Land across the New Siberian islands to the basin of the Yana river in Siberia. This area passes slightly to the American side of the pole, is apparently mostly covered by water, and has a mean annual temperature of 0° F. or lower. The seasons are reduced to two, summer and winter, and the diurnal changes are relatively slight. The greatest cold in winter is in the Yana basin, where the mean temperature for January descends to –50° F. or lower. In Grinnell Land for this month it is about –35° F. The July mean temperatures run from 36° F. in the vicinity of the pole to about 50° F. near the Arctic Circle. In the Yana basin it is about 30°. The precipitation about the pole is small, varying from 8 to 25 inches, and is somewhat more likely to fall in late summer than at other seasons. The accumulations of ice and snow are due not to heavy precipitation, but to the conservation of what does fall. It is largely in the form of snow, and evaporation is very small because of the low temperatures. Fog and high winds are common.

The north magnetic pole was found by Ross to be on Boothia Felix in 1832. It has since traveled a few degrees E. and is now probably near the southeast angle of this peninsula. The south magnetic pole is in an unexplored area S. of Australia and 17° 25' from the geographic pole. In Arctic regions the compass-needle is subject to so great variations and uncertainties that its usefulness is much impaired. These variations are due in part to the vicinity of the magnetic pole and in part to sudden and severe, yet unexplained, magnetic storms. Other anomalies, not explained as above, are thought to be due to the existence of masses of iron ore in the rocks. Arctic researches have also given opportunity for many studies of the aurora. The center of greatest frequency is in Northeastern America.

The geology of the Arctic region is apparently as diversified as elsewhere. Certain Cretaceous and Tertiary strata in Spitzbergen, Northern Greenland, and the Arctic Archipelago show that in Cretaceous times this area had a sub-tropical climate with a luxuriant flora, something like that now found in Southern Japan. By Tertiary times the climate, as shown by the fossil flora, had become cooler and was like that of Western Oregon. Volcanic action is seen only about the south pole. The Erebus volcano already mentioned was active when seen, and a small isolated peak 500 feet high among the South Shetland islands emits smoke continuously. Several volcanic peaks and craters have been recognized and much volcanic scoria seen.

The flora of Arctic regions is scanty. Willows, dwarf birches, and a few other shrubs extend to Southern Greenland and a dwarf willow extends far north. The flowering herbs of high latitudes are few in number, and include several rushes and grasses, the dandelion, a poppy, the crowberry, and several saxifrages. The most common and most Arctic flowering plant is the *Saxifraga oppositifolia*. Beyond these are found only flowerless plants—mosses, algæ, and lichens. The Antarctic flora is much more scanty than the Arctic. The species are identical or very similar in all longitudes in each polar region.

Animal life is relatively more abundant, but there is the same resemblance of species. The Lady Franklin Bay party recorded N. of lat. 81° the polar bear, the Arctic fox, the blue fox, the wolf, the ermine, a lemming, the polar hare, the reindeer, and the musk-ox. The two last named have been abundant in Northern Greenland and the reindeer is abundant on Spitzbergen. The party also recorded three species of seal, two species of whale, the swordfish, and the narwhal. Thirty-two species of birds have been observed N. of 81° 30' N., and the most of these have also been seen at Point Barrow and on Nova Zembla and Spitzbergen. The rock-ptarmigan is the only winter resident, the others being migratory. The list includes the gray eagle, gyrfalcon, snowy owl, raven, snow-bunting, two geese, three ducks, and a dozen gulls, terns, auks, divers, and similar birds. The migratory birds arrive usually in June and depart in September. There are also many fish and lower marine forms and insects.

The Antarctic region has generally been represented as swarming with animal life, especially the marine forms. The Dundee whalers before referred to in the summer of 1893–94 found five species of whale (not, however, right whales or sperm-whales), four species of seals, and twenty species of birds, among them seven petrels, two gulls, two terns, the common hooded crow, and a black-and-white duck. Enormous numbers of penguins were seen.

The Antarctic area is uninhabited by man, as also are Nova Zembla, the New Siberian islands, Franz Joseph Land, Spitzbergen, Jan Mayen, and the Arctic Archipelago, but on the coasts of the last named are many evidences of a former occupation by the Eskimo. The Lapps occupy the Arctic coasts of Europe W. of the White Sea, and the Samoyeds eastward to the Yamal Peninsula. From the mouth of the Obi to that of the Kolyma the coast is now uninhabited, though probably once occupied. From the Kolyma mouth to Bering Straits the coast is occupied by the Chukchees, who also extend southward about the Anadyr Gulf. The Arctic coast of America, both sides of Baffin Bay, and Davis Strait, and the southeast coast of Greenland are occupied by Eskimo. The most northern of these are the Arctic Highlanders, who occupy the western shore of Greenland to the N. of Melville Bay. They are simple in life, kindly in character, and not less intellectual than their brethren farther S. They now reach in their migrations no higher N. than lat. 79°, but traces of their former occupation can be found farther N. and on Grinnell Land. Though they endure the rigors of their climate with equanimity and fair comfort, they are thought to be decreasing in numbers.

See for further information GREENLAND, SIBERIA, NOVA ZEMBLA, SPITZBERGEN; COOK, JAMES; FRANKLIN, JOHN, etc.

REFERENCES.—The literature of polar research is very extensive. The best modern books are the series of reports of the international polar expeditions of 1882-83. These are all government reports, and are as follows: U. S., *Point Barrow* (1885) and *Lady Franklin Bay* (1888); English, *Fort Rae* (1886); French, *Cape Horn* (5 vols., 1884-88); Danish, *Godthaab* (1889); Norwegian, *Bossekop* (1888); Swedish, *Spitzbergen* (1887); German, *Königsa Fiord* (1886) and *South Georgia* (1886); Austrian, *Jan Mayen* (1886); Finnish, *Sodankylä* (1886); Russian, *Lena* (1886) and *Nova Zembla* (1886). A list of the literature to 1890 is given in Saint-Martin and Rousselet—*Nouveau Dictionnaire de Géographie universelle*, articles *Région Antartique* and *Région Arctique* (1892). MARK W. HARRINGTON.

Polar Seas: See ANTARCTIC OCEAN and ARCTIC OCEAN.

Pol'der [Dutch]: the technical term in Holland for a once submerged area of land surrounded by dikes and reclaimed by artificial drainage, usually in the smaller polders by wheels driven by windmills, in the great polders by powerful pumping-engines moved by steam. The polders vary in area from 100 acres and less to 12,000 or 15,000 acres; their surface is usually depressed from 1 to 15 or 20 feet below the surrounding country, and these lowest, as those of Schieland near Rotterdam, the Haarlemmermeer polder, etc., are below the sea-level. South Holland alone contains more than 1,000 polders. The most important are those which have been created by artificial drainage of what were permanently-submerged areas, such as that of the Haarlemmermeer. (See HAARLEM LAKE.) In connection with the formation of the NORTH SEA CANAL (*q. v.*), all the areas once covered by the waters of the Y and Wijkmeer are converted into polders.

Pole, REGINALD: prelate; b. at Stourton Castle, Staffordshire, England, in Mar., 1500; son of Sir Richard Pole, Lord Montacute, and of Margaret Plantagenet, Countess of Salisbury; graduated at Oxford, 1515, and afterward studied at the University of Padua, Italy, 1520-23. Returning to England in 1525, he was favorably received by his cousin, Henry VIII., by whom he was sent in 1529 to negotiate for the approval by the University of Paris of the projected divorce of Queen Catharine of Aragon, but soon came himself to an opinion adverse to that measure, and though the king sought to win his support by making him Archbishop of York, Pole refused the offer and left the kingdom. He resided successively at Avignon, Padua, and Venice; sent to Henry his book, *Pro Ecclesiasticæ Unitatis Defensione* (1536), for writing which he was summoned to return to England, and, refusing to obey, was deprived of his ecclesiastical preferments and attainted by Parliament, but in compensation was in the same year invited to Rome by Pope Paul III. and created cardinal Dec. 3. In his hostility to the Protestant cause he tried to induce the Roman Catholic powers to undertake the invasion of England, but was unsuccessful. He was legate at Viterbo 1539-42; presided as papal legate at the opening of the Council of Trent, Dec. 13, 1545; was excepted by name from the amnesty decreed by Edward VI. on his accession to the throne 1547; was a prominent candidate for the papacy in the election of 1549; was appointed legate to England on the accession of

Queen Mary, and received by her with great pomp Nov. 24, 1554; successfully invited Parliament to a reconciliation with the papacy, and freed the realm from spiritual censures; was appointed by the pope Archbishop of Canterbury Dec. 11, 1555; was consecrated Mar. 22, 1556; elected chancellor of the Universities of Oxford and Cambridge 1556; made a visitation of the universities Feb., 1557, and exercised a great influence upon the government of Mary. D. at Lambeth Palace Nov. 18, 1558, the day following the death of Mary. Author of *Liber de Concilio* (1562), the first work printed at Rome by Paulus Manutius; *De Summo Pontifice Christo in Terra Vicario* (1563), and *A Treatise of Justification* (1569), besides his principal work, previously mentioned. Revised by F. M. COLBY.

Pole-axe: See BATTLE-AXE.

Polecat: a name often, in the U. S., applied to the skunk, *Mephitis mephitis*, but properly belonging to one of the weasels—*Putorius fœtidus*—a European species (also called fitch), about 16 inches long. The fur, which is brown, blackish on the tail and feet, and harsh, is used in making paint-brushes, but the name fitch, originally given to brushes made from the fur of this animal, has been extended to others. The ferret is a semi-domesticated, more or less albinistic, variety of this species. F. A. L.

Polem'ics [from Gr. πολεμικός, warlike, deriv. of πόλεμος, war]: the side of the department of dogmatics especially concerned with ecclesiastical controversy, particularly of an aggressive character. It recognizes and emphasizes confessional differences and maintains the distinctive denominational tenets. It may be justly said that polemics is as old as the Church. For many centuries it was a somewhat prominent feature of all theological writing. As was inevitable, at times there was more disposition to win a victory over an opponent than to establish the truth, and the literary battle between the Latin and Greek Churches, between Protestants and Roman Catholics, and between different branches of the Protestant Church have been too frequently characterized by unholy passion and unfair methods; but there is a growing indifference to theological distinctions, and the churches are coming nearer together; so there is less polemics in the systems of theology. Irenics, or the harmonizing of differences, is the end to be sought by polemics. The formation of religious and philanthropic societies by members of different denominations, the bringing of the Old Catholic, the orthodox Oriental, and the Anglican Churches together, in conferences and such gatherings as the World's Parliament of Religions in Chicago in 1893—these are signs that polemics is yielding to irenics. The early Christian apologies, while defenses against, were also attacks upon Paganism. They are translated in the Ante-Nicene Christian Library. The Latin theologians of the ninth century busied themselves with attacks upon the Greek theologians. The most elaborate work upon this controversy is by Joseph Cardinal Hergenröther, *Photius, Patriarch von Constantinopel* (Regensburg, 3 vols., 1867-69). Of the conflict between Romanism and Protestantism the best works are by J. A. Moehler (R. C.), Eng. trans. *Symbolism* (2 vols., London, 1847), and by K. Hase, *Handbuch der protestantischen Polemik gegen die römisch-katholische Kirche* (Leipzig, 5th ed. 1890). The systematic theologies of the various Protestant denominations, e. g. C. Hodge (Presbyterian, 3 vols., New York, 1872), W. G. T. Shedd (Presbyterian, 3 vols., 1884-94), H. B. Smith (Presbyterian 1884), A. H. Strong (Baptist, 1889), H. Schmid (Lutheran, Eng. trans. Philadelphia, 1876), S. Buel (Anglican, New York, 1890), J. Miley (Methodist, 2 vols., 1892-94), contain discussions of points in controversy between the different denominations, such as predestination, regeneration, and the divine unity. The Church creeds are to a certain extent polemical. See the most complete collection, by P. Schaff, *The Creeds of Christendom* (5th ed., New York, 1890). See APOLOGISTICS.

SAMUEL MACAULEY JACKSON.

Polemon (in Gr. Πολέμων) THE PERIEGETE: the first to develop the preparation of "guide-books," with especial reference to works of art, inscriptions, and the like; flourished about 150 B. C., and is supposed to have been the source of much of the wisdom of PAUSANIAS (*q. v.*). See Müller, *Fræg. Histor. Græcorum*, vol. iii., pp. 108-148. B. L. G.

Polemoniaceæ: See PHLOX FAMILY.

Polevoi, NIKOLAI ALEKSEIEVICH: author; b. in Irkutsk, Siberia, June 22, 1796. Self-taught and originally a merchant, he gave himself up to literature, and founded the

Moscow *Telegraph* (1825), which became one of the chief Russian journals of the day. He attacked with passion and skill the writers of the pseudo-classical school, in opposition to whom he defended Pushkin, Byron, and other romantic authors. His own talent was remarkably many-sided, for he was at the same time critic, story-teller, dramatist, historian, and translator with varying success. Some of his plays (*Ugolino*, *Parasha*, *The Grandfather of the Russian Fleet*, *Death and Honor*, etc.) are still played, in spite of absurd exaggerations in them, which are also to be found in his stories (*Abaddonna*, *The Bliss of Madness*, *Emma*, etc.). His *Outlines of Russian Literature* had value for his time, but his unfinished attempt to write Russian history (6 vols., 1824-33) in the style of Guizot and Niebuhr, and in rivalry to the great work of KARAMZIN (*q. v.*), was a failure. His later years were unfortunate. His paper was suppressed by the Government (1835). As by changing his opinions he had lost his former adherents, in order to support his numerous family he was obliged to do literary hack-work as one of the editors of the *Son of the Fatherland*, in support of the party he had formerly opposed. D. Feb. 22, 1846.—His son, PEIR NIKOLAIEVICH POLEVOI, has written a *Life of Shakspeare* (prefatory to the edition of translations from Shakspeare of Gerbel and Nekrasov, 4 vols., 1866-67); a well-known *History of Russia in Sketches and Biographies* (4th ed. 1881), and other works. A. C. COOLIDGE.

Poliathes Tuberosa: See TUBEROSE.

Police [= Fr. < Lat. *politi'a* = Gr. *πολιτεία*, condition of a city or state, government, administration, from *πόλις*, city, state]: the means instituted by the government to maintain public order, liberty, property, and individual or personal security. In the accomplishment of this function it is sometimes the auxiliary of the administrative department, sometimes of the judicial department. In the former case the measures which it employs are chiefly preventive, and to a certain extent discretionary.

The real court of first instance is the policeman. The policeman on his daily post is the universal referee, as well as the universal guide-board; he has knowledge of more disputes and quarrels and he decides more cases than all the courts in the land. Of course, these are to the last degree trivial when looked at individually, but in the aggregate they are of vast importance. If the policeman be a man of good common sense he so decides these cases as not only to put an end to animosity between neighbors, but to prevent an infinite number of petty lawsuits which would otherwise occupy the courts. In doing this he merely carries out the object of his vocation—to keep the peace.

It is a narrow view of a policeman's functions which pictures him solely as arresting criminals. The discovery and apprehension of those who have broken the law is a most important part of his work, but in addition he has many petty duties, such as seeing that outside doors are locked, watching the street traffic and untangling blocks of vehicles, looking after the safety of women and children, enforcing corporation ordinances, and finding lost children. The organization of the police in a city enables cognate branches of that city's government to bring laws to the knowledge of the people as no other machinery can. In time of threatened epidemic, for example, the health authorities would be practically helpless without the police. As contrasted with the aggregate of these functions, in their value to the community, the sterner duties of the police, such as suppressing riot, are of comparatively little worth.

The need of discipline, of centralized power, has imparted to the police in every large city a semi-military organization. Everywhere the same general system is to be found. The people are represented by the police commission, which appoints men to serve on the force, makes the rules which are to govern them, sometimes fixes salaries, etc. It is in the commission, when there is more than one member, that all debate on police matters takes place, and it is here that debate ends. Immediately after the commission, and subject to the rules made by it, comes the police force. A marked difference is seen at once, because membership in this is always for life or good behavior, and there is always a pension for those worn out in the service. In some cases the police force is complete within itself; that is, the administration of the rules made by the commission is carried on by the officials of the force without interference. In other words, the force is autonomous.

At the head of the force is an official known by various titles in the different localities, but often called superintend-

ent. It is his business to see the orders of the commission carried out, to see that the members of the force, each in his degree, perform the multifarious duties exacted of them. He is the executive head of the force, and while he may, if he sees fit, consult with the higher officers on matters of moment, he issues orders to the force which all must obey. He is, from his position, not only the central authority, but the very mainspring of the force. In practice it has been found that the more uncontrolled the authority of this officer, the better the force; the more it is interfered with, the more disorganized and inefficient the force becomes. In some organizations of police, all promotions rest on the recommendation of the official who is the immediate superior of the person to be promoted and on the approval of the superintendent. This system has given the best results among the members of the force. No other has so completely secured promotion for merit, simply because all other systems have introduced causes for promotion which are not connected with the direct efficiency of the force.

Immediately under the superintendent there are officials called inspectors in the U. S. Each inspector has assigned to him five or more precincts over which he has executive control. As the superintendent carries out the orders of the commission, so the inspectors carry out the orders of the superintendent, and see that they are obeyed.

With reference to the population, a city is divided into sections called precincts, or in some countries, districts, and at the head of each is a captain of police. He rules the men attached to his precinct or station house—a building fitted up for the police and containing cells for prisoners—sees that the laws are obeyed, and the rules of the force carried out.

Below the captains in rank come the sergeants, or in some cities lieutenants and then sergeants. One of these is on duty in the precinct-house day and night. In many respects his duties are those of the captain. He is, however, more in contact with the people. He has many decisions to make, and must have a fair knowledge of the simpler rules of criminal law.

The "roundsmen," as they are called in the U. S., are the officers to whom is intrusted the inspection of the patrolmen. It is their duty to see that the latter are walking their posts, that they do not break any of the rules made for them, and that they are at all times carefully watching for the welfare of the people.

There is a separate branch of the force which contributes in no small degree to the suppression and punishment of criminals. This is the detective bureau. It consists of a number of men who have been selected for their shrewdness, courage, and common sense, and for their acquaintance with the faces and careers of criminals. It is the special duty of the detectives to investigate crime, but a far more important part of their work is the prevention of crime by a ceaseless watch kept on the dangerous elements of society. Under their scrutiny come the anarchist and the pickpocket, the burglar and the confidence operator, and though the greater part of their work is never known to the public, they are a powerful agency in the maintenance of order in the community.

In many countries there is a branch of the police which is practically unknown in the U. S. These are the political detectives, the men who watch those who are or who are supposed to be inimical to the existing government. During the civil war, and for a short time afterward, the members of the secret service of the U. S. Government did work of this kind, but since then the only avowed enemies of the Government in the U. S., the anarchists, are looked after by the local police.

The police force of the city of New York is governed by a commission, having four members, appointed for a period by the mayor. The force consists (1894) of a superintendent, 4 inspectors, 38 captains, 163 sergeants, 40 detective sergeants, 174 roundsmen, and 3,380 patrolmen—in all, 3,800 men, besides 15 surgeons, 79 doormen or janitors of station-houses, and 21 matrons who attend female prisoners. The city is divided into 38 precincts and 3 inspection districts. The posts patrolled in the day are twice as long as those during the night, so that during the latter twice as many men are on duty. In addition, a reserve of men is kept in each precinct-house ready to be sent to any point at which they are required. In the upper part of the city, where the posts are very long, many of the men are mounted. In time of danger, or when there is any great popular festival, the whole force is on duty night and day. There is a special

detail, known as the harbor police, which watches the shipping from launches and boats.

In Chicago the police force consists of a superintendent, an assistant superintendent, 3 inspectors, a chief of detectives, a superintendent of the bureau of identification, 45 captains, 59 lieutenants, 267 sergeants, and 2,493 patrolmen—in all 2,841 men.

In London the commission consists of a chief commissioner and two assistants, who are appointed for life by the Queen on the recommendation of the Home Secretary. The metropolitan police force consists of (1891) 5 chief constables, 31 superintendents, 787 inspectors—equivalent to captains in New York—1,637 sergeants, and 12,583 constables—in all, 15,043 men. There are 180 police districts (precincts) in London. This is exclusive of the city police, which consists of 905 men.

The metropolitan district of Dublin has its own police, created under parliamentary act of 1836. The force consisted on Dec. 31, 1892, of 1 chief commissioner, 8 superintendents, 24 inspectors, 176 sergeants, and 940 constables.

The Scotch police were organized under parliamentary acts of 1857 and 1862, auxiliary to and amendatory of acts passed during the early part of the nineteenth century. The force is subdivided into county districts, the authority governing each county force being vested in a commission consisting of seven county chancellors, and the sheriff of the county being an *ex officio* member of the commission. In Scotland, which has an area of 29,785 sq. miles and a population of 4,025,647, the total number of police in all the different counties is 4,700, or 1 for every 852 of the population.

In Paris the organization of the police is distinctly military. Under the Minister of the Interior, who is in the cabinet, there is the prefect of police and his subordinate, the director of public safety. The prefect occupies almost a cabinet position, in that he is expected to resign if the force fail in any great emergency. For example, the prefect, M. Lozé, resigned after the students' riots in 1892, and his successor, M. Lepin, after the assassination of President Carnot. There are 80 commissaires, 2 division inspectors, 25 clerks, 38 officers, 25 principal inspectors, 100 brigadiers (equivalent to sergeants in New York), 700 under-brigadiers (roundsmen), and 6,800 guards of the public peace—in all, 7,770 men. "Indicators," as they are called, are men outside the force who watch everybody. They are, in fact, spies, and the majority are reformed criminals.

In Berlin the police are divided into the county police, the industrial, the building, the criminal, the public safety, the stranger, and the community police. The fire department is also a part of the same general bureau. The Minister of the Interior is the head of the police force, and the system is purely military. Under him is the general with a staff of twelve brigade-generals who rank as colonels in the army, forty-nine district-officers who rank as majors or captains, and so on. The men carry swords and firearms.

In Russia the police form the executive administrators of the whole empire, and their number is not published. In St. Petersburg there are about 10,000 police—officials of the public safety—who maintain order. They are not armed in any way, but carry whistles. The number of those employed as detectives in the famous "Third Section" is unknown. It is the duty of these men to keep a constant watch on everybody, especially foreigners in the country, and to make their reports to the head of the section personally. For many years this was the Minister of the Interior, but of late it has been some man, generally selected from the army, who has been especially appointed.

The police in cities in Spain, Belgium, and Italy are organized under the military system so generally approved of on the Continent. In Turkey the police are more like watchmen who look out for fires than guardians of the peace.

Police organizations of a military character are maintained in several portions of the British empire. In Ireland the Royal Irish Constabulary, organized in 1836, have done good service, and it is this force which put into effect the various coercion acts passed by Parliament. In Canada a system of mounted police was formed on the model of the Royal Irish Constabulary, and in the Northwest territories have managed the Indians and maintained laws with thoroughness. In Australia and Africa similar organizations have been started, and the police branch of the East Indian Government is much like them. The organization is purely military in form; there is generally a lieutenant-colonel or major at the head, responsible to the Minister of the Interior

or the official who answers to him. Under the commanding officer there are captains, lieutenants, sergeants, and privates. These bodies of men have done splendid service and have kept the peace over large territories at a minimum of cost. In Australia the police have ruled the gold-fields and the blacks, and in South Africa a similar force has (1894) been organized to maintain order among the miners in the gold regions and to hold in check the Matabeles and other tribes. In India the force is recruited from the natives, but the officers are British. There is life-tenure of position and a pension for old age or disability. With the mixed population of India, governed by an alien race, the supervision exercised by the police is of enormous value.

Returning to the police in cities, a comparison of the number of men with the population is of interest. The figures are as follows:

CITIES.	Population.	No. of police.	No. of men, women, and children per 100,000 of population.
New York	1,975,646 *	3,800	519
Paris	2,441,600	7,856	299
London, metropolitan and city police districts, 1891	4,648,000	17,948	353
St. Petersburg	1,000,000	10,000	97
Glasgow	675,000	1,303	344

* Population estimated by Registrar of Vital Statistics, New York Health Department, October 23, 1894.

It must be remembered that in the Paris police the "indicators" and the Government political detectives are not included, and that in London the extremely puzzling streets make a large number of human sign-boards imperatively necessary, and the dense traffic requires to be regulated by a large number of men. The police in European cities, not excepting those of Great Britain, are aided to a great extent in their duties, so far as those duties relate to suppressing organized lawlessness, by the regular troops, large garrisons of which are quartered in every town of any considerable size.

THOMAS BYRNES.

Policy: a name applied to various forms of lottery. In one form the "policy shops" give out each afternoon slips containing two columns of twelve numbers each, and each evening slips containing two columns of thirteen each. The numbers in each column are drawn by lot from those between 1 and 78 inclusive. Before the drawing a person may make bets in various ways; in a "straight gig" the player selects three numbers and receives odds of 100 to 1 for the afternoon slips, or 87½ to 1 for the evening slips, that they will not all three appear in the same column of the slip. In this the real chances against the player are nearly 173 to 1 for the afternoon, and exactly 133 to 1 for the evening, even when the drawing is fairly conducted. Policy-playing is much in vogue among certain classes, in spite of laws against it, and dreams and other superstitions are much relied on in the choice of numbers.

Polignac, *pō lēn'yak'*: the name of a French family which played a conspicuous and fatal part in the later history of the Bourbons.—JULIUS, Count de Polignac and his wife, YOLANDE MARTINE GABRIELLE DE POLASTRON, were the most intimate friends of Marie Antoinette and the most prominent members of that faction of the court which intrigued against the reforms of Louis XVI. and his ministers. The count was made a duke in 1780, postmaster-general in 1782, and the family received immense dotations of land and money. As the prodigality of the queen and the political mistakes she made were generally ascribed to the influence of the Duchess of Polignac, she and her husband were the special objects of the French people's hatred and contempt. They left the country, together with the Count of Artois, July 16, 1789, as the first *émigrés*. The duchess died at Vienna in Dec., 1793. The duke went afterward to Russia, where he was well received by Catherine II.; she gave him an estate in Ukraine, where he died Sept. 21, 1817. His three sons tried first to form an intrigue for the re-establishment of the Bourbons by the First Consul, through his wife, Josephine; afterward they participated in the conspiracy of Cadoudal, and were imprisoned at Paris when the allied army approached the city. The second of them, JULIUS AUGUSTUS ARMAND MARIE, b. May 14, 1784, was a Roman prince by the pope in 1820, and became president of the cabinet Aug. 8, 1829. As such he signed the famous *ordonnances* of July 25, 1830, which caused the immediate downfall of the Bourbon dynasty. He fled, but was arrest-

ed, and sentenced by the Chamber of Peers to imprisonment for life and forfeiture of his titles and rights as a citizen. Restored to liberty by the amnesty of Nov. 29, 1836, he went to England. D. at St.-Germain, Mar. 29, 1847.

Revised by F. M. COLBY.

Polish Language: See SLAVIC LANGUAGES.

Polish Literature: the literary monuments of the Polish language both before and since the final partition of Poland. This literature, like the nation itself, has passed through many vicissitudes. Seven distinct periods of its development are generally recognized.

I. *Poland under the Piasts* (down to 1386 A. D.).—The ancient (heathen) Poles were not acquainted with the art of writing, and what little of their literature has been preserved by tradition is found in folk-song and fairy-tale. Christianity introduced Bohemian, German, and Latin culture into Poland, and the native language entered on a struggle against the German and Latin cultivated by the priests in their schools. The earliest specimens of Polish literature are a translation of Psalm I. (about 1290), the hymn *Bogarodzica* (Mother of God), ascribed to St. Adalbert (d. 997), and the psalter of Queen Margareth (d. 1349). The historians of this period, Martin Gallus, Mateusz Cholewa, Wincenty Kadlubek (d. 1223), and others, wrote in Latin.

II. *Poland under the Jagellons* (1386–1548).—The invention of printing (first press in Cracow, 1465) and the foundation of the Academy of Cracow (re-established, 1397) exercised a powerful influence on the development of native Polish literature. The Bible of Saros Patak dates from 1455. Important collections of judicial decisions were made. Some poets still wrote in Latin, but Stanislaw Ciolek, Jędrzej Galka, and others, wrote in Polish. In this period were made the first attempts at dramatic composition (mysteries, with biblical subjects). Theological controversies created considerable polemical literature. The chief works of the period are the legal tracts of Jan Ostroróg and the historical writings (in Latin) of Jan Dlugosz (d. 1480), who is justly considered the father of Polish history. *Kronika Polska*, by Chwalczewski, and a few other works were written in Polish.

III. *The Golden Age* (1548–1606).—The Reformation and the generous policy of Sigismund August combined to raise the standard of native literature to a level hitherto unknown. Poland was the common refuge of western "heretics," the Bohemian Hussites, and others, whose Polish adherents championed their tenets in Polish and thus compelled the Catholic majority to employ that language, though Latin did not yet wholly disappear; but the large number of polemical tracts, postillas, religious songs, and translations of the Scriptures possessed but an ephemeral value. Talented literary men received encouragement and generous support from the king and many high-minded nobles and ecclesiastics; native poetry found a number of gifted interpreters, and this period is pre-eminent in both quality and quantity of literary works. It is also marked by the decline of the Cracow Academy and the rise of Jesuit influence in Poland (first Jesuit college established 1564).

The most prominent names of the golden age are those of Mikolaj Rej z Naglowic (d. 1569), Jan Kochanowski (d. 1584), his brother Peter, Sebastian Klonowicz, Mikolaj Sep Szarzyński (d. 1581), Kaspar Miaskowski, Piotr Skarga (d. 1575), and Stanislaw Grochowski (d. 1612). Rej was not a great poet, but his prose work *Zwierciadło* (The Mirror), in which he presents the portrait of an ideal Polish nobleman, patriot, and Christian, is very valuable. Jan Kochanowski is the first great poet. Having no domestic models he had to invent a poetical language. He is best known by his excellent translation of the Psalms, his touching elegies *Treny* (Tears), his songs and satires, and, above all, the *Fraszki*. His drama *Odprawa posłów greckich* (The Expedition of the Grecian Envoys) is one of the earliest Slavonic dramas. Piotr Skarga, a champion of Catholicism, was the greatest preacher of his country. Szarzyński and Klonowicz followed Jan Kochanowski; Miaskowski and Grochowski cultivated religious poetry; Szymon Szymonowicz and Szymon Zimorowicz wrote five idyls. Mikolaj, Piotr and Jędrzej Kochanowski translated Greek, Latin, and Italian classics. Some of the poets still wrote in Latin. Valuable historical material is contained in the *Acta Tomicianna*.

IV. *The Panegyrists* (1606–1764).—The corruption of taste prevailing throughout Europe soon invaded Poland, and the golden age of her literature was followed by a period of decline. Panegyric verses, full of bombast, generally

written for a pecuniary consideration, became the fashion. Every wedding, funeral, and baptism was celebrated by long-winded speeches and poems, and the custom of mingling Latin and other foreign words with those of the native language in macaronic verse became universal. The best poets of the time were survivors of the preceding era. At their head stands Wacław Potocki (d. about 1696), whose fame rests on his great epic, *Wojna Chocimska* (The Campaign of Chocim). Krzysztof Opaliński (d. 1656) is the only satirist of note. A complete transition to Frenchified poetry was effected in the works of the Morsztyns: Hieronym, Jędrzej, Stanislaw, and Zbigniew. During this period historians confined their attention to memoirs. The first Polish newspaper made its appearance under Sigismund III.

V. *The Era of Stanislaw Augustus* (1764–1821).—This was an era of French classicism, a period of frivolous self-conceit. French customs, ideas, and forms dominated in literature as well as in society. At first the amount of literary work was comparatively small, notwithstanding the efforts of individual talent. Between 1764 and 1778 only 416 works were published in Poland, of which 84 were religious, 37 ethical, 32 political, 13 philosophical, 24 mathematical, 14 geographical, 56 historical, 13 oratorical, 56 poetical, 23 fiction, 27 grammatical, 13 medical, 2 architectural, and 22 agricultural. With a change of political conditions, however, came a change in literature; in the four years of the famous parliament (1788–91) the nation did more thinking and printing than it had done before in a century, and the functions of public newspapers became highly important.

Poetry followed French models for the most part, though there are some notable exceptions. Ignacy Krasiński (d. 1801) was an original genius, particularly in his satires, as was also Adam Stanislaw Naruszewicz. Krasiński's works *Myszeis* (The War of Mice) and *Monomachia* (War of Monks) are famous. Stanislaw Trembecki (d. 1812) was a master of form, but not a true poet. Kajetan Wegierski (d. 1787) was a clever rhymester, but his poetry is too sensual and voluptuous. Franciszek Karpiński (d. 1828) and Książnin (d. 1807) were authors of popular songs. Midway between the national and the French schools stood three notable poets of the Warsaw principality—Jan Pawel Woroniec (d. 1829), Julian Ursyn Niemcewicz (d. 1841), a patriotic satirist, theorist, historian, dramatist, and novelist, and Wojciech Boguslawski, the true founder of Polish drama, whose *Cud mniemany* won great popularity. French tragedy at this time found many translators and imitators, who were loudly applauded, though lacking talent.

In history the greatest name was that of the archæologist Adam Naruszewicz. Of his later followers Lelewel was the best. Politics gave rise to a considerable number of pamphlets, history of literature began to receive attention, and philology made rapid progress. Onufryj Kopczyński was the first great grammarian, and Samuel Bogumil Linde wrote the first standard dictionary of the Polish language.

VI. *The Era of Mickiewicz* (1821–63).—French pseudo-classicism could not dominate Poland for any considerable length of time; national poetry inspired the poets of the new generation. In Boguslawski's idyllic drama *Krakowiacy i górale* (The Cracowians and the Mountaineers) the national note is first sounded. The influence of Byron, Walter Scott, Goethe, Schiller, and Victor Hugo is manifest. Adam Mickiewicz (d. 1855), the leader of the romanticists, is the greatest poet not only of Poland, but of the entire Slavonic race. His great epic poems *Grażyna*, *Konrad Wallenrod*, and *Pan Tadeusz* marked him at once as a modern Homer. In his footsteps followed Antoni Eduard Odyńiec, Julian Korsak, Alexander Chodzko, Antoni Gorecki, Józef Massalski, and others. The life of the people of Ukraina found its poets in Bogdan Zaleski (d. 1887), Severyn Goszczynski, and Michael Grabowski. The unfortunate Antoni Malczewski, too, wrote *Marya*, a story of Ukraina. The romanticists were sharply criticised by Osiński, Dmochowski, and others, but the attacks were ably repelled by Mickiewicz himself, and pseudo-classicism was finally doomed in Maurice Mochnacki's critical work *O literaturze polskiej w wieku XIX*.

In Galicia reform was preached by the *Haliczanin*. The new movement soon invaded the field of novel-writing, Walter Scott being the principal model for Polish authors. Niemcewicz's *Jan z Teczyna* created a sensation. Then followed K. Gaszyński, F. Wężyk, F. Skarbek, the historical novelist Felix Bernatowicz, Mme. Jaraczewska, Alex. Bromikowski, and others.

The revolution of 1830 stopped the peaceable evolution of Polish letters. It brought stagnation to domestic production. Polish talent was to be found in exile, and Polish books then began to appear at Paris, Avignon, Strasbourg, Brussels, London, Berlin, Vienna, and especially Leipzig. Poland revived slowly. The review *Wizerunki* appeared first, followed at Warsaw by the *Ateneum* of Józef Ignacy Kraszewski (d. 1887), Poland's greatest novelist. In the forties St. Petersburg became an important literary center. A decided turn for the better was announced in 1851 by the appearance of the *Dziennik Warszawski*. Some of the old poets were heard again. Mickiewicz published *Pan Tułdusz*; Bogdan Zaleski, S. Goszczyński, and S. Witwicki were still active. Among the younger generation appeared three great lights of the romantic school—Zygmunt Krasiński, Wincenty Pol, and the proud and daring Juliusz Słowacki, a rival of Mickiewicz himself. The greatest poets to come to prominence at the end of this period were Kornel Ujejski (lyric) and Władysław Syrokomla (d. 1862), and the greatest novelists Jan Zacharysiewicz and Eliza Orzeszkowa.

Wacław A. Maciejowski was at first the only historian of note, and kindred branches of literature were much neglected; but an increased activity dates from 1841. Karol Szajnocha and Alex. Batowski, editors of ancient historical documents, deserve special notice. Philosophy found its first exponents in Karol Libelt and Bronisław Trentowski. Among the linguists Antoni Malecki is foremost.

VII. *The Present* (since 1863).—The present literature is noted for its riches, though it possesses but few names of international fame. The modern Polish novel deals chiefly with social questions—the relation of the nobility to the peasantry, the position of woman, that of the Jew, etc. The best-known author is Henryk Sienkiewicz, a number of whose novels have been translated into English by Jeremiah Curtin (*With Fire and Sword*, *Without Dogma*, etc.). Other well-known novelists are Bolesław Prus, W. Los, T. T. Jeż, Eliza Orzeszkowa, Marya Konopnicka (poet as well as novelist), Jan Zacharysiewicz (writer of character novels), Ostojka, and Lewer. Among the poets should be mentioned Marya Konopnicka, W. Wysocki, Felicyan, K. Lewandowski, and Miriam (Zenon Przesmycki). The foremost dramatist of the nineteenth century is Alexander, the Count Fredro, whose comedies are still popular, though French in style and color. Others whose works are meritorious are Antoni Malecki (*List żelazny*, *Grochowy wieniec*), Józef Szujski (*Halszka z Ostroga*), Apollo Karzeniowski, Romanowski (*Popiel i Piast*), and, above all, Edward Lubowski (*Przesady*, *Sąd honorowy*, etc.). The prominent historians are Antoni Malecki, the veteran, A. Szczepanski, K. Waliński, W. Bogusławski, and W. Spasowicz. Owing to the division of Poland the kingdom has three literary centers—Warsaw, Posen, and Cracow.

BIBLIOGRAPHY.—A number of histories of Polish literature have been written in the native tongue, among them those of Bentkowski (1814) and Wiesniewski (10 vols., Cracow, 1845–57), besides many works on special portions of it. There are also several good works in German.

J. J. KRÁL.

Politia'nus, ANGELUS: See POLIZIANO, ANGELO.

Political Economy [*political* is from Gr. *πολιτικός*, pertaining to citizens or to government or a state, deriv. of *πολίτης*, citizen, deriv. of *πόλις*, city, state; *economy* is from Gr. *οικονομία*, economy, management, liter., household management; *oikos*, house + *νέμειν*, distribute]: the science of wealth, or the body of knowledge which relates to the production, distribution, and exchange of wealth. It is only within the concluding years of the nineteenth century that this view of the scope of political economy has been generally accepted. Down to the end of the eighteenth century it was regarded as an art rather than a science. It meant the art of conducting the business of a nation, just as domestic economy meant the art of conducting the business of a household, while it was a broader term than finance, which applied to the business of the government alone. The writers of the seventeenth and eighteenth centuries made the analogy between national and domestic economy far too close. They thought that it was the object of a nation to get rich in the same sense that it was the object of an individual to get rich. As an individual may grow prosperous by producing more than he consumes, and thus selling more than he buys, so the earlier writers on political economy conceived that a nation would grow rich by selling more to

other nations than it bought from them, and that this was the only way by which the nation could be thoroughly prosperous. This view was at the basis of the *mercantile system* of political economy, so called, because it treated the business of a nation like that of a single merchant. Perhaps the leading British mercantilists were Thomas Mun in the seventeenth century and Sir James Steuart in the eighteenth. Steuart's *Inquiry into the Principles of Political Economy* (1767) was the most comprehensive English treatise previous to that of Adam Smith. To the eighteenth century belongs the work of Galiani in Italy, Justi in Germany, and Sonnenfels in Austria. Practical applications of the mercantile principle were seen in the commercial policy of nearly all European states down to the French Revolution, and still survive in many of the protective tariff systems. It was exemplified in the English navigation acts, and by the financial policy of Colbert in France in the seventeenth century.

It is easy to see that the mercantilists applied to national policy the principles of a miser rather than of a farsighted merchant, and that a wise business man becomes rich, not by the money that he accumulates, but by that which he spends farsightedly as a reinvestment. This line of criticism did not escape the notice of the mercantilists themselves. It was vigorously urged by Sir Dudley North (1691), and by his contemporary Sir William Petty. In the eighteenth century these criticisms were carried still further by the French school of economists known as *physiocrats*. This name was intended to emphasize their belief that legislative policy was subordinate in its effects to the action of the *powers of nature*. Whereas the mercantilists had attached too much importance to money as a measure of wealth and laid undue stress on forms of commerce, the physiocrats considered that national wealth was represented by the raw materials available, and laid chief stress on the productiveness of agriculture. The leaders of this school were Quesnay (1694–1774) and de Gournay (1712–59). The most eminent representative of the school in practical life was the great French minister Turgot (1727–81). It was a severe misfortune to France that this farsighted statesman was thwarted in the carrying out of his proposed reforms, which might have done much to mitigate the violence of the Revolution. Contemporary with the French physiocrats we find the work of Beccaria (1738–94) in Italy, and Adam Smith (1723–90) in England.

The work of Smith, whose *Wealth of Nations* was published in 1776, forms the starting-point of modern thought on political economy. He criticised the mercantilists as unsparingly as did his French and Italian contemporaries; but he took a broader view than the physiocrats in seeing that labor, as well as natural resources, was a decisive element in wealth and national prosperity. He also developed far more clearly than the physiocrats some operations of individual freedom and enterprise in their effect upon prices, and in so doing laid the foundation for the modern conception of economics as a science rather than an art. To Smith, more than any one else, is due the clear presentation of the truth that under free competition prices will ordinarily adjust themselves to cost of production; and the analysis—imperfect, it is true—of cost of production into its various component parts. The scientific method of Smith was carried much further by Malthus (1766–1834) and Ricardo (1772–1823). Malthus devoted special attention to social economy, the principles of consumption, and the effect of increasing numbers upon national or individual well-being. Ricardo started at the opposite extreme, with the investigation of money, banking, and finance. Applying the methods of finance to the analysis of cost of production, he developed the theory of rent which is associated with his name, as the theory of population is connected with that of Malthus. The popular movement for the repeal of the corn-laws gave these writers and their successors, of whom McCulloch and Senior were the most prominent, an opportunity to make their influence felt. To this group of writers the name of the English classical school is habitually applied. The work of this school is summed up and systematized in John Stuart Mill's *Principles of Political Economy* (1848), which is the leading treatise on the science. Its views are set forth in a more popular, but less philosophic, form in Fawcett's *Manual of Political Economy*. The continental writers at the beginning of the nineteenth century followed closely in the lines of the English. Among the French were J. B. Say (1767–1832), Sismondi (1773–1842), and Bastiat (1801–50), the last named being the most brilliant, but least scientific. The classical doctrines of political economy are gen-

erally held by French economists of the present day, among whom Leroy-Beaulieu is perhaps the most prominent. In Germany during the same period the leading names are those of Rau (1792-1870) and von Thünen (1783-1850), the latter of whom perhaps anticipated modern developments more than any contemporary writer in France or England.

It was a general characteristic of the classical school to believe in the let-alone or *laissez-faire* policy. With few exceptions these writers held that, under the action of individual liberty, the maximum of efficiency, as well as of justice, would be secured, and that all interference with liberty of contract was at least *prima facie* bad. Not content with criticising the mercantile system, they opposed the factory acts as such. Not content with pointing out the error of most legislation, they indulged in the most optimistic views as to the results of non-interference—views which the facts did not always justify. They thus exposed themselves to severe criticism from the socialist school, of whom Marx (1818-83) and Lassalle (1825-64) were the recognized leaders. Marx showed that, in point of fact, free competition did not produce the results which the political economists expected, and he therefore drew the conclusion that the social system which formed the basis of their assumptions was radically bad, while Lassalle, whose reasonings were historical rather than economic, endeavored to trace the direction which social changes must take in order to give the workman what he considered a just share of the product of industry. The protectionist writers also criticised the English classical school, but on lines wholly different from those of the socialists. Instead of accepting the deductions and attacking the system on which they were based, they may be said to have accepted the system and attacked certain deductions from it. The leading writers of the protectionist school during the first half of the nineteenth century were List in Germany (1789-1846) and Carey in the U. S. (1793-1879). They agree with Adam Smith and his followers in condemning the extreme errors of the mercantile system and in regarding labor and capital as the essential forms of wealth, but they believe that the greatest efficiency of labor and wisest expenditure of capital can be obtained, not by individual self-interest, but by certain restrictions on the part of government. Much of their argument is historical, rather than deductive. That is, they trace changes in the economic policy of nations as a whole, rather than methods of individual action under given conditions. In this way the protectionist school shades almost indistinguishably into the modern German historical school, of which Knies is regarded as the founder, and which numbers among its most prominent members the names of Hildebrand, Brentano, Schäffle, Wagner, Cohn, and Schmoller.

The criticisms of the German historical school have found an echo in England, to a greater or less extent, in Cliffe Leslie and Thorold Rogers and W. J. Ashley.

On the whole, it may be said that the work of the historical school has been very ineffective in proportion to its volume. The modifications in economic doctrines since 1870 have largely come through the detailed criticisms of those writers who profess to apply the deductive or individual method. The beginnings of this criticism may be seen in the writings of Cairnes (1823-75) and Bagehot (1826-77). Of greater importance were the criticisms of Longe and Thornton on the traditional doctrine of wages. Mill himself was converted to Thornton's views, although he died too early to incorporate the results in his *Principles of Political Economy*. Similar lines of criticism were carried on by F. A. Walker in America and Marshall in England.

Side by side with this critical progress we have a constructive movement on the part of the mathematical school of economists. As early as 1838 Cournot had made some important applications of mathematics to the economic analysis, and the almost unnoticed work of Gossen in 1857 had carried the same method still further; but it was reserved for Stanley Jevons in 1871, in his *Theory of Political Economy*, to call general attention to the advantages of this method. Coming at the time he did, he was able to lay the foundation for certain positive theories of political economy which could take the place of some of the untenable principles of the classical school. Contemporary with Jevons we have the work of Walras in Switzerland, and subsequently of Pantaleoni in Italy and Edgeworth in England, while Marshall in England, Clark and Patten in America, Menger, Wieser, Sax, and Böhm-Bawerk in Austria have done much to present the results of similar methods of analysis, divested of their algebraic form. So important have been the con-

tributions of the Austrians in this field that the name "Austrian school" is now habitually applied to this whole group of writers.

Political economy in the U. S. was somewhat slow in its development. With the exception of Henry C. Carey, there was for a long time no economist of originality and eminence. The first teachers of political economy, like Amasa Walker, A. L. Chapin, or A. L. Perry, both in their thought and in their writings followed closely in the lines of the English classical school. Much more important work was done in the years following the war by a group of practical men working in special lines of study. First in this group should be named David A. Wells, for some years U. S. revenue commissioner, whose works on taxation and trade have a world-wide reputation. His last, and in some respects most comprehensive, book is entitled *Recent Economic Changes*. Edward Atkinson has done work of equal importance with reference to questions of production, distribution, and internal commerce. Charles Francis Adams, as Massachusetts railway commissioner, laid the foundation for a scientific study of railway problems. Carroll D. Wright, as labor commissioner, first of Massachusetts and then of the U. S., has attained a world-wide reputation for his investigations on wages and other matters connected with the factory system. In connection with this group should be mentioned the names of John Jay Knox and Horace White, leading authorities on questions of banking and finance. Chief among theoretical writers should be named F. A. Walker, superintendent of the census of 1870 and 1880, professor at Yale, and afterward president of the Massachusetts Institute of Technology, who is probably the leading economist of the present day, in the English-speaking world, at any rate; W. G. Sumner, of Yale, who has published books on American financial history and on certain sociological questions; and Simon Newcomb, of Washington, a political economist as well as astronomer.

A special place in the history of economics in the U. S. must be assigned to Henry George, a writer standing midway between the classical economists and the socialists, agreeing with the former in their advocacy of freedom from interference, with the latter in their projects of nationalization of the land. His *Progress and Poverty* was first published in 1879, and has had an unprecedented popular influence. Another important writer, springing like Henry George from the ranks of the laborers, but more conservative in his conclusions and more careful in his methods of analysis, is George Gunton.

Until about 1880 most of the study of political economy in the U. S. had been under English influence. At that time a group of younger men who had studied in Germany came into prominence, and began to mould economic thought in the direction of the historical method. Among those who were prominent in this direction were Prof. R. T. Ely, of Johns Hopkins University and subsequently of the University of Wisconsin, Prof. E. J. James, of the University of Pennsylvania, and Prof. Henry C. Adams, now of the University of Michigan. Under their influence the American Economic Association, whose publications have done much to increase the interest in economic study, was founded in 1885. Among its most important members are Prof. J. B. Clark, of Amherst College, Prof. F. H. Giddings, of Bryn Mawr, and Prof. J. W. Jenks, of Cornell. In the most recent years the economic courses in all the leading colleges of the U. S. have been strengthened, and most of them maintain publications specially devoted to economics and political science. Among scientific publications largely devoted to political economy, besides those of the American Economic Association, may be mentioned *The Quarterly Journal of Economics* (Harvard), *Political Science Quarterly* (Columbia), *The Economic Journal* (Chicago), *The Yale Review*, and the *Annals of the American Academy of Political and Social Science*.

Scope of the Science.—Political economy or economics is the science which undertakes to explain prices and price-movements. Any such explanation involves two processes. We may assume a given set of laws and customs, and see how the operation of individual motives will affect the price of different goods or services; or we may go one step farther back and investigate the reasons which have caused those laws and customs to be established, and which make modifications desirable or probable. Those who chiefly occupy themselves with the former class of problems are said to employ the deductive method, those who chiefly study the latter class employ the historical method; but it is begin-

ning to be understood that any good economist must employ both methods, and that the distinction between the so-called deductive and historical schools is much less fundamental than was once supposed.

Political economy, as thus defined, is a science and not an art. It is occupied primarily with explanations rather than precepts. It bears the same relation to the arts of finance and legislation that the science of physiology bears to the arts of medicine and hygiene, or the science of mechanics to the art of building.

Price and Value.—A price is the quantity of one article or service which is exchanged for another. If a ton of coal is exchanged for 5 bush. of wheat, either may be said to be the price of the other; but usually prices are expressed in some one article—money—which is adopted as a common measure or standard.

Many economists make a distinction between price and value by restricting the term price to those cases where it is measured in money, and applying the word value to all other standards of exchange; but this does not correspond to common usage, and is almost always misleading. In common usage, a price is a *fact*, the amount of something which we must pay for something else; while value is an *estimate*, either by the community or by some individual, of what a price ought to be. Under ordinary circumstances value means the average probable price. If we say, for example, that certain railway stock is selling below its true value, we mean that, in our opinion, this stock will, on an average, sell for a higher price than it now commands. Value is also sometimes used to mean what, in the opinion of the speaker, is regarded as a just price. If we say that a combination is able to keep the price of oil above its true value, we mean above that price which would constitute a fair return for the labor and capital invested. Many of the fallacies in economic reasoning arise from treating the term value as an estimate at one point of the reasoning, and as a fact at another point. It is better to confine it entirely to the former use and to employ the word price for the latter.

How Value is Determined. Competition.—The value or proper price of an article may be determined by the community in two ways, either by custom or by competition. The former was almost universal in mediæval times.

It was believed by the mediæval writers, as it is believed by the modern socialists, that value depends on cost of production, that there is a constant effort on the part of the producers to sell their articles for more than the value or just price, and that public sentiment, or even legislative enactment, should fix a price of this kind and compel the producers to maintain it. The objections to this view are, first, that such a way of determining prices is possible only where the processes of industry are simple and uniform. In the absence of such uniformity, the public can not readily determine what is the cost of production of an article or its just price on this basis. Second, even when the price has been fixed with substantial correctness, it is difficult to insure the production of the right quantity. If more is produced than the public will take at the price in question, it goes to waste. If less is produced than the public wants at such a price, there will be scarcity and distress. Only in the case of production for orders or for a perfectly uniform market could this matter be regulated under the mediæval system, and even under such circumstances it was necessary to determine by the most tyrannical rules what trade each man should be allowed to pursue.

The modern method of determining value by competition avoids these difficulties. Suppose wheat has been selling in the New York market at \$1 a bushel. The dealers find that the quantities supplied by the producers at this price are less than the quantities demanded by the consumers, that the stocks on hand are diminishing, that if this process continues there will be a scarcity. They put the price up to \$1.05 a bushel. At this price there will obviously be somewhat fewer persons who wish to buy and somewhat more who are willing to sell. The quantity supplied becomes equal to the quantity demanded; if this process goes far enough, it becomes even greater. Then comes a reaction. The dealers are afraid that unsold stock will accumulate on their hands. They will put the price down to \$1, or even to 95 cents, in order to adjust the quantity which the public is willing to buy, to that which the producers stand ready to sell. The essence of this method is that the producers are allowed to fix the price at the point which the public is prepared to pay. The advantages of this system over the sys-

tem of customary prices are, first, that it prevents waste. If wheat remained at \$1 a bushel until the whole supply was used up, people would not economize in their consumption, and would find themselves unexpectedly face to face with a season of famine. On the other hand, if the price were kept at \$1 a bushel when the supply was so great that it could not all be used at that price, the accumulated stocks would deteriorate and not be used to advantage. By adjusting the prices to the quantities on hand, excessive use on the part of consumers or excessive accumulation on the part of producers is avoided. Second, the system of competition directs production automatically. If there is going to be a scarcity of wheat, any custom or law which prevents an increase of price takes away from producers the motive to meet the public need. If the price of wheat be allowed to rise to \$1.05, new supplies of wheat are attracted to the market and prevent famine or scarcity. If, on the other hand, such increase be prohibited, it is merely an attempt to check the distress by repressing the symptom. In fixing prices by custom, a deficiency in production is perpetuated; but if free competition be allowed, that deficiency is permitted to correct itself. Third, and most important of all, competition makes price conform to cost of production more closely than is possible by any system of legal enactments; for if the price of any article continues for any length of time in excess of the cost of production, new capital and new laborers will be attracted in the business of supplying it. The quantity offered will increase, and the price will go down. If, on the other hand, the price of an article for any considerable time fails to cover the cost of production, capital and labor will go out of the business, the quantity supplied will be diminished, and prices will rise until they reach a fair and just level. This automatic adjustment of price to cost makes the modern system fairer, as well as more elastic, than the mediæval one.

Relation of Value to Utility and Cost of Production.—Under this system the value of an article does not depend primarily on its cost of production, but on its utility; not upon the utility of the article as a whole, be it observed, but upon the utility of additional supplies of that article. It may be laid down as a general rule that the utility of additional supplies of any article in a given market tends to decrease as the quantity of that article supplied from day to day increases. This utility of additional supplies is the primary cause of the value. Competition among different sellers insures that the price of one part of the supply will not be much greater than that of another; in other words, that the value of the article as a whole will be fixed by the utility of the last increments or additions to the supply. The increase of supply will go on so long as this value more than covers the cost of production. When it ceases to cover the cost of production there is at once a reaction; the utility of the additional supplies is less than the sacrifices involved in producing them, the price received no longer covers the expenses of production, and the quantity offered will diminish until the utility becomes substantially equal to the cost.

Functions of the Speculator.—The adjustment is not universal or immediate. In some lines of business, where considerable stocks of goods must be kept on hand, and where large amounts of fixed capital are required before additional supplies can be put on the market, such an adjustment may take months, or even years, during which competition of sellers may be very ineffective, and prices remain much higher than cost of production. Such a state of things is not practically remedied by the socialistic schemes that have hitherto been tried, for the government is quite as likely as the individual producer to take advantage of any such temporary monopoly. It is the function of the speculator in modern society to avoid such fluctuations. A man is allowed to buy cheap and to sell dear because, on the whole, such a process does the community more good than harm. If the speculator makes money for himself by simply anticipating the needs of the market instead of manipulating it, he does an inestimable service to the community at the same time. By buying when prices are low he prevents waste. By selling when prices are high he makes available those supplies which he has saved in times of plenty. Nor is speculation confined to mercantile transactions. Under the modern system, every manufacturer and almost every producer is, to a greater or less extent, a speculator. If by his skill and foresight he is able to sell goods for more than they cost him, he serves the public by directing labor in lines where its products are needed. If, on the other hand,

he fails to cover his expenses, he has injured the public as well as himself, for he has directed labor in lines where its products were much less needed. What holds true of the control of labor is still more conspicuously true of the control of capital. The man who directs capital into profitable lines is making profitable use not merely of the labor of the present, but of that of the past. He is utilizing not merely the community's present work, but its system of past accumulations.

It must not be assumed that this speculative system always selects the best employers or the best methods of business management, but it is true that it develops better employers and better methods than any other system which has hitherto been devised. It was because of its superior efficiency that it supplanted by degrees the old mediæval system which has been already described, and which was closely analogous to that proposed by the socialists. From the fifteenth century down to the nineteenth greater powers have been constantly put in the hands of those who could control capital. In the fifteenth century the right to pursue a trade and to hire laborers was in large measure hereditary. To-day any one who will take the risks of advancing the capital is allowed to assume the direction of industry. This constitutes the wages system. He is even allowed to borrow the capital of others, and, within wide limits, to make what terms he pleases for borrowing it. This constitutes the system of interest. To encourage the speculative investment of capital for remote ends, there has developed a system of land-tenure and land-transfer, which gives control of agriculture and building to the capitalist instead of the government. To facilitate the investment of capital in new methods of manufacture whose return is somewhat doubtful, a system of patents and patent-rights has come into existence. To make possible the association of the capital of different individuals in industries requiring concentrated management, governments have not merely promoted the establishment of joint-stock companies or corporations, but have allowed their power to increase almost to the danger limit. Each step in this development has been taken somewhat reluctantly, because the speculative management of industry proved more efficient than its regulation by tradition or by government.

Attacks on the Existing System.—It is claimed by the socialists that the price determined under the existing system tends to the advantage of the capitalists and the disadvantage of the laborers—that the rich are growing richer and the poor poorer as a direct consequence of this system. They hold that of the enormous increase in efficiency of labor during the nineteenth century the laborer himself has received but a slight benefit, and that the rest has therefore accrued to the speculator or capitalist, as a class. Most of the reasoning of writers of this school rests upon the assumption that capital is monopolized, while laborers are competing with one another. If there were but one capitalist in the world, the reasoning of the socialists might possibly hold true. In those industries where capital is so concentrated as to form a practical monopoly, what they say may be partly true; but, taking the world as a whole, their charges are not well founded in fact or in theory. The investigations of Col. Wright and Edward Atkinson show conclusively that the poor are not growing poorer, either in their absolute condition or in their share of the national income, and that if the difference in accumulations between the richest and the poorest is greater now than it was a hundred years ago, it is because the accumulated wealth itself is so much greater that the difference between the richest and the poorest must necessarily be larger. There is reason to believe that the laborers individually have a higher average standard of comfort under the operation of the speculative system than ever before, and that, as a class, their share in the national income is increasing rather than diminishing.

The Distribution of Wealth.—The distribution of returns between laborers and capitalists is one of the most perplexing subjects in political economy. The old or "classical" theory was that the owners of capital, as a class, set aside certain funds for the payment of wages, that the amount of this fund depended on the amount of capital available for employment, and furnished the total real wages of the community, while the average rate of wages of each individual was to be found by dividing this fund by the number of laborers. Under this view, known as the wage-fund theory, the aggregate wages could be increased only by an increase in accumulations. The rate of wages in any given

amount of accumulation could be increased only by diminishing the number of laborers among whom this product was to be divided. This theory is incomplete because it fails to take account of the fact that, with a given amount of accumulation, a greater or less activity in the use of capital may cause the amount offered to the laborer to rise at the expense of the amount wasted or imperfectly utilized. It will often happen that years when the past accumulations are small are the very ones when wages are high, because the expectation of renewed business activity causes business men to utilize the existing product to the utmost. This is sometimes seen after a war. It is often seen in a time of recovery from a commercial crisis. It is almost always seen in the early development of a new country. In all these cases accumulations are small, but the spirit of enterprise is so large that wages become really, as well as nominally, high. It is evident that the speculator will advance money so long as he expects the product to be decidedly in excess of the cost of wages and materials. Each extension of his enterprise constitutes at once a demand for labor in the present and a supply of products in the future. His operations and those of other persons in the same business tend to push wages up now and to push prices down six months or a year hence. This will continue until the difference becomes very small. The limit of this difference between what the employer will pay for wages and materials (and this expenditure for materials is, for the most part, but a repayment of wages already advanced) and the expected price of the product is to be found in the interest which he must pay on his advances during the period of production. Price tends to conform to the amount of wages and interest under ordinary conditions. If the price is inadequate to pay wages and interest, the employer will find that he has made a speculative mistake and will go out of business. If the price more than covers wages and interest, the employer will feel that he has done well and will strive to extend his operations in the next period of production.

Differential Gains. Theory of Rent.—Some business, however, is not done under ordinary conditions. A part of the supply may be produced under exceptional advantages of location. If the New York market must have a certain amount of Dakota wheat, the people in Minnesota, who are supplying the same market, have an advantage due to the fact that they do not have to ship their wheat so far. The price can not fall below the cost of production for Dakota wheat, else the quantity supplied would be too small. The difference in location gives rise to a gain which is known as rent. If certain of the persons supplying the New York market have the benefit of some processes and methods of industry which are not open to all, we again have a special gain closely analogous to the rent of land, due to patents or monopolies of a process of production. Finally, if under a given set of conditions one producer is possessed of exceptional organizing power, so that he can produce part of the supply at less than the general cost of the whole, he obtains a gain known as profits in the narrower sense, due to his monopoly of brains. Price, under the existing system, is not determined by the average cost of production of the commodity as a whole, but tends to approach the cost of production of that part of the supply which is produced without exceptional advantages of any kind. Rent and profits form part of the returns of industry, but are not elements in the cost of production in the same sense that wages and interest are elements. They are known to the economist by the name of differential gains, and the laws to which they are subject are much clearer than those which regulate wages and interest.

Theory of Population and Wages.—Wages form, without any question, the largest element in cost of production. Under the competitive system they are determined by an adjustment between the supply of and demand for labor. The supply of labor under certain conditions tends to increase so rapidly that some persons have supposed that wages for unskilled labor must perpetually remain at the starvation-point, and that no progress for the mass of laborers was possible except by rigid limitation of their numbers. This view has been associated with the name of Malthus, who first developed certain important facts relating to population. He showed the existence of a tendency of population to increase faster than the means of subsistence, and pointed out that if this tendency went on unchecked there must soon come a time when the increased numbers of the laborers would prevent any gain from improved processes; a time, in short, when wages would be so low that starvation must

ensue, and continue until the number of laborers was again brought within the limit of the food-supply. He saw no escape from this difficulty except by a policy of conscious restriction of population on the part of the laborers themselves. In its main features the theory of Malthus has withstood the attacks of the critics. It is not true, as urged by Henry George, that increased population will take care of itself. It is, however, a mistake to assume that there is any such general pressure of population upon subsistence as Malthus supposes. The institutions of private property and of the family have localized this pressure of population upon subsistence, and have confined the destructive effects of overpopulation within narrow limits. If a confirmation of these views were needed, it would be found in the experience of England and other countries with regard to poor relief. Wherever it has been assumed that groups or classes of men would be supported by the community, there has been a tendency to multiply their numbers. Wherever, on the contrary, relief has been strictly limited and a spirit of independence cultivated, the number of paupers has diminished in a most unexpected manner. What Malthus says about population as a whole would probably be true in the case of a society organized on the more extreme forms of socialism, but it does not hold true of society to-day. On the contrary, the institution of the family has established certain standards of comfort and certain habits of providence which prevent the multiplication of numbers up to the limit of the food-supply, and which causes the increase of wages to be largely spent, not in supporting greater numbers under the old conditions, but in supporting the old numbers under better conditions. Of this generalization, the statistics of America and Western Europe furnish sufficient proof. The rate of wages for any given grade of industry is primarily determined by the standard of comfort set by the mass of laborers themselves. The extent to which labor can be employed in any given direction depends upon the amount of product which the public will consume at rates sufficient to insure to the laborers wages which will conform to this standard. The employer, under the existing system, makes a speculative judgment of what this amount will be. The demand for labor is not determined by accumulations, as was falsely stated by the "classical" theory already referred to, but by the expected value of the product as estimated by those who control the capital of the community.

Theory of Interest.—If no time elapsed between the expenditure of labor and the return of the product, or if there were no such thing as interest, the probability is that the price would adjust itself accurately to the labor cost; but as it is, interest enters into the prices of nearly all products. The rate of interest is determined by a bargain or series of bargains between the borrowers and the lenders. Whoever has accumulated disposable property or capital, of which money is but the symbol, has the right to the control of industry, and the speculative employer is paying a greater or less rate of interest to secure the chance of using that right himself. (Even if he is working with his own capital the case is not essentially altered, for he could sell the right to the use of that capital to some one else, and he will therefore not employ it himself unless he can obtain a profit corresponding to that which he would receive by disposing of these rights to others.) The conditions which enter into this bargain are an estimate of risk on the part of the lender and an expectation of profit on the part of the borrower. The expected profit on a loan creates a demand for such loans, just as utility creates a demand for commodities. The estimated risk tends to limit the supply of such loans, just as cost of production and many other considerations tend to limit the supply of commodities; but, just as in the purchase of ordinary commodities some persons are able to buy them for less than their utility to them as individuals, and some are able to sell those commodities for less than the cost to them as individuals, so, in the case of interest, some can borrow at rates which leave them a large margin of expected profit, and some can lend at rates decidedly above those which they would take in case of necessity. The rate for any given class of loans adjusts itself to the point which will bring into the market an amount of such capital equal to the amount business men demand at the rate in question. Risk enters into interest in precisely the same way that cost of production enters into value.

Depreciation of Capital.—It is, to say the least, an open question whether in the U. S. and Great Britain to-day the losses of investors on their principal do not more than

counterbalance the receipts in the form of interest or dividends. That the borrowers of capital as a class make money by the aggregate of transactions there can be little doubt, but that the lenders of money more than indemnify themselves for their losses is by no means certain. The socialist assumption of an enormous sum earned by capital in the form of interest is unquestionably false, and so long as this is so any scheme based upon the assumption of such a surplus must be regarded as utopian. The causes which fix the rate or the amount of interest must be carefully distinguished from those which establish the system of interest. The system of interest has grown up because, on the whole, it brought the use of capital into efficient hands. Society maintains this system as a means of securing efficiency. Whether the judgment of individual investors with regard to the rate they are receiving be true or false is a secondary question, and one with which society has not hitherto concerned itself.

Effect of Improvements in Production. A controversy has arisen as to what class in society receives the "residual share" of the product of industry. To whom, it is asked, does the benefit of improvements in production ultimately go? The socialist, as a rule, holds that it goes to the capitalist. Henry George thinks that it goes to the landowner. Gen. Walker, with the majority of economists, believes that it goes to the laborer. The last view appears to be nearest the truth. To be sure, in an individual transaction under the existing system it is the speculator who receives the gain. If he has introduced an improved process which is covered by a patent, he is, for the time being, enabled to sell his goods at the old prices, while his cost of production has been much reduced and his profits correspondingly increased. When, however, the use of the new process becomes general and all the less economical producers have gradually dropped out of the business, a fall in prices or an increase in wages, or both, must ultimately follow. There may be a considerable gain to the landowner in the form of rent, as urged by George; but it does not seem likely that this is nearly so important an element as George assumes. The action of different business men narrows down the margin between wages at one extreme and prices at the other. True, there always remains a certain amount of margin represented by the rate of interest, and it might be supposed that with the increased accumulations of capital the amount paid in interest would be covered; but the investigations of Edward Atkinson go to show that the increase in capital under the old system of industry, where each man worked by himself or in small factories, though less in each individual case, was even greater in the aggregate than exists at the present day, and that the ultimate benefit of the improvement shows itself in a larger demand for labor and a lower price of product. By the former the laborer benefits directly. By the latter he benefits with the rest of the community, as a consumer. Though it doubtless is true that the gain to consumers from new processes has been more conspicuous than the increase in wages, it is also true that the result of new processes and new methods has been to promote an increased popular use of commodities which were formerly confined to a few. It is the staples, rather than the luxuries, that have cheapened. So far as this is true, the gain from the new processes goes to the laborers rather than to the landowners or capitalists. This will appear in another way if the conditions under the present system of manufacture be compared with those under the system of hand labor. Under the system of hand labor there was a small quantity of each kind of manufactured article sold at high prices, and the laborer made his money not by the quantity of his output, but by the high price for each unit of work. He resisted labor-saving machinery because it seemed likely to throw him out of employment; but the cheapening of the product created an increased demand which more than counterbalanced the increase in supply. When railways were first introduced they were opposed by large classes of the community because it was thought that the increased efficiency of transportation would throw teamsters and innkeepers out of employment; but the increase of travel and shipment proved to be many times more than the increase of efficiency, so that to-day the reduction of cost from a dollar a ton-mile to a cent a ton-mile has increased the amount of transportation more than a hundredfold, and has increased the demand for labor instead of diminishing it.

Government Interference with Industry. The general principles form the basis of what is known as the system of

laissez faire, or the scientific justification of the let-alone policy. The majority of economists have held that it was best for the community that the interference of government with industry should be reduced to a minimum, and that in this way a higher degree of industrial efficiency and a more equitable distribution of wealth could be secured than in any other; but there has been some disposition to modify these views, especially with regard to equity of distribution. The principle that government should not interfere with industry is no longer treated as an axiom, but as a general result of experience. That most cases of government interference with industry have done harm instead of good is pretty clearly proved by history; but it is far from true that all such interference has been bad, or that proposed measures of restriction should be condemned unheard.

Usury laws furnish an example of the kind of government interference which seems right, but really is wrong. Those who advocate the restriction of the rate of interest say that the capitalists are few in number, intelligent, and well organized, while the borrowers are many, needy, and short-sighted. In these circumstances it has been urged that the government should step in and fix a maximum rate as a necessary means of preventing extortion. Yet the amount of good which has been done by such interference has been very much less than the amount of harm. In the great majority of cases the high rate of interest is not an indication of extortion so much as of exceptional opportunities for the investment of capital. If we refuse to permit the high rate one of two things happens. Either the law will be evaded, which is always bad, or the supply of capital will be restricted, the development of the country checked, and the rich opportunities which made the high rate of interest possible will remain unused. The high rate of interest is a symptom of scarcity of capital. The attempt to lower the rate by law makes that scarcity continue, and deprives the community of the natural means of remedying it.

The Labor Contract.—A somewhat similar case is furnished by the relations between labor and capital. Here again the relations between workmen and employers are somewhat like those between borrowers and lenders, and it has been proposed that the government should remedy the disadvantage under which laborers act by direct interference with the wages contract. A few extremists think that government ought to fix the rate of wages, a great many more believe in regulation of the hours of labor, while a still larger number hold that the work of women and children should be subjected to special oversight and special regulations. It is hardly necessary to say that attempts to fix the rate of wages have proved a failure wherever tried. Attempts to regulate the hours of labor have been successful in a limited degree, yet even here it may be questioned whether much good has been done in connection with the labor of adult men. The work of women and children furnishes much better ground for regulation. This is one of the cases where the self-interest of the individuals does not promote the best interests of the community. As men are constituted each is likely to strive for the maximum enjoyment in the present, even though the labor power and the intelligence of the community in the future be jeopardized by keeping married women and children in factories. The experience of England and of many parts of the U. S. with restrictive acts concerning such labor has been distinctly good. See *Factories and Factory System*.

Monopolies, Railway Regulation.—Special regulation is also proposed in those cases where an individual or group of individuals has a monopoly in a particular line of business, whether that monopoly be due to special legislation, or, as is now more commonly the case, to the necessities of business organization. With the progress of invention large establishments have become more economical than small ones. It is no longer possible for the independent workman to compete with the large monopoly. It is scarcely possible for the small establishment to compete with the great one. In railway business first, and afterward in all other lines of industry requiring much capital, monopolies have grown up in the hands of enormous joint-stock companies. It is held, with a great deal of plausibility, that such industries form a necessary subject for special regulation by the government, if not for direct government ownership, and that in the absence of such special regulation the public has no protection whatever. Most of the arrangements of modern society are based upon the assumption that individuals will act as individuals, and where such individual action does not in fact take place many of the traditions of modern industrial law

cease to apply. Yet even in those cases the dangers of interference are greater and those of non-interference less than superficial observers suppose. See *MONOPOLIES*.

Throughout this article the purchasing power of money has been assumed to be constant, and little has been said about variations in the operation of the credit system. On the way in which supply and demand regulates the value of money comment will be found under *CURRENCY*. The operations of the credit system and their effect on speculation are treated under the head of *COMMERCIAL CRISES*, while certain details respecting the relation of labor and capital are treated more at length under *WAGES*. See also *RENT*.

BIBLIOGRAPHY.—The best account of the literature of the science is Luigi Cossa's *Introduction to the Study of Political Economy* (translated from Italian by Louis Dyer, London, 1893). Among the most important of the many books on the subject accessible to English readers are Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (edited by J. E. Thorold Rogers, Oxford, 1880); John Stuart Mill, *Principles of Political Economy* (London, 1848); Henry C. Carey, *Principles of Social Science* (Philadelphia, 1858, a classical work of the protectionist school); W. Stanley Jevons, *Theory of Political Economy* (London, 1871, the first important work of the mathematical school); Henry George, *Progress and Poverty* (San Francisco, 1879); Francis A. Walker, *Political Economy* (2d ed. New York, 1887); Alfred Marshall, *Principles of Economics* (London, 1890).

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Political Parties: free social organizations founded and kept together for the purpose of accomplishing certain political results.

POLITICAL PARTIES IN GENERAL.—*Essential Principles.*—Political parties can not exist and flourish where government is not of a nature to be influenced greatly by public opinion; but where public opinion is recognized and encouraged they grow up spontaneously out of certain psychological characteristics of human nature. In regard to all important political questions there will not only be differing opinions, but such opinions, when free to act, will almost invariably range themselves ultimately into two opposing parties. When not influenced by authority or considerations of personal gain or loss, such party alliances are determined by certain fundamental conceptions or principles. Those persons in whom the importance of stability and order predominates range themselves on the one side, while on the opposite side are to be found those who give emphasis to the importance of action and progress. Frederick Rohmer, in his *Doctrine of Parties*, compares these two principles with the peculiarities of the different periods of human life. The boy and the youth, he says, represent the impulse in behalf of action and progress. This impulse corresponds with the radical element in political life. At the other extreme the old man represents the most conservative element. He is inclined to oppose every departure from the ways of the past; he distrusts all innovations; he forms at once an obstacle to progress and a security against precipitancy. Between these two elements represented by age and youth there are elements represented by the developing stages of manhood. Conservatism may be found in the boy and radicalism may be found in the old man, but whatever the views of the individuals at the two extremes, there is an intermediate period during which less extreme views are commonly held. While, therefore, youth and old age are the personifications of radicalism and absolutism, manhood is the personification on the one hand of liberalism, and of conservatism on the other. Hence wherever political parties are organized these four elements, corresponding to the terms absolutist, conservative, liberal, and radical, will be found in a greater or less state of activity. The doctrines in relation to which political parties take their characteristic positions are determined by the dominant political issues of the day; but whatever the question at issue, the matter of personal temperament will generally exercise a controlling influence in determining party affiliations. This, however, must not be understood as applying to all classes of persons. On the contrary, there are two classes to whom these considerations do not apply: First, those who unselfishly devote their lives to the work of reforming what they consider abuses, and, secondly, those whose political actions are selfishly determined by considerations of personal advantage. These two classes either refuse to acknowledge allegiance to any party or are bound by such feeble party ties that they can readily pass from

one party to another. It is in consequence of such feebleness of tenure that these two classes constitute the uncertain element in every popular election. Notwithstanding the tendencies of political parties to group themselves into a dual system under the general character of conservatives and liberals, it frequently happens that minor interests of various kinds express themselves, as shown below, by means of separate organizations.

Party Declarations and Methods of Action.—The doctrines of political parties are nowhere very clearly or authoritatively expressed. This statement would seem to be at variance with the custom in the U. S. of adopting "party platforms"; but a very slight familiarity with the political history of that country must reveal the fact that such declarations have no very authoritative significance. The importance of such a manifesto of course depends upon the deliberateness and the discretion with which it is framed. The Tamworth manifesto of Sir Robert Peel in 1837 outlined the policy by which the Conservative party in Great Britain was guided for many years, and the Nottingham address by W. E. Gladstone in 1890 performed a similar service for the Liberals; but in the U. S. the platforms are either the joint product of conflicting opinions, or the utterances of single individuals acting in an irresponsible capacity. They are ordinarily designed quite as much to show the weaknesses of the opposing party as to set forth the principles of the party making the declaration. Moreover, new exigencies may arise, and if the declarations are too definite there may be no room for that flexibility necessary to party efficiency. If a party declares itself unequivocally in favor of an immediate policy of a certain kind, it may be found a little later that only a partial fulfillment of its promises are for the present within the range of possibility. Hence it is that the various party platforms are generally somewhat vague in their utterances, and that parties consider themselves bound to such utterances by very slender ties.

The management of political parties differs greatly in different countries. In Great Britain each party has its official leader, who, acting under such advice as he may seek, controls and directs all party action. By parliamentary law all candidates are required under oath to make a public statement in detail of expenditures of every kind, such expenditures being strictly defined and limited by statute. Contested elections are tried, not by Parliament, but by the courts, and in case the law in regard to expenditures is shown to have been violated the seat of the defendant goes to his opponent. Nominations are made by personal announcement, not by the choice of a Caucus (*q. v.*). As the legitimate expenses of a parliamentary election for printing and for speakers are necessarily very considerable, the number of candidates presenting themselves is limited by the probabilities of success or failure. In the U. S., on the other hand, there is practically very much less individual liberty on the part of candidates, and very much more party supervision. The candidate does not nominate himself, but is nominated by a caucus or a convention. Each political party has its national committee, its committee in each State, and its local committees. These committees determine the general plan of canvass or "campaign," providing, for the most part, by voluntary subscriptions for the necessary expenses. Toward these expenses the candidates are expected to make large contributions; and in many instances holders of minor offices have been made to feel that the permanency of their tenure depended upon the liberality of their contributions. The freedom with which money is expended depends upon the supposed importance of the election. In case of a hotly contested election, especially when a U. S. Senator is to be chosen by the Legislature or when there is a presidential election, the efforts of the various political committees are extended down to a personal canvass of the voters in every voting precinct. It not infrequently happens that even in the largest States the issue is determined by a very small majority. In the presidential election of 1884 the entire electoral vote of the State of New York was determined by a majority of only a few hundred, and the electoral vote of the State determined the presidential election, on which depended the tenure of more than 100,000 subordinate officials. Either human nature must be reformed or so momentous an issue must be the parent of widespread corruption. With human nature as it is, the more thorough the organization of political parties, the more intense will be the political feeling, and the more dangerous will be the political menace.

POLITICAL PARTIES IN PARTICULAR COUNTRIES.—*In Great Britain.*—The four principal parties represented in the British Parliament are the Conservatives, Liberals, Home-rulers, and Liberal-Unionists. Of these, the first two can be traced back to the early times of the monarchy, in that the earliest records reveal the existence of contests between a party of progress and a party that clung with tenacity to the established order. A clearer dividing-line appears in the reign of Elizabeth, but party designations corresponding in any respect to the present party terms were not employed till the time of the great civil war, in which Cavaliers and Roundheads may be regarded as the prototypes of the two modern groups. The latter, however, correspond more nearly to the later distinction between Petitioners and Abhorrrers—terms employed in the reign of Charles II. to designate respectively those who favored the petition for the summoning of a Parliament hostile to the succession of the Duke of York, and those who, in their hatred of the Exclusion Bill, declared their "abhorrence" of the attempt to induce the king to call Parliament. These terms soon gave way to the more familiar Whigs and Tories, as the enemies and friends of the royal prerogative were respectively called; and these names continued to designate the party of progress and the party that held to established rights till, in the nineteenth century, they were replaced by the terms Liberals and Conservatives. It is not to be supposed that the party issues which divide modern Liberals and Conservatives can be found in the older distinctions between Whigs and Tories or their respective predecessors, but the same attitude toward measures of change and reform is discernible throughout all the vicissitudes of party history. The Home Rule party came into existence as a distinct political organization through the efforts of Butt and Parnell. (See HOME RULE.) By an alliance with the Liberals under Gladstone's leadership, in 1886, it made Home Rule the chief issue between the Liberals and Conservatives, and in the House of Commons of 1892 secured a majority favorable to that measure. This action of the Liberals caused the defection of an important group of members who, under the name of LIBERAL-UNIONISTS (*q. v.*), have strenuously opposed Home Rule for Ireland. A less important party than any of these is the Labor party, which is socialistic in some features. See GREAT BRITAIN (*History*) and PARLIAMENT.

In France.—While progressive and conservative elements are discernible throughout French political history, it was not till the era of the Revolution that definite party issues and party names made their appearance. Radical and moderate opposition to the old régime were the respective characteristics of the JACOBINS and the GIRONDISTS (*qq. v.*) during this period, while the Feuillants tried to maintain the Bourbon monarchy, but with constitutional limitations. Since that time political parties in France have passed through many changes both of name and principle. After the restoration of the Bourbons on the final overthrow of Napoleon I., there were, in addition to the Constitutional Monarchists who supported Louis XVIII., the Ultra-Royalists, or adherents of the Count of Artois; afterward Charles X., the Bonapartists, the DOCTRINAIRES (*q. v.*), and the Republicans. When the Bourbon monarchy was finally overthrown, Louis Philippe, the representative of constitutional monarchy, encountered an opposition from Bonapartists, Republicans, and Legitimists. The first of these triumphed with the elevation of Napoleon III. to the imperial throne in 1852, and the second, the Republicans, with the establishment of the republic in 1871. The death of the Comte de Chambord in 1886 made the Count of Paris of the Orleans branch the heir to the Legitimist claims, and his death in 1894 has brought the young Duke of Orleans forward as the representative of the Royalist party. This group, however, has lost much of its importance as an element of opposition to the French republic, and the Bonapartists and Radicals have shown themselves more dangerous enemies to the Government. The reactionary elements of the opposition, including both Bonapartists and Monarchists, sit together in the Chamber, and are known as the Right. The Republicans may be divided into the Opportunists, who believe in adapting their political action to circumstances rather than forcing it into conformity with certain pre-established principles, the Moderates, and the Radicals. The last of these constitute the Extreme Left, while the more moderate groups make up the Center. See FRANCE, HISTORY OF.

In the German Empire.—The leading parliamentary groups in the Reichstag after the formation of the empire were the National Liberals, who, though not in sympathy

with Bismarck's general policy, supported his efforts for unification and reform; the remnant of the Progressists (*Fortschrittspartei*), who opposed all compromise with Bismarck; the Old Conservatives, hostile even to the measure of reform that Bismarck was willing to concede; and the Free Conservatives (*Reichspartei*), who were his thoroughgoing supporters. To these were added the Ultramontane party, or Center, composed of Roman Catholics who opposed the Government's policy during the *KULTURKAMPF* (*q. v.*), the Social Democrats, with a socialistic programme, the Jewish members held together by racial interests; and the protesting delegates from Alsace-Lorraine. Since 1871 the representation of the Social Democrats in the Reichstag has increased from two in that year to forty-three after the election of 1893; but none of the numerous parties has increased sufficiently to secure a majority in the Reichstag. After the election of 1893 the principal parties represented in that body were, in the order of numerical strength, the Center, called also the Ultramontane or Clerical party, German Conservatives, National Liberals, Social Democrats, Radicals (*Freisinnige*), Free Conservatives, and Anti-Semites.

In Italy.—The distinction between conservatism and liberalism can not be clearly discerned in the division of Italian parties, since both the majority and the greater portion of the minority profess liberal principles. They are divided, however, on minor issues, the supporters of the ministry being known as the Ministerial Left, and the others as the Opposition Left, or the Pentarchists. The Irredentists are those who demand the annexation of an "unredeemed" Italy—i. e. of the provinces inhabited by an Italian-speaking population but subject to a foreign government.

In other European countries the names and principles of the leading political parties may be briefly summarized as follows: In Austria racial and religious differences constitute the chief political issues. Thus the party of the Young Czechs desire national emancipation, to which the Germans, the most numerous element, are opposed. The chief parties in the lower house of the Reichsrath may be described as the German Liberals, the Poles, and the German Conservatives and Clericals. In Belgium the two leading parties are the Catholics, or Clericals, and the Liberals. In the Danish Rigsdag the Right, or Conservatives, hold that the lower house, or Folkething, has not the supremacy in matters of taxation and finance and in the choice of the ministers, while the Left contend that these rights are vested in that body. In the Spanish Cortes there are, in addition to the usual division into Liberals and Conservatives, the extreme Republicans and the moderate Republicans, or Possibilists. A few Carlists were returned in the elections of 1893.

In the United States.—The principal political parties in the U. S. are discussed in the articles DEMOCRATIC PARTY, REPUBLICAN PARTY, PEOPLE'S PARTY, and PROHIBITION PARTY (*qq. v.*). For an account of older political groups, see FEDERALIST, ANTI-FEDERALISTS, FREE-SOIL PARTY, and KNOW-NOTHINGS; and for the general facts of party history and the discussion of party programmes, see UNITED STATES (*History*), SLAVERY, FREE TRADE, PROTECTION, NATIONALISM, etc. On the subject of the methods of political parties in the U. S., see the articles CIVIL SERVICE and CIVIL SERVICE REFORM and PRIMARY ELECTIONS. On the general subject of political parties, consult Wachsmuth, *Geschichte der politischen Parteien* (3 vols., 1856); Cooke, *History of Party in England* (3 vols., 1836); Rohmer, *Doctrine of Parties* (1844); Sidgwick, *Elements of Politics* (1891, chap. xxix.); Woolsey, *Political Science* (1878, pt. iii., chap. xiv.); Bryce, *American Commonwealth* (vol. i.).

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Political Science: the science which treats of the nature of the state, and of the principles underlying society organized for the purpose of governing itself. In accomplishing its objects political society employs force. This is what especially distinguishes it from industrial society, whose moving power is simply the desires of its individual members, and from religious society, whose motive power is likewise individualistic, acting through the consciences of its members. Of course, religious bodies have often employed force to carry out their plans, but in that case they have become political, interfering in the government of the state.

NATURE.—*The origin of the state* has been explained usually in accordance with one of three theories: First, the theological. By this God is declared to have directly instructed man how to organize government, and to have upheld government by divine intervention. Second, the con-

tract theory. This presumes that men first lived in a state of nature, each independent of others, and with unlimited rights to all things. To keep peace and to secure the benefits of co-operation, they entered into a contract by which each gave up many of his individual rights and agreed to submit to government. Hobbes, Locke, and Rousseau, the chief exponents of this doctrine, advocate entirely different forms of government, as will be seen in the historical portion of this article, and the theory is now abandoned by scientific writers, though it still has some vogue. Third, the natural or development theory. As Aristotle says, man is a political being, formed for society. From the family, organized unconsciously under the father, grows the tribe, thence the state, assuming gradually the form of government best adapted to its needs. Man can not develop normally outside the state.

The purpose of the state may be considered either from the standpoint of its members or from that of the state as an organized unit. From the standpoint of the individual, Aristotle has well said that the state exists to enable man not merely to live, but to live well, or better, as Pollock puts it, the purpose is "complete life in the associated state." From the other point of view, Burgess, following Holtzendorff, gives three ends: the immediate purpose of securing orderly government and liberty within the state; the next end of developing the national spirit and strength; the ultimate purpose, the perfection of humanity, to be secured finally, after æons of separate national governments, in one all-inclusive world-state.

Relation of Political Science to Politics.—Ordinarily by the word politics used alone one understands the art corresponding to political science. The practice of politics, naturally, arises in governments of a low grade long before the science, and experience eventually furnishes the material from which the general principles of the science are drawn. The politician, however, or the statesman—for a statesman is simply a practical politician of the highest class—in an advanced stage of civilization has much to learn from the teacher of the science of politics, the political philosopher. The latter, from his studies, is the better equipped of the two in the knowledge of the experience of the past and in the fundamental principles of true statecraft, though it is doubtless true that he less often knows the temper of the people and the special form into which a law must be put to be adapted to their needs. The two classes of men need to work hand in hand. Neither can do his best work without the aid of the other. It has been a common fault of political philosophers to limit their studies too much to the letter of constitutions and laws. By so doing, and by thus failing to study the actual working of the laws, they have often been led into false judgments. They have failed to catch the spirit of the law. Even great writers like Montesquieu have at times failed in this regard. The chief intellectual characteristic of the political philosopher should be an unprejudiced judgment; but he needs a wide and accurate knowledge of facts as well. The business of the statesman is action—the accomplishment of some specific purpose for the good of his people. He needs chiefly knowledge of men, their motives and passions, and firmness and skill in handling the means at his disposal to bring about the desired results.

The relation of politics to morals is as difficult a topic as the political philosopher has to consider; it is one that the practical politician meets daily, and no one who is conversant with the actual working of politics doubts that many politicians treat the subject of morals differently when considering it from the standpoint of their duties as statesmen than when looking at it from their private standpoint. Few men will plant themselves openly on the side of Machiavelli, and say that when the advantage of the state is concerned the end justifies the means, however corrupt or wicked in themselves the means may be: and yet politicians—honest men—condone many corrupt practices in public life. The following is practically the view of Bluntschli on this subject: Many of the aims of statesmen may be morally indifferent, as when they favor the extension of a railway system, but they ought never to be immoral. It must be borne in mind, however, that the statesman deals with men as they are—weak, and often wicked—and that his business is to do something for the good of his people. He is a man of action. He can not, therefore, if he is to succeed, lift himself far above the level of the best average thought of his people. He ought to have high ideals; he can not hope to attain them soon. These ideals are doubtless rising among the

people, and it is the duty of the statesman to lead the people; but he can not push forward very rapidly. One would not justify the cruel acts of earlier times against prisoners of war; but we justify war itself, one of the greatest of evils and wrongs, and justifiable only on the ground that it prevents a greater evil. In modern society one of the chief purposes of the state is to effect the moral advancement of its citizens. This suggests the question whether the man whose political sagacity and skill are likely to serve the interests of the state, but whose private life is known to be immoral, is entitled to the support of conscientious citizens. The evil of an individual may possibly further the good of the whole, and in certain circumstances the statesman seems to be justified in making use of corrupt agents and evil passions to secure good results. This doctrine, however, may readily be abused.

Closely connected with this topic is the one concerning what has been called the *right of revolution*. Society develops and changes; laws once suitable become so no longer. Often to avoid an injustice they must be broken or evaded before they are changed. To suit the law to specific cases is the duty of the courts; and in its interpretation the law itself is slowly changed to meet the needs of the times. When, however, need is felt for a great change it must come, or suffering will ensue. It is one of the chief advantages of modern governments that the laws can be changed directly by the act of the people, usually without violence. In this way peaceful revolutions arise. When, however, the executors of the law have a personal interest in upholding the law, and the law, as executed, has become very oppressive, the question arises, Shall the people endure the wrong or commit the crime of overthrowing the law? Here, as before, one has but a choice of evils, and all agree nowadays that circumstances may be so onerous as to justify a bloody revolution. The law exists for the state; it must be shaped to meet the needs of the state.

The relation of political science to economics appears most clearly in the fact that the individualistic economic motive often determines the political action of the citizens. In times of war or other national crisis the patriotic impulses are apt to dominate, but in times of peace each person and each class is inclined to keep personal welfare in the foreground and to think little of the good of the state. Hence arise class legislation, political corruption, and the rule of the wealthy or of demagogues. The clashing economic interests of different classes lead to struggles for political supremacy, and by these struggles constitutions are subverted and new ones made. Contrariwise, political action is often the dominant cause in bringing about a change in economic conditions. See REPRESENTATION.

The best form of government for the state is a topic that has engaged the thoughts of philosophers in all ages. Comparative studies have led to the belief that there is no absolutely best form. Each people must have a form adapted to its special stage of civilization, character, and needs. No one doubts that the nineteenth century shows a strong tendency toward democracy, under various forms, in all civilized nations. There is also an evident tendency for the state to increase its functions and to become more active in regulating business and private life. The limit of this activity can not yet be seen.

HISTORY.—Ancient Times.—Aristotle may be said to be the founder of political science, and, indeed, since his day no other writer has appeared who has surpassed him in philosophical penetration and power of analysis, or even probably in extent and thoroughness of research. Before his time in the East—in India and China—there had been writings that touched the subject, especially in connection with religious teachings, but no one had formulated it. The laws of Manu in India give in detail many duties of the different castes in society, and even those of the king and courts are considered at some length, while Confucius and Mencius in China, among many other wise sayings, especially on morals and religion, give some also on the relations and duties of governments and people. Mencius even goes so far in liberal views as to declare that a people may rid itself of a king with whom it is dissatisfied. Again, he divides citizens into two classes, the head-workers and the hand-workers, but he has not treated the subject at all fully or scientifically. In early Greece Homer and Solon give wise advice on specific points; Aristophanes, in satirizing the wickedness of demagogues and the folly of the people, shows much political wisdom. Socrates rendered important service to the science by his discussions on ethics as applied in political life. Plato, in his *Re-*

public, and especially in the *Laws*, treats the subject at considerable length, though not systematically. In the *Republic* he gives us an ideal state. He does not pretend to consider the state as it is, or even to consider men as they are; rather he writes a romance showing a state and men as he might wish them to be. In the *Laws* he discusses the subject of government with much more regard for actual affairs, and, in fact, in both works there are wise suggestions for statesmen and many good ideas that might bear fruit in experience. For example, though the mental and physical education of the young can not wisely be directed in all respects as Plato advises, the importance of the proper training of the young, if one would have a successful state, can not be overlooked. It would not be well, perhaps, to have philosophers the sole governing class, with the other classes under their control, as he suggests; it would be well to have rulers, by whatever means selected, wise. The family can not be abolished, as Plato wishes. He is right in thinking that, in great part, at least, justice is the true end of the state, and that the true strength of the state lies in virtue.

In Aristotle we find thorough preparation for his work, the proper method, wonderful insight, and completeness in his treatment. He had collected, arranged, and digested, it is said, 360 different constitutions; and with this mass of facts at hand he formulated his general principles. He analyzes into their elements the state and government. He traces the influence of the various factors of which the state is composed, and their relations to one another. His idea regarding the origin and nature of the state is summed up in the words, man is a political being. This contains what is true regarding the divine origin of the state; it implies all that is true regarding the theory of the social contract. Man was created to live in society, and with a nature that develops only there. Society begins without special intent of man. As he develops his acts become more and more conscious, and politics becomes an art as well as a science; civilized government is based in great part upon contract. Aristotle classified governments into monarchies, aristocracies, and democracies, a division followed since his day, though the mixed forms of the present day render it now of doubtful utility for modern use, the names often not conforming to the reality. He rightly, too, saw that the chief danger to each form of government was in the abuse of its principle, the carrying of its principle so far that it would become unbearable. The chief danger of a democracy, for instance, is that democracy will be carried to the extent of anarchy, when the people will demand a strong hand to restore tranquillity. The monarchy, too, is in danger of becoming a tyranny, as he said, that in its turn must be overthrown. In France, since the days of Mazarin, this principle of Aristotle's has been exemplified more than once. From the nature of Greek civilization Aristotle was unable to see the evil of slavery. Instead of that, he seems to consider it a necessity and even a blessing. His doctrine of natural slavery—that some men are born to command, while others, from their natures, are incapable of self-direction—has in it much truth, and is an advanced criticism on the practice of his time. In the philosophical schools established after Aristotle's time there are hints of some of the later doctrines. The Cynics protested rightfully against the too great exaltation of the state by Plato and Aristotle. The Epicurean doctrine, by leading men away from public life, had a like tendency. Epicurus, too, may be fairly considered the precursor of Hobbes in the enunciation of the doctrine of the social compact. The Stoics laid down and emphasized the principle of natural justice that played so great a rôle in later times. Cicero, Marcus Aurelius, Epictetus, and others, in their writings on ethical subjects, exposed the weakness of the slave system, while Cicero, Polybius, and the juriconsults of the empire, discussed with effect the forms of the state, the nature of law, etc., though generally with little advance on the doctrines of Aristotle.

Christianity and the Renaissance.—Although Christianity may be said to have revolutionized the politics of the world, the purpose of Christianity was not political. Christ stated that his "kingdom was not of this world," and the disciples taught men to "be subject unto the higher powers." The doctrine of absolute submission to the will of God and the founding of a spiritual "kingdom" with Christ as its supreme head show nothing different in purpose from the old Jewish political theories. Practically, however, when the "kingdom" is made a spiritual kingdom solely, and when the decision as to the duty of every individual regard-

ing this kingdom is left to himself to make, and he is held individually responsible for his beliefs and his acts, we have an entirely new principle. Individual responsibility and the equality of all are democratic principles that, if carried out in the religious world, will certainly make themselves felt ultimately in the political world. The manifestation, however, of the force of this principle did not make itself felt until about the beginning of modern history, and not until recent times has it been of prime consequence in the political world. The early Christians contented themselves with keeping Church and state apart, and with looking after the moral and religious life. When at length the state became Christian, however, the question of supremacy arose; and the struggle between Church and state lasted throughout the Middle Ages. Thomas Aquinas was the most illustrious writer on one side, as was Dante on the other.

With the Renaissance came a new spirit into all fields of learning, and in Machiavelli political science found an admirably equipped exponent of the political doctrines of his day and a writer whose teachings have had a great influence. He was a man of wide experience in political matters and of keen insight into human nature and the real character of political problems. He did for political science the great service of separating in thought the field of politics from that of morals. In political practice the statesman can not afford to neglect the moral sentiment of his people nor to favor immoral practices. It is, nevertheless, very important for the student of political science to distinguish the two fields, and to be able to look at political problems from the standpoint of only the advantage of the state. This Machiavelli did more completely, probably, than any other writer. He sets out in the *Prince* the way in which a ruler, under various circumstances, should act in order to hold and to strengthen his government, and in giving these counsels he halts at nothing, however bad. If they can strengthen the ruler, as he thinks they can under certain circumstances, he advises hypocrisy, treachery, oppression, and murder. See MACHIAVELLI, NICCOLO DI BERNARDO.

Modern Times.—The Reformation emphasized the principle of individual responsibility as it had never before been emphasized, and this brought about a freer discussion of religious and, naturally, also of political principles. Protestants first, and then Catholics, questioned the rights of kings and peoples, and then first the question of sovereignty and where it rests was propounded, the question that since then has been the central one in political philosophy. There were many writers on all sides—Luther, Melancthon, Reuchlin, Colet, More, Erasmus, Politian, Suarez, Calvin, Bacon. The most illustrious was Bodin, whose great work *Les Livres de la République* in method and extent may be compared with those of Aristotle and Montesquieu, for he, too, studies historically, and attempts to base his opinions on a wide knowledge of facts. He criticises Aristotle on many points, sometimes effectively, sometimes not. He exposes well the weakness of slavery, and his denunciation comes with more force from the fact that slavery was then rapidly on the increase, owing to the discovery of America nearly a century before. His discussion of sovereignty is able, and though in attempting to discover the best form of government he takes sides in favor of monarchy, he yet recognizes so well the weaknesses as well as the strong points of each form that he can not be considered partisan or narrow-minded. In his opinion every form of government should be subject to divine law. He is a vigorous opponent of Machiavelli, declaring that justice is the strongest support of all governments, and that the governor is bound at any rate to do justice. He has also rendered a valuable service to the science by his careful distinction between public and private law.

The English revolutions were indirectly the cause of the two greatest works on political science of the seventeenth century. When the doctrine of the divine right of kings had been pushed to an extreme in practical politics by the house of Stuart, its weakness was shown by the decapitation of Charles I. and the forced abdication of James II. Naturally the violent controversies of the day led the thinkers of both schools to formulate their doctrines and to defend the actions of their parties by an appeal to reason. Hobbes, in his *Leviathan*, defends absolutism. In a state of nature, which seems to him to be a state of natural warfare, each man has a right to defend himself. To secure peace and protection each one surrenders this right to a common ruler. This surrender is complete and irrevocable; the ruler there-

fore is absolute, subject only to the law of God. See HOBBS, THOMAS.

Many others wrote on the side of Hobbes, notably Filmer, and many wrote refutations of his opinions. The best work of the latter kind, though it was directed especially against Filmer, and the one that had by far the most influence, was the *Essay on Civil Government*, by John Locke. Locke starts, as does Hobbes, from the state of nature; but the state of nature in his judgment exists between men whenever there is no superior power to determine their possible disputes. This state is not necessarily a state of warfare, for there are rights which exist among men even without government—natural rights which have their corresponding obligations recognized by all even where civil law does not exist. Among these natural rights are the right of property, the right of liberty, the right to labor. Society is formed by contract, to be sure, to protect and carry out these rights, but it is not formed by the renunciation of these rights to a ruler. Rather the ruler is the instrument in the hands of the people to enforce these natural, but still retained, rights. One readily sees the conclusions that are drawn from such premises. He founds the right of property upon labor, a new doctrine then, and one tending most strongly toward upholding the control of the House of Commons over the royal purse. He, of course, attacks slavery as subversive of one of the natural rights. Most pointed of all at the time, and most closely applicable to the situation, is his doctrine of the right of revolution—if the king fails in his duty to the people, they may depose him.

Montesquieu, in his *Esprit des Loix*, furnished one of the most learned works on the subject of political science. "History explained by laws and laws by customs; the secrets of the customs sought for in the hidden instincts of human nature, in the mode of development of each society, in the influence of climate, and in the particular needs created for each nation by its geographical position; all the differences of race, genius, and legislation ranged in harmonious order; the science of government, which embraces morals, religion, commerce, and industry, and withal, order, method, and perspicuity, joined to an ever-present consciousness of the grandeur of man, of the responsibility of the powerful, of the rights of the oppressed, and a vigorous love of justice and right"—these are some of the merits claimed for the work by its admirers. In it are found some wrong interpretations of facts, but it is filled with valuable information, with profound reflections, and has been probably the most influential work in modern practical politics. Montesquieu's interpretation of the English Constitution, with his strong advocacy of the doctrine of the separation of the legislative, judicial, and executive powers, has been generally followed until within a few years, and it doubtless had direct influence in shaping the Constitution of the U. S. American thinkers are inclined to believe in the desirability of this separation of powers, as did he; but the experience of Great Britain has led many to question its wisdom, and it is doubtful if now a majority of writers on political science will be found in agreement with him. His theory as to the principles of governments, in which he makes monarchy rest upon honor and democracy upon virtue, i. e. patriotism and love of equality, is very suggestive and contains much truth. His views as to corruption in governments and as to the dangers from corruption that surround democracies can not be kept too closely in mind. His view of popular liberty is that of to-day, and to him is due the credit of having established it as a principle. His method was right. His thoughts, that one must carefully study the human passions that underlie political forms; that the forms of government were relative to climate, stage of civilization, surrounding people, etc.; the theory of the division of powers and of checks and balances in government, were important services rendered to the science.

Jean Jacques Rousseau, in his *Contrat Social*, elaborated the doctrine of the social contract that had been propounded by Hobbes and developed in another direction by Locke. Before examining the act by which a people choose a king, he thinks it wise to examine the process by which people become a people. "To find a form of association which shall defend and protect with the public force the person and property of each associate, and by means of which each, uniting with all, shall obey, however, only himself, and remain as free as before" is his problem. Each citizen in his state loses natural liberty, but gains civil liberty. The general will controls all. The contract is among the people. The relation between people and king is not a

contract, but a business method that the people can change at will. Any form of government may do, so long as people really keep control. Indeed, unless the people are good and intelligent, a republic is perhaps not suited to them. He thinks that all the people should come together periodically to vote (a) whether they wish to keep the present form of government, and (b) whether they wish to leave the government in the hands of the present rulers.

To his teachings regarding the omnipotence of the people, set before the people in attractive form and widely read, is ascribed by many a great influence in forming a theory for the French Revolution.

The economists of the close of the eighteenth century and of the first half of the nineteenth, by their doctrine of free trade, which resulted in extreme *laissez-faire* doctrines, exercised a great influence over political thought and theories, which has not yet ceased. This doctrine tended toward individualism, springing from the theory that the interests of the state coincide with those of individuals, without sufficient consideration of the frequent hostility of private interests to one another. Later in the century the rise of the socialistic school gave a new turn to political as well as to economic thought, and as a consequence the great question of political science of to-day is to fix the limits of the activity of the state. On the one hand, the individualists think that the state should exert only what may be called its police power, securing to each safety of property and liberty to work as he will, but taking no initiative in industrial enterprises. On the other hand, the socialists or nationalists wish to put all industrial control, and even all capital, into the hands of the state for management. Both seek equally the good of the greatest number, or, perhaps, more accurately stated the greatest good of all; both claim to base their theories on justice.

Among other modern writers who have contributed to the advancement a few require especial mention. Bentham and Austin, in England, did much in expounding the theory of sovereignty and law, and in effecting legislation along criminal and economic lines. De Tocqueville, in his *Democracy in America*, attempted to show by an examination of the real working of democracy in the great republic the fundamental principles of that form of government. The work is of great value from the standpoint of information as well as of philosophical criticism, though it may now be said to be superseded in great part by the work of James Bryce, *The American Commonwealth*. Bluntschli in Germany, Lieber in the U. S., and Laveleye in Belgium rendered distinguished service in expounding political principles. Herbert Spencer, in his *Political Institutions* and in his great collection of facts regarding various societies, better than any other writer of the day, perhaps, may be said to have formulated a general theory, and to have thrown light upon the origin of political institutions, though on this last point some of the writers on anthropology have done as good work. Space will not permit the enumeration of the long list of names that might be cited as those of living writers in this field, for the present day is one of active investigation, and many works of great value have been produced. The tendency seems to be toward study of special problems and separate states rather than toward general philosophical works, though two or three of the later writers, especially in connection with sociology, seem to be preparing to formulate again with ability the general principles of politics.

AUTHORITIES.—The best authorities are, of course, the works of the great writers, the best of whom have been mentioned. The best general commentary covering the whole field is Paul Janet's *Histoire de la science politique dans ses rapports avec la morale*. Besides may be mentioned Burgess, *Political Science and Comparative Constitutional Law*; Pollock, *History of the Science of Politics*; Bluntschli, *Lehre vom Modernen Staat* (the first volume has been translated into English under the title, *The Theory of the State*); Woolsey, *Political Science*; Lieber, *Civil Liberty and Self-government and Political Ethics*. Lalor's *Cyclopedia of Political Science* contains many excellent articles on the various branches of the subject.

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Polity, Ecclesiastical: the form, system, and method of Church government. There are three general plans of such government, each of which has been advocated on the ground that it is the plan laid down in the New Testament for the perpetual conduct of the Church. There is, however, a growing agreement among Protestant scholars to

concede that the New Testament can not be quoted for any one plan exclusively. The three plans named are in their historic order: 1. The *Presbyterian*, or government by presbyters, or elders, also styled bishops, all the clergy being on a level, these officers coming directly from the synagogue, and historically from the earliest constitution of the Hebrew people. (See *PRESBYTER* and *PRESBYTERIAN CHURCH*.) 2. The *Congregational*, according to which each congregation regulates its affairs and settles its belief independent of control by other congregations, although such are called in for consultative purposes and joint action. (See *CONGREGATIONALISM*.) 3. The *Episcopalian*, or government by bishops who constitute an order superior to the presbyters and deacons. (See *BISHOP*.) Originally it would seem that the bishop was merely the presiding elder over the board of elders which governed the local church; then he was the permanent president, then raised above the other elders. In the Ignatian Epistles (A. D. 107-18) this distinction between presbyter and bishop is first made. The next step is the development of the diocese, or the union of several congregations under one bishop. This phenomenon comes out in Irenæus (d. about 200), Tertullian (d. 240), and especially in Cyprian (d. 258). Then came the metropolitan and patriarchal system, when the union of Church and state had been effected under Constantine (d. 337). The metropolitans were styled archbishops in the West. They were the bishops of the chief cities and presided over the bishops of the adjacent province. The patriarchs were the Bishops of Alexandria, Antioch, Rome, Jerusalem, and Constantinople, and had the oversight of two or more provinces. They ordained the metropolitans. The Greek Church has five patriarchs, but substituted the Patriarchate of Moscow for that of Rome. The Bishop of Rome protested against the action of the Fourth Œcumenical Council (Chalcedon 451, *Can. 28*, cf. Hefele ii., 527, *seq.*) in putting the Bishop of New Rome (Constantinople) on a level with him of Old Rome, and the conflict of the East and West Churches may be said to have thus begun. So came about the final development and the highest of the episcopal idea. The Bishop of Rome became the pope, and since 1870 the infallible pope, superior to patriarchs, metropolitans, and bishops, the successor of St. Peter, and the head of the Universal Church.

The Church of England is episcopal in government, and claims apostolic succession. It is governed by two archbishops—Canterbury and York—under the supremacy of the sovereign. The Church in the U. S., as the Episcopal denomination prefers to be called, and the branches of the Church of England are also episcopal. The bishops of the Swedish and Danish Lutheran Churches, of the Moravians, Methodist Episcopal, United Brethren in Christ, Evangelical Association, and other denominations are properly superintendents, and no divine right is predicated of them.

The Presbyterian plan is adopted by Reformed bodies which do not call themselves Presbyterian. It is usually linked with Calvinistic theology. The Congregational plan in like manner is adopted by those who are not styled Congregationalists, as the Baptists, Disciples of Christ, Unitarians, and Universalists.

LITERATURE.—For the New Testament polity, see G. A. Jacob, *The Ecclesiastical Polity of the New Testament* (London and New York, 1871; 3d. ed. 1894); E. Hatch, *The Organization of the Early Christian Churches* (1881; 2d. ed. 1888) [advocates the Greek origin of the Church polity]; for Presbyterian view, see Charles Hodge, *Discussions in Church Polity* (New York, 1878); A. T. McGill, *Church Government* (Philadelphia, 1890); for the Congregational, H. M. Dexter, *Congregationalism* (Boston, 1865; 5th ed. 1879); G. T. Ladd, *The Principles of Church Polity* (New York, 1882); and for the Episcopalian, see Francis Vinson, *Manual Commentary on the General Canon Law and Constitution of the Protestant Episcopal Church in the United States* (1870).

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Poliziano (Lat. *Politianus*; Eng. *Politian*), ANGELO: humanist and poet; b. at Montepulciano (whence his own name), July 14, 1454; d. at Florence, Sept. 24, 1494. In 1469 he was sent to Florence to study, and had as his masters several of the most renowned scholars of the time; attracting the attention of Pietro de' Medici, he was made the school-companion of the latter's son Lorenzo. Here began the lifelong intimacy of the scholar with the great Florentine family. At eighteen years of age he began a Latin version of the *Iliad*, which, so far as it was finished (5 books, of

which, however, the first was by Marsuppi, showed marvelous facility. Even earlier he had tried his hand at both Greek and Latin verses—epigrams, elegies, odes—and these he wrote with great ease and brilliancy all his life. He was the first modern whose command of both classic tongues was so great that he could freely clothe his thought in either. Not less remarkable was his passion for exact scholarship. He toiled unremittingly on the text of the ancients, employing as aids inscriptions and coins, as well as manuscripts. Particularly important were his labors on the text of the famous manuscript of the *Pandects*, which Florence had taken from Pisa, as Pisa from Amalfi. He translated from Greek into Latin Epictetus, Herodian, Hippocrates, Galen, Plutarch's *Eroticus*, Plato's *Charmides*, and portions of other authors. At the age of twenty-six he was made Professor of Greek and Latin Eloquence in the studio, or university, at Florence; and his lecture-room was frequented even by his own former masters. To these audiences were read his introductions to his courses (*praefationes*), several of them in verse, in which he discussed and praised that form of literature represented by the author about to be expounded. This success aroused the jealousies of other scholars; and when in 1489 Poliziano printed a collection of critical notes to classical authors (*Miscellanea*), he was speedily assailed by Giorgio Merula, Bartolommeo Scala, Michele Marullo, and other humanists. The strife lasted till his death. Poliziano was also one of the most important Italian poets of the fifteenth century. He was a spirit eager for beauty, delighting in nature, gifted with imaginative sympathy for the loveliness to be found even in simple things, and though he was essentially a court poet, it was not as subservient or adulatory that he praised his friends as well as masters, the Medici. His first important work in Italian, *L'Orfeo*, which was recited in Mantua in July, 1471, is the earliest Italian secular drama extant. Later this was remodeled, probably by one Antonio Tebaldeo, into a regular tragedy in five acts. Probably in 1475, in honor of a splendid tournament held in Florence, Poliziano began his *Stanze per la giostra del magnifico Giuliano di Piero de' Medici*—left unfinished, however, perhaps because of the death of Simonetta Cattaneo, whom Giuliano loved and the poet sang. Still more gracious and lovely than these longer works are the *rispetti* and *ballate* which the poet wrote under the inspiration of the naïve popular songs of Tuscany—*strambotti*, *rispetti*, etc. Like many scholars of his time, Poliziano, though not a priest, enjoyed benefices and emoluments of the Church. He became secular prior of the Church of San Paolo in Florence, and in 1486 was made canon. Only his premature death prevented his becoming a cardinal. The *Opera Angelii Politiani* were published at Lyons (3 vols., 1536–46). G. Carducci edited, with excellent introduction, *Le Stanze, l'Orfeo e le Rime* (Florence, 1863); and I. del Lungo, *Prose Volgari e Poesie Latine e Greche* (Florence, 1867). The best *Life* is the Latin one of F. O. Menckenius (Leipzig, 1736). See also A. Gaspari, *Geschichte der italienischen Literatur*, vol. ii., p. 213, seq. (Berlin, 1888); and J. A. Symonds, *The Renaissance in Italy*.

A. R. MARSH.

Polk, JAMES KNOX: eleventh President of the U. S.; b. in Mecklenburg co., N. C., Nov. 2, 1795, of Scotch-Irish stock originally named Pollock; was a grand-nephew of Col. Thomas Polk, celebrated in connection with the MECKLENBURG DECLARATION (*q. v.*); removed to Tennessee with his father, Samuel Polk, 1806; graduated at the University of North Carolina 1818; studied law in Nashville with Felix GRUNDY (*q. v.*); was admitted to the bar 1820; was a member of the State Legislature 1823–25; acquired prominence as a lawyer; was elected to Congress 1824, and continuously re-elected until 1839; was an able speaker and debater; conspicuous as an opponent of the administration of Adams, of all Federal appropriations for internal improvements, of protective tariffs, and of the national bank; was an early and influential supporter of Jackson, whose conduct in the removal of the deposits he vindicated in the session of 1833–34, being then chairman of the committee of ways and means; was defeated as a Democratic candidate for Speaker 1834, but elected 1835, and re-elected 1837, presiding over the House with dignity and ability; was Governor of Tennessee 1839–40; was proposed by the Legislatures of Tennessee and of other States 1840 as a suitable candidate for Vice-President of the U. S., but received only one electoral vote. He was defeated in 1841 as a candidate for re-election as Governor; was nominated by the Democratic national con-

vention at Baltimore (May 27, 1844) for the presidency in opposition to Henry Clay, and elected by 170 electoral votes against 105, the chief issue being the annexation of Texas, which was accomplished by the expiring administration of Tyler the day before Polk's inauguration, Mar. 4, 1845. President Polk formed an able cabinet, consisting of James Buchanan, Robert J. Walker, William L. Marcy, George Bancroft, Cave Johnson, and John Y. Mason; settled the Oregon boundary question; created the Department of the Interior; succeeded in carrying the low tariff of 1846; reorganized the financial system of the Government; and conducted the Mexican war, which resulted in the acquisition of California and New Mexico and had far-reaching consequences upon the later fortunes of the republic. The annexation of Texas caused, as had been predicted, an immediate rupture between the U. S. and Mexico. On June 4, 1845, President Herrera of Mexico issued a proclamation declaring the right of Mexico to the Texan territory, and his determination to defend it by arms if necessary. Fully aware of the hostile feelings of the Mexicans, President Polk ordered Gen. Zachary Taylor, then in command of the U. S. troops in the Southwest, to go to Texas and take up a position as near the Rio Grande as prudence would allow, that river being regarded by the U. S. as the boundary between Mexico and Texas, while the Mexican Government claimed jurisdiction to the Nueces. In September Gen. Taylor formed a camp at Corpus Christi, and there he remained during the autumn and winter; but in Jan., 1846, he was ordered to move his camp to the Rio Grande, opposite the city of Matamoras. There he was attacked by the Mexicans, but defeated them; and on May 11, 1846, Congress declared that "by the act of the republic of Mexico a state of war exists between that Government and the U. S.," authorized the President to raise 50,000 volunteers, and appropriated \$10,000,000 for carrying on the war. It was prosecuted with great energy, and lasted two years. Declining to seek a renomination, Polk retired from the presidency Mar. 4, 1849, when he was succeeded by Gen. Zachary Taylor; retired to Nashville, and died there June 15, 1849. Without being possessed of extraordinary talents, he was a capable administrator of public affairs and irreproachable in private life.

Revised by F. M. COLBY.

Polk, LEONIDAS: bishop and soldier; b. at Raleigh, N. C., Apr. 10, 1806; graduated at the U. S. Military Academy, and entered the artillery July, 1827; resigned Dec. 1, 1827; in 1831 was ordained in the Protestant Episcopal Church; was missionary bishop of Arkansas and the Indian Territory S. of 36° 30', with provisional charge of the diocese of Alabama, Mississippi, and Louisiana, and missions in the republic of Texas 1838–41; bishop of Louisiana 1841–61. In 1861 he accepted the appointment of major-general in the Confederate army—without, however, resigning his bishopric—and was placed in command of the districts along the Mississippi from the mouth of the Arkansas to Paducah, on the Ohio; Fort Donelson and Fort Henry were constructed under his direction. He subsequently commanded a division in the West; at Murfreesboro', Chattanooga, Chickamauga, and in the Georgia campaign of 1864 commanded a corps, ranking then as lieutenant-general. He was killed by a cannon-shot at Pine Mountain, Ga., June 14, 1864. See *Leonidas Polk, Bishop and General*, by W. M. Polk, LL. D. (2 vols., New York, 1893).

Revised by JAMES MERCUR.

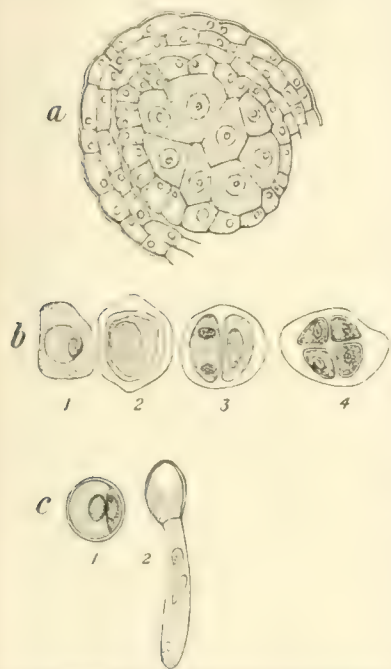
Polko, ELISE: story-writer; b. at Leipzig, Jan. 31, 1823; a sister of the African traveler Edward Vogel; was trained under Garcia as an opera-singer, and appeared on the stage in Frankfurt; after her marriage left the stage and devoted herself to literature, living at Minden and subsequently at Deutz, on the Rhine; made her *début* by her *Musikalische Märchen* (Leipzig, 1852), which afterward grew into a whole series, comprising many volumes. Among her other works are *Neue Novellen*; *Ein Frauenleben* (Leipzig, 1854); *Aus der Künstlerwelt*; *Erinnerungen an Felix Mendelssohn Bartholdy* (Leipzig, 1868; translated into English by Lady Wallace, London, 1869); a *Life* of her brother; *Plaudereien* (1872–73); *Aus dem Jahre 1870*; *Neues Märchenbuch* (Minden, 1884); and several books for children.

Pollaiuolo, pol-lā-yoo-ō'lō, ANTONIO: painter, sculptor, goldsmith, and engraver; b. at Florence, Italy, in 1429. He studied under Bartoluccio, the stepfather of Lorenzo Ghiberti, who employed him in modeling the ornaments of the architrave of the central gates of the baptistry of Florence. After this he worked on his own account as a goldsmith. Vasari asserts that he was the first artist who dissected the

dead body for art instruction. He devoted himself to painting after he had attained much success as a sculptor, and was one of the earliest Florentine artists who used the oil medium. D. at Rome, Feb. 14, 1498. W. J. STILLMAN.

Pollaiuolo, PIERO: painter; b. at Florence, Italy, 1443; brother of Antonio Pollaiuolo. Vasari says that the younger Pollaiuolo was a pupil of Andrea del Castagno, but this is doubtful. The two brothers generally worked conjointly, Antonio furnishing the design and Piero carrying it out in color in many instances. D. in 1496. *The Martyrdom of St. Sebastian* in the London National Gallery is supposed to have been the work of both brothers. It was painted for the Pucci chapel in Florence, and finished in 1475. Piero designed the Belvedere Palace built by Innocent VIII. He was a medalist also, and an engraver; his works in this branch surpassed all others of his time. W. J. STILLMAN.

Pollen [from Lat. *pollen*, fine flour or dust]: the dust-like cells produced in the anthers of flowers. They are developed as follows: When the anther is still young the cells in (usually four) longitudinal columns undergo internal division, each into four daughter-cells (see Figures, a, b) and these cover



a, cross-section of a column of pollen mother-cells; b, development of pollen-cells from a mother-cell; c, the two nuclei in pollen cells, one cell germinating. All highly magnified.

themselves with a coat of cellulose, at first thin, but later thick and separable into an outer and an inner wall. In the meantime the wall of the mother-cell usually deliquesces, and the pollen-cells are set free within the anther. Later the anther opens (usually by splitting longitudinally) and the pollen falls out as a yellowish, sometimes whitish powder. In some cases the pollen-cells adhere more or less to one another by a sticky substance in masses of considerable size, as is seen in milkweeds and orchids.

In the study of the comparative anatomy of plants it is seen that the pollen-cell is the homologue of the microspore of the higher ferns.

and some botanists now use this term in preference to the old one of pollen-cell. Before germination the pollen-cell has two nuclei—namely, the “vegetative” and the “generative” nuclei, the former the sole representative of the prothallium (c). In gymnosperms there are usually two or more fully formed vegetative cells. See, further, the articles BOTANY, FLOWER, and PHYSIOLOGY, VEGETABLE. CHARLES E. BESSEY.

Pollio, GAIUS ASINIUS: orator and author; b. at Rome in 76 B. C.; began his career as an orator; sided in the war between Caesar and Pompey with the former, whom he accompanied from the Rubicon to Rome, and again on the march to Pharsalia; commanded in Spain against Sextus Pompeius; was consul in 40 B. C., during the first triumvirate; made a successful campaign in Illyria in 39; retired from public life, and devoted himself to literary pursuits; was a friend of Vergil, Horace, and Catullus; founded the first public library in Rome, and wrote a history of the civil war in seventeen books, which is lost. He was also a poet and literary critic. D. 5 A. D. Three letters from him to Cicero have been preserved, and a few fragments of his orations. As an orator he enjoyed a very great reputation; his contemporaries ranked him next to Cicero and on the same line as Caesar and Brutus. He was very young when he attracted great attention by his accusation of C. Cato, who as tribune,

in 56 B. C., had committed numerous illegal acts in favor of Pompey and Crassus. Afterward he defended the rhetors Mosechus and Apollodorus, who were accused of poisoning their relatives for the sake of the inheritance, and he continued to plead to the last. His speeches were always very carefully prepared. He was especially anxious to eliminate anything vague or superfluous, avoiding the redundancy of Cicero, whom he sharply criticised; but his austere taste sometimes made him dry, a quality which became still more visible among his pupils and imitators. He was fond of archaic and poetic expressions, and Landgraf and Wölflin attribute to him the *Bellum Africum*, but this is still a disputed question. He introduced the custom, afterward so common, of reciting his writings to an audience of friends. See J. H. Schmidt, *Ueber den Sprachgebrauch des Asinius Pollio* (Munich, 1890); also Wölflin, *Archiv für Lat. Literaturgeschichte* vii, 84, 106; Landgraf, *Untersuchungen zu Caesar und seinen Fortsetzern* (Erlangen, 1888); and Wölflin and Miodoński, *Polionis de Bello Africo Commentarius* (Leipzig, 1889). Revised by M. WARREN.

Pollock: See COALFISH.

Pollock, Sir CHARLES EDWARD: lawyer and author of legal works; b. Oct. 21, 1823; son of Sir Frederick Pollock; studied law under Justice Willes and was called to the bar in 1847; made queen's counsel in 1866; appointed baron of the exchequer in 1873, and knighted in the same year. Besides other writings he has published a *Compendium on the Law of Merchant Shipping* (as joint author with Frederick P. Maude; 4th ed. London, 1884) and a *Treatise on the Power of the Courts of Common Law to Compel the Production of Documents for Inspection*. F. S. A.

Pollock, Sir FREDERICK: lawyer; b. in London, England, Sept. 23, 1783; graduated at Cambridge 1806; studied law at the Middle Temple, and was called to the bar Nov., 1807; had great success in his profession; became king's counsel 1827; sat in Parliament for Huntingdon 1831–44; was knighted Dec., 1834; was attorney-general during the first and second administrations of Sir Robert Peel; chief baron of the court of exchequer and privy counselor from Apr., 1844, to 1866, when he retired with a baronetcy. D. at Hatton, near London, Aug. 23, 1870.

Revised by F. STURGES ALLEN.

Pollock, Sir FREDERICK: jurist; b. Dec. 10, 1845; grandson of Sir Frederick Pollock. He was educated at Cambridge University, and was called to the bar at Lincoln's Inn in 1871; has been several times examiner in law at Cambridge University and in other universities; Professor of Jurisprudence at University College, London, 1882–83; Professor of Law in the Inns of Court 1884–91; Corpus Professor of Jurisprudence at Oxford University since 1883; lecturer in the University of Calcutta 1893–94. He has been editor of *The Law Quarterly Review* since 1885, and of the revised reports since 1891. He has written much for periodicals upon jurisprudence and legal ethics, and is a leader in the modern school of historical and analytical law writers. His most important works are *Principles of Contract* (6th ed. 1894); *The Law of Torts* (4th ed. 1894); *A Digest of the Law of Partnership* (5th ed. 1890); *The Land Laws* (2d ed. 1887); *Spinoza, his Life and Philosophy* (1880); *The Law of Fraud, Misrepresentation, and Mistake in British India* (1894); *Leading Cases done into English, and other Dissertations* (1892); *Essays on Jurisprudence and Ethics* (1882). F. STURGES ALLEN.

Pollock, WALTER HERRIES: journalist; b. in London in 1850; brother of Sir Frederick Pollock, jurist. He graduated at Cambridge, in 1871, and was called to the bar in 1874. In 1884 he became editor of *The Saturday Review*. Author of *Lectures on French Poets* (1879); *Songs and Rhymes* (1882); *The Picture's Secret* (1883); *Verses of Two Tongues* (1884); and (with Lady Pollock, his mother) *Amateur Theatricals* (1880). H. A. BEERS.

Pollok, ROBERT: poet; b. at Muirhouse, Renfrewshire, Scotland, in 1799; graduated at the University of Glasgow; studied theology, and was licensed as a preacher of the United Secession Church 1827. D. at Southampton, Hants, Sept. 17, 1827. Author of *Tales of the Covenanters* (1823) and of *The Course of Time* (1827), a poem in blank verse which gave great promise of future excellence. It became extremely popular in Great Britain and in the U. S., where for many years it was used in schools as a parsing-book.

Poll-tax: See FINANCE.

Pollux: See CASTOR AND POLLUX.

Pol'lux (in Gr. Πολυδύνης), JULIUS: scholar; b. at Nau-racris, Egypt, about 130 A. D.; lived in Athens as teacher of rhetoric and philosophy. His *Onomasticon*, edited by Dindorf (Leipzig, 1824) and Bekker (Berlin, 1846), is a kind of dictionary in which the principal words relating to certain subjects are collected into groups, defined, and illustrated by quotations. The work is of manifold interest to the student of the Greek language, literature, and art.

Po'lo: a modern adaptation of the Persian game of *chaugán*, the origin of which is unknown. It was introduced into Great Britain in 1869, from India, by officers of the Tenth Hussars; into the U. S. in 1876 by James Gordon Bennett; and in 1883 a flourishing club was started in Mexico city. It has earnest supporters in Africa and Australia, while in Great Britain it has long been a recognized sport. The game is an old one in Tibet, and the Japanese have a very similar form of recreation in *daiku*.

Briefly, polo is simply playing the game of "hockey" or "shinny," on horseback. The game consists in knocking a ball, with a stick having a crook or "mallet" at its end, from one goal to another, these goals being some 8 yards wide and about 250 yards apart at opposite sides of a level rectangular field. The players, four upon each side, are mounted on ponies. By the rules of the New York club the height of the ponies is limited to 14 hands, and the "mallets" to be used must be 4 ft. 4 in. in length. The ponies used are "hog-maned," and have their tails cut short. The game is extremely rough, and accidents upon the field are numerous. Because of the expense attached to securing and keeping "mounts" the game is confined to the wealthier classes.

Roller-polo came in with roller-skating rinks, with rules adapting it to skaters and indoor playing.

Water-polo seems to have no logical connection with polo proper, it being a game played by swimmers. Sides are chosen, and the attempt made while swimming to force a football through the opponents' goal. This game has generally been confined to the baths in the larger gymnasiums.

E. HITCHCOCK, JR.

Polo: city; Ogle co., Ill.; on the Burl. Route and the Ill. Cent. railways; 12 miles N. of Dixon, 23 miles S. of Freeport (for location, see map of Illinois, ref. 2-E). It is in an agricultural region; contains a high school, the Buffalo Public Library (founded in 1871), a national bank with capital of \$65,000, a private bank, a semi-weekly and a weekly newspaper, and manufactories of agricultural implements and buggies; and ships large quantities of cattle and hogs. Pop. (1880) 1,819; (1890) 1,728.

Polo, GASPAR GIL: romancer; b. at Valencia, Spain, probably about 1540; little is known of his life. Most likely he is the same Gaspar Gil Polo who held the second professorship of Greek in the University of Valencia from 1566 to 1574. He seems also to have had legal training, for he appears in Valencian documents of 1571 to 1573 with the title of "Notario." He died probably before 1591. His fame is due to the fact that he published at Valencia, in 1564, a continuation of the *Diana Enamorada* of MONTEMAYOR (q. v.). This passed through many editions in Spain, and was translated into several other languages—e. g. English, by Bartholomew Yong (with Montemayor's *Diana*, 1598); Latin, by Caspar Barth (under the title *Eroto-didas-calus sive Nemoralium libri V.*, Hanover, 1625). Cervantes esteemed Polo's work more highly than Montemayor's (cf. *Don Quixote*, i., 6). The best edition of Gil Polo's *Diana* is that with *Life* by Francisco Cerda y Rico (Madrid, 1778). A good modern edition of the text is printed with that of Montemayor's *Diana*, in the *Biblioteca clásica española* (Barcelona, 1886).

A. R. MARSH.

Polo de Medina, SALVADOR JACINTO: poet; b. in Murcia, Spain, about 1607; d. about 1660. After studying and amusing himself with poetry in his native place he went, about 1630, to Madrid to continue his studies. He became a priest, and in 1638 was secretary to the Bishop of Lugo. In his earlier work he showed himself gifted with considerable satiric power. His chief model was Cervantes, but he was influenced also by Góngora and Saavedra. In 1630 he published at Madrid his *Academias del Jardín*, his *Buen humor de las musas*, and his fables *Apolo y Dafne* and *Pan y Siringa*. In 1636 appeared his *Hospital de incurables, viaje de este mundo al otro*—a vision, in which the poet visits the infernal world. His moral treatise *Gobierno moral á Lelio* (1657) was much admired, and frequently imitated during the remainder of the seventeenth century. The first complete edition of his works, *Obras en prosa y verso*, ap-

peared at Saragossa in 1664. The works in verse are printed in vol. xlii. of Rivadeneyra's *Biblioteca de Autores Españoles* (Madrid, 1875).

A. R. MARSH.

Polo, Marco: traveler; b. in Venice in 1254; son of Nicolo Polo, one of three brothers, who seem to have been jointly engaged in extensive mercantile ventures in the East. In the year 1260 Nicolo, who had left a family at Venice, and his brother Maffeo went on a mercantile venture to the Tartar court at Sarai on the Volga. Thence circumstances carried them to Bokhara, and a party of Mongol envoys, passing that way, invited their company to the court of the Great Khan in the far East. Kublai, the ablest descendant and successor of Chinghiz, was then reigning. Never before having seen European gentlemen, he took the Polos into great favor, and after a time sent them back, in the character of envoys, to the papal court, to ask, among other things, for a great body of priests to instruct his people. The two brothers reached Acre in Apr., 1269, and, hearing that the papal see was vacant, went home. Nicolo found that his wife was dead, but that his son Marco, the subject of this article, was then a fine lad of fifteen. After waiting two years vainly for a new pope, the brothers started again for the East, taking young Marco. They were yet on the Gulf of Scanderoon when they heard at last of a pope's election in the person of Tedaldo Visconti, a Church dignitary of Acre, who had shown great interest in their mission, and who afterward reigned creditably as Gregory X. He recalled them to Acre to receive his letters, but in lieu of the hundred teachers asked by Kublai he could give but two, and the hearts of these failed at the outset. The long journey to Cathay occupied three years and a half. It lay through Southern Armenia, Persia, the valley of the Oxus, and Badakhshan, thence over the high plateau of Pamir. From Pamir they descended upon Kashgar, and thence by Khotan and across the Gobi desert to *Tangut*, as the country at the western end of the Great Wall was then called. Here they were met as the Great Khan's guests, and conducted to his summer-seat at Shangtu on the plateau of Mongolia, nearly 200 miles N. of Peking. Kublai received the party cordially, and showed especial favor to Marco. The young man applied himself to acquire some languages current at the Mongol court (though Chinese was certainly not one of his acquisitions), and soon got employment in the khan's service. His first important commission carried him through Western China and the wild Tibetan frontier to Yunnan, called by the Mongols *Karajang* (*Carajan*), and thence to the borders of Burma (*Mien*). A mission to India was one of his charges, and the government of the great city of Yangchow, on the Grand Canal, with its district, was another. The khan grew old, and the Polos began to fear what might follow his death; they desired to depart, but he heard them with displeasure; and it was not till 1292 that an opportunity offered. Kublai's kinsman, Arghûn, Khan of Persia in 1286, having lost his favorite wife, Bulugân, envoys were sent to Cambaluc to request that a Mongol lady of Bulugân's own family be selected to succeed her, as she had requested on her deathbed. Kukâchin, a beautiful maiden of seventeen, was selected. The envoys desired to return by sea, and sought the company of the experienced Venetians. Kublai was reluctant, but consented, and fitted the party out nobly for the voyage, charging the Polos with friendly messages for the Kings of France, England, and Spain. Their fleet of fourteen vessels sailed from Fuh-kien in the beginning of 1292; the voyage was long and disastrous, but the Polos after two years landed in Persia. After a time the Polos proceeded to Europe, and late in 1295 reached Venice, where they were received coldly by their relatives, who had long considered them dead. Venice and Genoa were then in hot and often sanguinary rivalry. In 1298 Marco joined the Venetian fleet under Andrea Dandolo as gentleman-commander (*sopra comito*) of a galley, and in an action off Curzola was taken prisoner with 7,000 others and carried to Genoa. At Genoa he fell in with a certain Rusticiano or Rustichello of Pisa, an inmate also of the prison there. To him is due the preservation of Polo's travels and memory, for he probably suggested the record of his experiences, and certainly he wrote them down from Polo's dictation. In the summer of 1299 peace was made and the prisoners were liberated. Marco Polo survived to Jan., 1324, the date of his will still extant, but died soon after—certainly before June, 1325. He had married, and left three daughters; two of them married before his death.

The *Book of Marco Polo* consists of two unequal sections. The first, called *Prologus*, is a personal narrative of great interest, but too great brevity. The second consists of a long series of chapters, extremely various in length and interest, descriptive of the regions of Asia visited by the Polos in their different journeys, but especially of the Emperor Kublai, his court and dominions. It is a curious fact that the original work, dictated by Marco, a Venetian, to Rustichello, a Pisan, was written in French, and very bad French too. The greatest number of MSS. are, however, in Latin, a version by Friar Pipino, executed in Polo's lifetime, having been much diffused. Italian versions are also numerous, the French less so, but far more valuable. The whole number of MSS. known is under eighty. Polo's recognition as prince of mediæval travelers is due to his romantic story and to the vast compass of his travels, anticipating so many supposed discoveries of the sixteenth century, rather than to transcendent character or capacity. He was the first traveler to trace a route across the whole longitude of Asia from the shores of Cilicia to the Yellow Sea—the first traveler to reveal China in all its wealth and vastness, the first to tell of the nations on its borders; of Tibet, of Burma, of Laos, of Siam, of Cochiu-China, of Japan; the first to speak of that museum of beauty and wonder, the Indian Archipelago; of Java, the pearl of islands; of Sumatra (*Java Minor*); of Ceylon, with its Mountain of Adam; of India, not as a mythical region, but as a country seen and partially explored; of the secluded Christian kingdom of Abyssinia; of Zanzibar, Madagascar, and Socotra; and of remotely opposite quarters of the high plateaus of Pamir, with their wild sheep; of Siberia and the Arctic Ocean; of white bears, sledge-dogs, and reindeer-riding Tunguses. His book has presented many difficulties, but progress in exploration and in the translation of Oriental literature has made most of them now clear. Marsden's (London, 1818) was the first edition of value; Pauthier's (Paris, 1865) brought a vast amount of curious and interesting Chinese learning to bear upon the subject. The most important is Yule's *Book of Ser Marco Polo* (2 vols., London, 1871; 2d ed. 1875).

Revised by R. LILLEY.

Poltava, pōl-taa'vā: government of European Russia; bordering S. and W. on the Dnieper. Area, 19,265 sq. miles. The surface is level, the soil fertile, and the climate mild. Agriculture and rearing of cattle are almost the only branches of industry pursued. Grain, hemp, tobacco, the sunflower, and fruits are raised; bees and silkworms are extensively reared. Pop. (1890) 2,898,600.

Poltava, or **Pultowa**: town; capital of the government of Poltava, Russia; on the Vorskla, a tributary of the Dnieper; 88 miles S. W. of Kharkoff (see map of Russia, ref. 9-D). It has manufactures of tobacco and leather and four annual fairs, at which horses, cattle, leather, wool, hides, etc., are sold to the value of about \$12,000,000 annually. It is the seat of a bishopric. June 27, 1709, Peter the Great won here a decisive victory over Charles XII., in commemoration of which a large monument has been raised in the principal square. Pop. (1891) 43,563.

Polya'nus (Gr. Πολύανος): sophist; flourished under Marcus Aurelius, and composed in rhetorical style and with an utter lack of critical spirit eight books of *Stratagems* (Στρατηγήματα), which are extant with the exception of gaps in the sixth and seventh. There are editions by Casaubon (1589) and by Wölfflin Melber.

Revised by B. L. GILDERSLEEVE.

Polyandry [Gr. πολύς, much, many + ἀνὴρ, ἀνδρός, man]: See MARRIAGE AND MARRIED WOMEN.

Polyan'thus [Mod. Lat., from Gr. πολάνθος, many-flowered; πολύς, much, many + ἄνθος, flower]: any one of a large class of primroses, probably belonging to *Primula grandiflora*, and closely allied to the auriculas, cowslips, oxlips, etc. The polyanthus is a hardy perennial, and the flowers are often beautiful and profuse.

Polyatomic Alcohols: See ALCOHOLS.

Polybasic Acids: See ACID.

Polyb'ius: Greek historian (b. 205, d. about 123 B. C.); a native of Megalopolis, in Arcadia; son of Lycortas, general of the Achaean League. His birth and his ability brought him early to the front, and he was employed in important diplomatic and military affairs. After the defeat of Perseus at Pydna, in 167, he was one of the 1,000 prominent Achæans who were deported to Italy by the Romans as hostages for the future good conduct of the Achaean League.

In his seventeen years of exile he learned to appreciate the mission of Rome; and his study of the Roman state and his familiar intercourse with the leading men of Rome filled him with admiration of the new favorites of fortune (Τύχην). He was an intimate in the house of Æmilius Paulus, and accompanied Scipio the younger on his campaigns. In 150 his exile was at an end, but he returned to Rome twice and was in the suite of Scipio at the fall of Carthage (146) and at the siege of Numantia. Polybius was of great service to his countrymen in their subsequent complications with Rome, and was highly honored for his patriotic intervention. He preserved his mental and physical vigor to the age of eighty-two years, when he died in consequence of a fall from his horse. His great work was his *Histories* in forty books, five of which have come down to us entire; of the remainder we have fragments of considerable compass, part of them preserved in the excerpts of Constantinus Porphyrogenitus.

Polybius is the expounder and exemplar of the "pragmatic" method in history. The facts (πράγματα) once ascertained must be made to yield their causes, the causes ascertained must be made to yield lessons for the future. Pragmatic and practical are the same thing from different points of view. For the ascertainment of the facts he was rarely equipped by practical knowledge of the art of war and the life of politics. Not only did he bring a critical spirit to bear on the traditions of the past and on the work of his predecessors in the domain of history, but he was personally cognizant of many of the events which he describes. He "thinks straight and sees clear," and his love of truth is manifest; but there is far too much "exposure" of his fellow-workers, far too much sermonizing about right methods and correct results; although no one can deny that in the study of the causes of events Polybius showed in some directions wider and deeper vision than any of his predecessors, and with him begins a new era of historiography. He studied what was in man, he studied what was in nature, in order to find the springs of action; and it was he who taught historians to take into calculation the effect of political institutions, and the influence of soil, of climate, of geographical situation. True, his practical soul was not open to the influence of religion, which was to him an engine to work on the masses withal, not a spirit to animate a nation. To him the central force of history which dominated all the causes he had so laboriously evolved was a mysterious Τύχην (Fortune), the unknown, unaccountable power that took the place of the old gods. He does not seem to have been susceptible to the charm of poetry or alive to the influences of philosophy, but, Romanized though he was, Polybius was still too much a Greek not to admit with Aristotle the potency of music. As a stylist, Polybius has the merit of clearness, but lacks grace and charm, and his mechanical scrupulousness in the avoidance of the hiatus stands in amusing contrast with his neglect of the weightier matters of stylistic law. With Polybius begins the period of the so-called common dialect in contradistinction to Attic; he lets in new words with a flood, multiplies periphrases, and inspissates his style with abstracts and articular infinitives. The student of classical Greek finds himself in a new world of language just as the student of Greek history finds himself in a new world of thought.

EDITIONS.—Schweighäuser (Leipzig, 1789-95); 8 vols., I. Bekker (Berlin, 1844); L. Dindorf, re-edited by Büttner-Wobst (Leipzig, 1882; Hultsch, 2d ed. Leipzig, 1888. Translated into English by Shackburgh, 2 vols., London, 1889). See also W. W. Capes, *The History of the Achaean League as contained in the Remains of Polybius* (London, 1888); J. L. Strachan-Davidson, *Selections from Polybius* (Oxford, 1888); and Rudolf von Seala, *Die Studien des Polybius* (2 vols., 1890).

B. L. GILDERSLEEVE.

Pol'ycarp [from Lat. *Polyarpus* = Gr. Πολύκαρπος, liter., bearing much fruit]: one of the Apostolic Fathers, b. about 70 A. D., apparently of Christian parentage; a disciple of St. John and Bishop of Smyrna, where he suffered martyrdom, probably, according to modern scholars, in 155 or 156. The old date was 166 or 167 A. D. Most of what is known of him comes from his pupil Irenæus, who was Bishop of Lyons 177-202 A. D. In his letter to Florinus (preserved by Eusebius, *Hist.*, v., 20) Irenæus gives a graphic account of Polycarp as remembered by him. Another extract (*Adv. Hæc.*, iii., 3, 4) emphasizes Polycarp's hostility to heretics, and there is still another extract from a letter of Irenæus to Victor, Bishop of Rome (preserved by Eusebius, *Hist.*, v.,

24), in relation to the Passover dispute, describing a visit of Polycarp to Anicetus, Bishop of Rome from 154 A. D. An epistle from the Church in Smyrna to a neighboring Church in Philomelium, describing the martyrdom of Polycarp, is probably in its main contents genuine, but in its present form has two closing sections which are not. Some features of the narrative are above suspicion and in keeping with the best traditions of the age. When entreated to save his life by reviling Christ the answer of the martyr was: "Eighty and six years have I served him, and he has done me no ill. How, then, can I blaspheme my King who has saved me?" The spot now pointed out as the site of this martyrdom is marked by a tall cypress on the face of Mt. Pagus, overlooking the city of Smyrna. Polycarp's Epistle to the Philippians appears to have been written shortly after the martyrdom of Ignatius, 115 A. D. Its genuineness is now generally conceded. Its tone is hortatory; its most important characteristic, great profuseness of quotation from the apostolic writings. The best recent editions of Polycarp are by Jacobson (1838; 4th ed. 1863); by Hefele (1839; 5th ed. by Funk, 1878); by Dressel (1857; 3d ed. by Zahn, 1876); but especially by Lightfoot (*Ignatius and Polycarp*, 1885). See also Lightfoot's *Apostolic Fathers* (1893).
Revised by S. M. JACKSON.

Polycentridæ [Mod. Lat.; named from *Polycentrus*, the typical genus; Gr. *πολύς*, much, many + *κέντρον*, goad, spine]: a family of spiny-rayed fishes peculiar to the fresh waters of tropical South America. It is composed of two genera—(1) *Polycentrus*, without a barbel, and (2) *Monoctirrus*, with a barbel. Two species of the former and one of the latter are known.

Polychæta [Mod. Lat., from Gr. *πολύς*, many + *χαίτη*, bristle]: an order of annelids (jointed worms) belonging to the class CHÆTOPODA (q. v.). In these forms each segment of the body bears numerous bristles, which either project from the general surface or from fleshy outgrowths (parapodia) on the sides of the body. The head is distinct and usually provided with feeler-like appendages, some of which may be modified into gills; the parapodia are usually complicated in shape, and besides the bristles they may bear tentacular processes (cirri) and in some instances respiratory organs. The internal organs are upon the general annelid plan, but usually the circulatory organs are highly developed. Reproduction is largely by means of eggs, although some species have the power of spontaneously dividing into two individuals. The young escape from the egg as a spherical embryo (trochophore), which gradually elongates into the adult condition. With the exception of the single genus *Manjukia* from the Schuylkill river, Pennsylvania, all are marine. Among them are many forms beautiful alike in shape and color, which go far toward contradicting the common impression that a worm is a loathsome creature. The *Polychæta* are usually subdivided into two groups. In one, *Errantia*, the animal lives a free life, either burrowing in the mud or swimming through the water. These animals are predaceous and are provided with strong jaws for capturing their prey. In the second group, *Tubicola* or *Sedentaria*, the parapodia are less developed, the animals live in tubes of their own construction, and, since jaws are lacking, they have to depend for food upon the minute particles brought them in the currents of water produced by the appendages of the head. There are many hundreds of species of *Polychæta*. The most valuable papers upon the group are Ehlers, *Die Borstenwürmer* (Leipzig, 1864-68); Claparède, *Annélides du Golfe du Naples* (Geneva, 1868-70); and various articles by Grube, Malmgren, etc. The American species have largely been described by Verrill (*Invertebrata of Vineyard Sound*), Webster, and Andrews. For the development, reference should be made to Hatschek (*Arbeiten Zool. Inst.*, Vienna, i., 1878), Wilson (*Johns Hopkins Studies*, ii., 1882; *Journal of Morphology*, vi., 1892), A. Agassiz, and Fewkes. For structure, Claparède (1862), Meyer (*Mittheil. d. Zool. Station*, Naples, vii., 1887), Andrews, and others.

J. S. KINGSLEY.

Polychrome: synonymous with *ESCUIN* (q. v.).

Polychromy: the application of varied and generally bright colors to buildings, statuary, and other objects; also the study or theory of this art. Most ancient peoples decorated their buildings inside and out with painting in vivid colors. When this was not done it was because the materials of the building or of its facing were naturally varied in color: Thus the frieze of the Erechtheion at Athens was in

black marble, with white-marble figures in relief upon it, and the interiors of Roman temples, basilicas, and palaces were lined with variegated natural marbles. Oriental nations, both those of the far East and the Mohammedan peoples of the Levant, show great skill in polychromy. The differences between these nations in their use of color in this way are considerable: Thus the Japanese excel in the combination of browns and grays, gold of different tints, bronze, and other alloys, and generally in all the effects of subdued and delicate color, while the Chinese surpass them and all other peoples of modern times in handling dark and light blue, pure green, vivid yellow, orange, and white. The surprisingly refined combinations which they make of these strong and pure colors help us to understand how a Greek temple may have looked with patterns and even broad surfaces of pure red and deep blue, with white and gold. The modern peoples of European extraction show little power in making designs in color, and are generally content to copy those of antiquity or of the East.
RUSSELL STURGIS.

Polycele'tus (in Gr. *Πολύκλειτος*): statuary of the fifth century B. C.; b. at Sicyon, Achæa; was made a citizen of Argos; received instruction, together with Phidias and Myron, from Ageladas, and made the celebrated chryselephantine statue of Hera in the Heræum of Argos, and the still more celebrated statue of the *Spear-bearer*, which was afterward studied by other artists as containing the *canon* with respect to the proportions of the human body. He was also famous as an architect, and built the theater of Epidaurus. See Murray, *History of Greek Sculpture* (London, 1880), i., p. 257 ff.; Mitchell, *History of Ancient Sculpture* (New York, 1888), i., p. 384 ff.; Overbeck, *Geschichte der Griechischen Plastik* (Leipzig, 1893), i., p. 507 ff.; Collignon, *Histoire de la Sculpture Grecque* (Paris, 1892), i., p. 485 ff.; see also the article *Polykleitos* in Baumeister's *Denkmäler*.
Revised by J. R. S. STERRETT.

Polye'rates (in Gr. *Πολυκράτης*): tyrant of Samos; one of the most daring and most successful of the many sea-kings who in ancient times swarmed over the Ægean Sea. When seeking the alliance of Egypt, he was warned by Amasis that he should sacrifice whatever he valued most highly in order to ward off the envy of the gods. He consequently threw his ring, a jewel of immense value, into the sea, but the next day the ring was found in the stomach of a fish that was served up on his table. Thereupon Amasis abandoned the alliance on the ground that his destruction was decreed by the gods. His life, which was one long series of brilliant victories, ended, nevertheless, in a pitiful manner. One Orætes, satrap of Sardis, lured him into Magnesia, and seized and crucified him for some unknown reason about 522 B. C.
Revised by J. R. S. STERRETT.

Polydæmonism: See ANIMISM.

Polyg'amy [from Gr. *πολυγαμία*, deriv. of *πολύγαμος*, polygamous, having many marriages: *πολύς*, many + *γάμος*, marriage]: the state of a man having two or more wives at the same time. The state of a woman having two or more husbands at the same time is generally called *polyandry*. In ancient times polygamy was practiced by all the Eastern nations, and was sanctioned, or at least tolerated, by their religions. In the Homeric age it seems to have existed to some extent among the Greeks, but during the later development of Greek civilization it entirely disappeared. To the Romans and the Gotho-Germanic races it was unknown. With the Jews it was common among the patriarchs and tolerated by the law of Moses, but toward the beginning of our era the custom appears to have died out. The Koran sanctions it, but among the Arabs it does not prevail as a general rule. Among Christians, although the New Testament contains no positive injunction against it, it was never tolerated except among the Mormons. (See MORMONS.) In modern times polygamy is common only among the savage African and Malayo-Polynesian races, and among the degraded nations of Asia. See BIGAMY.

Polyglot [from the Gr. *πολύς*, many, and *γλῶττα*, tongue]: a book with versions of its texts in several languages, but generally used only of such editions of the Bible. Of Origen's *Biblia Hexapla* (see ORIGEN), only a few fragments are extant. The first great polyglot printed was the *Complutensian* (printed under the care and at the cost of Cardinal Ximenes at Alcalá de Henares, Spain, named in Latin *Complutum*, 1502-17, 6 vols. fol., but not published till 1520); it was followed by the Antwerp (edited by Benedict Arias Montanus, 8 vols. fol., 1569-72), the Parisian (ed-

ited by Gabriel Sionita, 1628-45, 10 vols. fol., but all these are far surpassed by the London (edited by Walton, 6 vols. fol., 1654-57).

Polygno'tus: painter; b. in the beginning of the fifth century B.C. in the island of Thasos; was an intimate friend of Cimon, and lived mostly in Athens, where he decorated the temple of Theseus, the Anaceum or temple of Castor and Pollux, and the Pœcile or painted portico; afterward, also, the inner halls of the Propylæa. He painted also some important pictures at Delphi. His pictures were celebrated in antiquity, and the art of painting appears to have been raised from early formality and elevated to a high standard by his genius. Revised by R. STURGIS.

Polygon [from Gr. *πολύγωνος*, polygonal, many-cornered; *πολύς*, many + *γωνία*, corner, angle]: a plane figure bounded on all sides by straight lines. The bounding lines are called *sides* of the polygon, and the points at which they meet are called *vertices* of the polygon; the entire bounding line is called the *perimeter*. Polygons are divided into classes according to the number of their sides or angles. Polygons of three sides are called *triangles*; those of four sides are called *quadrilaterals*; those of five sides, *pentagons*; those of six sides, *hexagons*; and so on. If the sides of a polygon are equal, the polygon is said to be *equilateral*; if its angles are equal, it is called *equiangular*. A *regular* polygon is both equilateral and equiangular. A closed broken line, all of whose sides are not in a single plane, is often called a *twisted polygon*. Revised by R. A. ROBERTS.

Polygon'al Numbers: See NUMBERS.

Polygor'dius [Mod. Lat., from Gr. *πολύς*, many + *Γόρδιος*, Gordius, in allusion to the Gordian knot]: a genus of annelid worms, interesting from the simplicity of its structure, which may be due either to its being a primitive form or to degeneracy. It is usually, with a few others, assigned to a special group, *Archannelida*. Species are found in the seas of Europe and America.

Polyhedral Angle: a solid angle formed by three or more planes passing through a common point. If there are but three planes the angle is called *triangular*. The intersections of the bounding planes are called *edges* of the polyhedral angle, and their common point is called the *vertex* of the angle. If a sphere be described about the vertex as a center with a radius equal to 1, the part of its surface included within the bounding planes is taken as the measure of the angle. Revised by S. NEWCOMB.

Polyhedron [Mod. Lat., from Gr. *πολύεδρος*, having many bases or sides; *πολύς*, many + *ἔδρα*, seat, side]: a solid bounded on all sides by polygons. The polygons are called *faces*, and the lines in which they meet are called *edges* of the polyhedron. The points in which two or more edges meet are called *vertices* of the polyhedron. The simplest polyhedron is bounded by four triangles, and is the pyramid known as a tetrahedron.

Polyhym'nia [= Lat. = Gr. *Πολυμνία*, liter., abounding in songs; *πολύς*, many + *ὕμνος*, song]: one of the Muses, the inventor of the lyre and the genius of lyric poetry; generally represented by ancient artists in a pensive attitude.

Polymer'ism: See ISOMORPHISM.

Polymorphism [from Gr. *πολύμορφος*, multiform; *πολύς*, many + *μορφή*, form]: in biology, that condition in which different kinds of individuals appear in the same species. In the animal kingdom it has its greatest exemplification in the group of *SIPHONOPHORE* (q. v.), where the whole colony is made up of members, all reducible to a common type, which are specialized for the functions of floating, swimming, reproduction, eating, and touch. Among the free forms it is not so common, but still is not rare. Thus among insects we find butterflies in which not only the males and females are different in their markings, but among the females different patterns may easily be recognized; in fact, so different may they be that did we not know their life-history we should not regard them as belonging to the same species. Where but two forms are known, the phenomenon is spoken of as *DIMORPHISM* (q. v.). J. S. K.

Polynem'idae [Mod. Lat., named from *Polynemus*, the typical genus; Gr. *πολύς*, many + *νήμα*, thread]: a family of spiny-rayed fishes peculiar for the free filiform rays below the pectoral fins. The family is represented by about twenty-five species, distributed in almost all tropical regions, and one (*Polydactylus octonemus*) occasionally wanders northward as far as New York.

Polyné'sia [Gr. *πολύς*, many + *νῆσος*, island]: a geographical designation somewhat loosely applied. It is now generally used for that part of Oceanica which lies S. of the equator and E. of the 170th meridian of E. long., a division based on ethnographic grounds.

Polyni'ces (in Gr. *Πολυνεικής*): in Grecian mythology, the first-born son of (ἜΔΙΠΟΣ (q. v.), by his own mother Jocasta. He was banished from Thebes by his younger brother, Eteocles, and fled to Argos, where he married Argeia, a daughter of Adrastus, the King of Argos. Adrastus undertook to reinstate Polynices, but the seer Amphiaraus knew that the expedition (see SEVEN AGAINST THEBES) was doomed to failure, and he urged Adrastus not to undertake it. Polynices gave the necklace of Harmonia to Eriphyle, and she persuaded her husband to sanction the expedition, which meant death to himself. All the chieftains except Adrastus were slain at Thebes, Polynices falling at the hands of Eteocles, whom he slew. J. R. S. STERRETT.

Polyp [Mod. Lat. *polypus*; Gr. *πολύς*, many + *πούς*, foot]: one of the individuals of any of the fixed COELENTERATA (q. v.), and in earlier times of the *Polyzoa* and *Tunicates*. At one time there was recognized a "class" of polyps or *Anthozoa*, but the term is obsolete. See SCYPHOZOA.

Polyph'e'mus (in Gr. *Πολυφημος*): in Grecian mythology, the famous Cyclops, a son of Poseidon; a gigantic monster with one eye in the center of the forehead; lived in the island of Thrinacia, where he captured Odysseus on his return from Troy. Odysseus escaped by making Polyphemus drunk and burning out his eye. See GALATFA.

Polyphony [Gr. *πολυφωνία*, variety of tones; *πολύς*, many + *φωνή*, tone]: in music, composition in several parts, vocal or instrumental, each part having an independent melodic flow of its own, but all uniting to express one musical thought or idea. This is in contrast to *homophony*, so called, which may be popularly explained as a simple succession of chords supporting a given melody, but without independent progression among the various accompanying parts or voices themselves. A well-written fugue exhibits, through the independent movement of its parts, a good example of practical polyphony. There is no essential distinction between polyphonic and contrapuntal writing. DUDLEY BUCK.

Polyplacoph'ora [Mod. Lat.; Gr. *πολύς*, many + *πλάξ*, *πλακίς*, tablet, plate + *φέρειν*, bear]: an order of molluscs containing the chitons, and better called *Placophora*. See CHITON and MOLLUSCA.

Polyp'od, or **Polyp'ody** [*polypod* is from Gr. *πολύς*, many + *πούς*, *ποδός*, foot; *polypody* is from Gr. *πολύς* + *ποδῖον*, dimin. of *πούς*, foot]: popular names given to many ferns, but properly belonging to those of the genus *Polypodium*, of which the U. S. has eleven species, growing on rocks, tree-trunks, etc. See FERNWORTS. C. E. B.

Polyp'terus [Mod. Lat., from Gr. *πολύς*, many + *πτερόν*, feather, wing]: a genus of ganoid fishes of considerable interest to the naturalist from its affinities to the lower sharks, the siluroid fishes, and the urodele batrachians, as well as from the fact that it and another African genus (*Calamichthys*) are the only living representatives of a group of fishes which were predominant in Paleozoic times. *Polypterus bichir*, the only species, occurs in the rivers of West Africa and in the upper Nile. It reaches a length of 4 feet, the body is covered with lozenge-shaped scales, and the dorsal fin is represented by from eight to eighteen spines, each bearing an articulated finlet. For details of structure, see Leydig, *Zeitschrift für wissenschaftl. Zoologie*, v. (1854); van Wihje, *Niederland. Archiv für Zool.*, v. (1882); Pollard, *Zoolog. Jahrbücher*, v. (1892); and Traquair, *Jour. of Anat. and Physiol.*, v. (1871). J. S. KINGLEY.

Polytechnic Schools: See SCHOOLS.

Polytheism: See ANIMISM and GOD.

Polyn'ria [Gr. *πολύς*, much + *οὖρον*, urine]: excessive urination. The term is applied to occasional increase in the flow of urine, due to transient causes, but also to a permanent condition or disease characterized by excessive excretion of urine, consisting chiefly of water, but not dangerous and seldom met with. See DIABETES. W. P.

Polyzo'a [Gr. *πολύς*, many + *ζῷον*, animal]: a group of animals formerly associated with the hydroids, later among the molluscs, and recently placed among the worms, together with the brachiopods and sipunculids. The name *Polyzoa* alludes to the fact that these forms are

colonial, many individuals being associated together, while the term *Bryozoa* used mostly by the Germans has reference to the mossy appearance due to the small size of the numerous individuals. The separate animals are situated in chambers or "cells" in a horny or calcareous exoskeleton, and each can retract entirely into the hard case. When extended, each polyp presents a circle of tentacles (sometimes folded into a horseshoe shape) borne on a disk or lophophore, in the center of which is the mouth, the alimentary canal (consisting of oesophagus, stomach, and intestine), folded on itself, the vent being either inside the circle of tentacles, or, more usually, just outside the lophophore. The nervous system consists of a ganglion between mouth and vent. Nephridia (but a single pair) are occasionally present, and open near the mouth. The stomach is usually tied to the body-wall by a cord, or funiculus, in which may be situated either the testes or both testes and ovaries. In some the sexes are separate, in others united in the same individual. The *Polyzoa* reproduce both by eggs and by budding. The eggs in their development pass through a metamorphosis, with free-swimming embryos entirely different from the adult. When the adult condition is reached, the sessile individual forms the beginning of a colony which increases in size by the outgrowth of new persons from the older members of the colony. In the *Entoprocta* the buds become detached, forming free individuals.

The *Polyzoa* are divided into *Entoprocta* and *Ectoprocta*, accordingly as the vent is within or outside the circle of tentacles. The *Entoprocta* are few in number, and are all marine. The numerous *Ectoprocta* are subdivided into the *Gymnolemata*, in which the tentacles are in a true circle, and the *Phylactolemata*, in which the circle of tentacles is folded in horseshoe shape. These latter are exclusively fresh-water forms, and frequently occur in large gelatinous masses in lakes and streams. To carry the species through the winter cold, they form peculiar reproductive buds or statoblasts, inclosed in hard shells, which, with the return of warm weather, re-form the colony. Except one or two genera, all of the *Gymnolemata* are marine. The genera *Rhabdopleura* and *Cephalodiscus*, formerly regarded as polyzoans (*Pterobranchia*), are thought to be related to *Balanoglossus* (q. v.). Polyzoans occur in all geological ages since the Silurian. See Hincks's *British Marine Polyzoa* (1880); Hyatt, *Proceed. Essex Institute*, v.; and papers by Barrois, Schmidt, Smitt, etc.

J. S. KINGSLEY.

Pombal', SEBASTIAN JOSEPH DE CARVALHO E MELLO, Marquis of: statesman; b. near Coimbra, Portugal, May 13, 1699; studied law at the University of Coimbra; spent some years in the army; afterward entered the civil service and obtained the favor of the court; was sent in 1739 as minister to London, and in 1745 to Vienna, where he married the wealthy Countess of Daun, and succeeded as mediator in averting the threatened rupture between the court of Austria and Pope Benedict XIV.; became Minister of Foreign Affairs of Portugal 1750; acquired a great influence over his sovereign, King Joseph; displayed great vigor and judgment as a political reformer, curtailing the powers of the Inquisition and improving the finances of the kingdom; exercised a kind of beneficent dictatorship during the days of panic following the great earthquake of Nov., 1755; superintended the rebuilding of the city with greater magnificence; became first minister 1756, and caused the banishment from Portugal of all the members of the Society of Jesus by royal decree of Sept. 3, 1759, they having been suspected of connection with the attempted assassination of the king in the previous year; created Count of Oeiras in 1759, he was made Marquis of Pombal in 1770, and retained nearly supreme power until Joseph's death in 1777. On the accession of Pedro III. he was superseded in favor at court, and retired to his estates. D. at Pombal, May 5, 1782. He is known in Portugal as the "great marquis." See Smith, *Memoirs of Pombal* (London, 1843); Oppermann, *Pombal und die Jesuiten* (Hanover, 1845); and Canota, *Marquis Pombal* (London, 1871).

Revised by F. M. COLBY.

Pomegranate, pûm-grân it [from O. Fr. *pome grenate* < Late Lat. *po'mum* (earlier *ma'hum*) *granatum*, lit., apple with many seeds; *po'mum*, fruit, apple + *granatus*, seeded; deriv. of *gra-num*, grain, seed]: a shrub, *Punica granatum*, of the Old World (of the family *Granataceæ*), now naturalized in most warm countries. It grows finely in those parts of the U. S. bordering the Gulf of Mexico. Its fruit, also called pomegranate, is of fine appearance. Some of the varieties are sub-acid and others sweet; most of them abound

in small seeds, but some are seedless. The fruit is very grateful in hot climates. The plant is sometimes used for hedges. The flowers are very fine, and sometimes are double. The bark is used in tanning. The rind of pomegranates is a good astringent for medicinal use. Its active principle (pelletierine) and the bark of the root are good anthelmintics against the tapeworm.

H. A. H.

Pomelo, or Pumelo: See SHADDOCK.

Pomerania (Germ. *Pommern*): province of Prussia; bordering N. on the Baltic, and bounded W. by Mecklenburg and S. and E. by the provinces of Brandenburg and West Prussia. Area, 11,623 sq. miles. The ground is low and the surface level. Along the Oder and the Baltic the soil is marshy, and produces good pasture; in other places it is sandy and little productive. Rye, wheat, potatoes, and hemp are cultivated; cattle and poultry are reared; the fisheries are important; smoked geese and pickled eels form two considerable items of exportation. There is an extensive commerce in the coast towns, where also ship-building and manufactures of sugar, chemicals, machines, paper, tobacco, etc., are carried on. The former inhabitants of Pomerania were of Wendish origin, and formed an independent Wendish dukedom during the Middle Ages. The present Pomeranians belong principally to the old Saxon stock. From the fourteenth century the portions E. and W. of the Oder, called Hither and Farther Pomerania, were separate duchies until 1625, when they were united under Boleslaus XIV. On his death, in 1637, the ruling dynasty became extinct, and the country was divided between Prussia and Sweden, which during the Thirty Years' war had made large conquests in Germany. After the death of Charles XII., Sweden was compelled in 1720 to cede a part of Pomerania to Prussia, but it was not until the downfall of Napoleon that the entire province became part of Prussia. Pop. (1890) 1,520,889.

R. A. R.

Pomeranian Dog: a name frequently given to the SPRITZ DOG (q. v.).

Pomeranus: See BUGENHAGEN.

Pomeroy: city; capital of Meigs co., O.; on the Ohio river, and the Columbus, Hock, Val. and Toledo Railway; 18 miles N. by E. of Gallipolis, about midway between Cincinnati and Pittsburg, Pa. (for location, see map of Ohio, ref. 7-G). It is situated on a narrow strip of land between the river and a range of precipitous hills, and has daily steamboat connection with the principal river towns; is in a region underlaid with bituminous and cannel coal and deposits of salt, and is engaged principally in coal-mining. Salt in large quantities is obtained by simply boring into the earth. There are rolling- and nail-mills, steam-engine and machine shops, flour-, saw-, planing-, and woolen-mills, a national bank with capital of \$50,000, a private bank, and 2 daily, a semi-weekly, and 2 weekly newspapers. Pop. (1880) 5,560; (1890) 4,726.

Pomeroy, JOHN NORTON, LL. D.: lawyer; b. at Rochester, N. Y., Apr. 12, 1828; graduated at Hamilton College 1847; studied law, and was admitted to the bar 1851; Professor of Law and dean of the law faculty in the University of New York 1864-69; returned to Rochester to practice his profession; removed in 1878 to San Francisco to take the chair of municipal law in the law department in the University of California. He was a man of wide and accurate learning, and wrote numerous articles for magazines upon topics connected with constitutional and international law, general jurisprudence, and the science of politics; edited editions of Sedgwick's *Statutory and Constitutional Law* (1874) and Archbold's *Criminal Pleading and Evidence* (1877), and, besides other minor works, wrote *An Introduction to Municipal Law* (2d ed. 1883); *An Introduction to the Constitutional Law of the United States* (9th ed. 1886); *Treatises on Jurisprudence as Administered in the United States* (3 vols., 1881-83); *Remedies and Remedial Rights, according to the Reformed American Procedure* (2d ed. 1883); *Civil Code in California* (1885); *Treatises on the Law of Riparian Rights* (posthumous, 1887). D. in San Francisco, Cal., Feb. 15, 1885.

F. STURGES ALLEN.

Pomeroy, SETH: soldier; b. at Northampton, Mass., May 20, 1706; was major in the Massachusetts forces at the capture of Louisburg 1745; lieutenant-colonel of the regiment commanded by Col. Ephraim Williams, at whose death, in the battle of Lake George, Sept. 8, 1755, he took command and gained a complete victory over Baron Dieskau. By occupation a mechanic, he was skilled in the manufacture of

arms. He was a delegate to the Massachusetts provincial Congress 1774-75, by which he was elected a general officer Oct., 1774, and a brigadier-general Feb., 1775; fought at Bunker Hill as a private soldier, and was soon afterward appointed senior brigadier by the Continental Congress, but declined the honor in consequence of disputes which arose about military rank, and retired to his farm. In the autumn of 1776 he raised a considerable military force for the relief of the army under Washington, and marched to the Hudson river. D. at Peekskill, N. Y., in Feb., 1777.

Pomfret: see **PONTEFRACT**.

Pomology [Lat. *po-mum*, fruit + Gr. λόγος, discourse, reason]: the science of fruit-culture. Pomology may be divided into four heads, especially as concerns its application to the U. S.: *Viticulture*, or grapes-growing; *orcharding* (which is again divided into the cultivation of pomaceous fruits, or the pear and apple-like tribes; drupaceous or stone fruits; citrous fruits, as oranges and lemons; nut-fruits, nuciculture; and palmaceous fruits); *small-fruit culture*; and *cranberry-culture*. Pomological interests are greater in the U. S. than in any other country.

Statistics of the viticultural interests in the U. S. are given under **GRAPE**. (See also **NURSERY**, and the articles on the various fruits; also **HORTICULTURE**.) The total investment in commercial fruit-growing in 1890 was estimated to exceed \$1,000,000,000. The area devoted to peaches was 507,736 acres; valuation of produce, \$76,160,400. Upward of \$90,000,000 were invested in peach-growing. Of almonds, California had 1,450,224 trees, nearly half of which had arrived at bearing age. Of cocoanuts, Florida had 123,227 bearing trees and 1,199,549 young trees. There were 666,007 lemon-trees, of which 386,636 were in Florida, the remainder in California. California had 607,377 olive-trees. Pine-apples were represented in Florida by 21,605,000 plants. The number of orange-trees was as follows:

	Bearing,	Not bearing.
Florida	2,735,372	7,708,544
California	1,553,801	2,229,710
Other States, about.....	4,279,073	9,632,253=13,911,326
		600,000

Total number of trees..... 14,511,326

The literature of American pomology, aside from viticulture, is not extensive. The first distinct pomological work was William Coxe's *View of the Cultivation of Fruit Trees* (Philadelphia, 1817). This was followed by works by James Thacher, *The American Orchardist* (1822, 2d ed. 1825); William Prince, *Pomological Manual* (2d ed. 1832); William Kenrick, *The New American Orchardist* (1833); Robert Manning, *Book of Fruits* (1838; 2d ed. by John M. Ives, 1844); E. Sayers, *The American Fruit Garden Companion* (1839); A. J. Downing, *The Fruits and Fruit Trees of America* (1845, with subsequent editions); John J. Thomas, *The Fruit Culturist* (1846, with subsequent editions); Thomas Bridgeman, *The Fruit Cultivator's Manual* (1845); George Jaques, *A Practical Treatise on the Management of Fruit Trees* (1849); Chauncey Goodrich, *The Northern Fruit Culturist* (1849). A few others of less note, as well as American editions of English works, appeared before 1850. Since that date the chief writers of books have been Hooper, Warder, Barry, Thomas, Downing, Fuller, Strong, Baker, Roe, and Wickson.

L. H. BAILEY.

Pomo'na: the Roman goddess of gardens and fruit, of whose wooing by Vertumnus, the god of the revolving year, Ovid has made a pretty story (*Metamorphoses*, xiv., 623 ff.). Her worship was presided over by a special priest, the flamen Pomonalis, and in the country between Ardea and Ostia there was a grove, called the Pomonal, sacred to her.

Pomona: the largest of the Orkney islands.

Pomona: city; Los Angeles co., Cal.; on the S. Pac. Railroad; 33 miles E. of Los Angeles, the county-seat (for location, see map of California, ref. 12-F). It is in an agricultural, mining, and fruit-growing region, contains several manufacturing, and has 3 banks with combined capital of \$200,000, and 3 weekly newspapers. Pop. (1890) 3,634.

Pompadour, pōn'pā' door', JEANNE ANTOINETTE POISSON, Marquise de; b. in Paris, France, Dec. 29, 1721; was supposed to be the natural daughter of Le Normant de Tournehem, a farmer-general of the revenues, who provided for her education; was noted for her dignity, beauty, intelligence, and wit; was married in 1741 to Le Normant d'Étoiles, a nephew of her guardian; became the mistress of Louis XV. in 1745; was presented at court as Marchioness

of Pompadour, and splendidly established in the royal residences at Paris, Versailles, and Fontainebleau; received several magnificent estates and an annual income of 1500,000 francs, and exercised a decided influence on the Government of France for nearly twenty years, in all its branches—its finances, foreign alliances, military operations, etc.—bringing loss and disgrace over the kingdom. On the other hand, she deserves praise for her patronage of literary men and artists. Her efforts to retain her influence over the king were unceasing, and she accomplished her ends largely by encouraging him in his excesses. D. at Versailles, Apr. 15, 1764, detested by the whole French people. See the study by Campardon (1867); E. and J. de Goncourt, *Les Maitresses de Louis XV.* (vol. ii., 1860); Beaujoint, *Secret Memoirs of La Marquise de Pompadour* (1885); and the volumes of her *Correspondance*, edited by Malassis (1878) and by Bonhomme (1880).

Pompano [adapted from Spanish *pinpano*, a kind of fish (*Stromateus fiatola*) found in European waters]: a name applied to several food-fishes, particularly to *Trachinotus carolinus*, a species found in the Gulf of Mexico and highly valued. It is rather deep in form, bluish above, silvery on the sides, and attains a length of about 18 inches. In California the name is given to a smaller fish of somewhat similar shape (*Stromateus simillimus*). F. A. L.

Pompeii, pom-pā'yē: an ancient city of Campania, on the bay of Naples, at the foot of Mt. Vesuvius. The date of its founding is unknown. Its oldest architectural remains reveal the Doric style of the sixth century B. C. The Oscans seem to have occupied the city down to the end of the fifth century B. C., when it was wrested from them by the Samnites. At this early period, through contact with the Greek colonies of Southern Italy, the city had arrived at a degree of culture far surpassing the contemporary civilization of Rome. The Samnite wars (342-290 B. C.) brought Pompeii, along with the rest of Campania, into partial subjection to Rome, through an alliance in which Rome's position was supreme; but in all domestic affairs of government it still enjoyed autonomy. Not until the Social war (90-88 B. C.) was this semi-independence replaced by regular subjection to Rome as a Roman colony. Pompeii was a well-to-do commercial city, with a harbor on the Sarno, somewhat nearer to the sea than at present. For a century before its destruction it was also a favorite site for the villas of wealthy Romans, attracted hither by the beauty of its location and the healthfulness of its climate. Its population at the time of its destruction is conjecturally placed (by Mau) at 30,000. Up to the year 63 A. D. Vesuvius had never, since the settlement of the region, given any indication of its volcanic character, but at that time Pompeii and the surrounding country were violently shaken by earthquakes, which wrought much destruction, evidences of which are still distinguishable among the later ruins. While the inhabitants were still occupied in rebuilding the city, the sudden eruption of Aug. 24, 79 A. D., overwhelmed them. (For details of this event, see the famous descriptions in the correspondence of the younger Pliny, vi., 16 and 20.) This eruption was attended by earthquake, which did much damage that could not have been caused by the shower of small stones and ashes beneath which the city was buried. The depth of the covering of volcanic matter is 14 or 15 feet, the lower layer consisting of small pumice-stones, the upper layer of ashes, each of about equal thickness. It is not likely that the volcanic matter set fire to the city, but the carbonized condition of all woodwork found is due rather to chemical change under the influence of moisture. After the eruption the upper portions of the larger buildings still projected above the surface, and were not only thus themselves more quickly destroyed, but they served also to guide excavations which were doubtless made soon afterward for valuables of all sorts, including the marble which must have adorned public buildings. Most of the inhabitants escaped unharmed, but, from the skeletons discovered, Mau estimates that not less than 2,000 perished. During the Middle Ages the existence of Pompeii was forgotten and its site was unknown. Excavations were begun in 1748, and continued irregularly for more than a century. The present systematic work of unearthing the city was begun in 1861 by Giuseppe Fiorelli. About half of the city has been disclosed, and the course of the wall has been determined.

The outline of the boundaries of Pompeii is of oval form, fitting in general the hill of lava formation on which it is built. The town was laid out regularly, with the principal

streets running N. and S. and E. and W., although some deviation from parallel lines was occasioned in places by irregularities of the surface. The streets vary in width, averaging, however, about 20 feet, and are paved with irregular blocks of lava. Narrow sidewalks are found on both sides of the street, beneath which the conduits of a very complete sewer system are carried. The public buildings were clustered about two centers, the Forum and the Stabian gate. The Forum, situated near the western edge of the city, was a rectangular space, completely surrounded by temples and other structures—such as the basilica, the tribunals, the *macellum* (or market-hall)—serving various public ends. The area of the Forum itself was adorned on the north side by the temple of Jupiter, and surrounded on the remaining three sides by long porticoes. None of the buildings about the Forum are perfectly preserved, but the foundations and the columns still standing have generally made it possible to ascertain their design. The second group of buildings about the Stabian gate extended along one side of the so-called triangular Forum, a three-sided space almost surrounded by an admirable Doric portico. Within this space is situated the most ancient edifice of Pompeii, commonly (but erroneously) called the temple of Hercules, a structure in the Doric style of the sixth century B. C., which had already fallen into ruins at the time of the city's destruction. The open space of the Forum triangulare served doubtless as the entrance to the large theater, an adjacent structure on the east side. This theater had a seating capacity of about 5,000. The stage is raised above the orchestra, and accessible from the latter by a flight of stairs. Adjoining the larger theater and nearer the Stabian gate is the smaller theater, used, it would seem, for less formal occasions. Further toward the center of the city from the Stabian gate are found the Stabian baths, the most completely preserved example of that institution so characteristic of Roman civilization. Two other establishments of similar character are found in different parts of the city. No buildings, however, possess a greater interest than the private houses, of which those here found are the only well-preserved examples now existing. The Pompeian private residence is identical with the Roman house as described by Vitruvius, and consists of a central room or atrium with smaller apartments clustered about it. Most commonly, however, this simple arrangement is amplified by the addition of an open court or garden behind the atrium surrounded by columns, and hence called the peristylum. The houses afforded no outlook upon the street, and indeed very frequently the apartments on either side of the entrance had no communication with the house itself, but were rented as shops.

The works of art in marble and bronze which have been discovered at Pompeii are for the most part preserved in the museum at Naples. They are of very great interest, although for the most part inferior to the works of similar character discovered at *HERCULANEUM* (*q. v.*). Among the most attractive and unique decorations discovered at Pompeii are the paintings which adorned the walls of public buildings and of the more sumptuous private residences. There is discernible in them considerable diversity of style, showing a development from the imitation of purely architectural effects to the treatment of landscape, mythological figures, and scenes from daily life and from history. The last and most characteristic period is represented by designs which combine, in curious and often grotesque fashion, fantastic architectural motives with figures and ornamental treatment of foliage. Another interesting form of decoration is the mosaic work which adorns the floors of many of the houses. Usually it consists of merely ornamental designs in black and white, but there are a few examples of more elaborate work, such as the famous representation of the battle of Alexander in the Casa del Fauno. No manuscripts or important literary monuments, aside from inscriptions, have been found at Pompeii. Of the latter there are many very interesting specimens, ranging in subject-matter from announcements of the merits of candidates for public office or proclamations of gladiatorial games to personal effusions of the most diversified character.

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Wandmalerei in Pompeii (Berlin, 1882). For the inscriptions, see vol. iv. of the *Corpus Inscriptionum Latinarum*, ed. C. Zangemeister (Berlin, 1871). For detailed bibliography, consult *Bibliografia di Pompei, Ercolano e Stabia*, compiled by F. Furchheim (Naples, 1891). G. L. HENDRICKSON.

Pompeius Trogus: See *TROGUS*.

Pompey (Lat. *Gnaeus Pompeius*, called *MAGNUS*, the Great): a Roman general; b. in 106 B. C. of a plebeian family which had only recently emerged from obscurity. From childhood Pompey enjoyed a military training, fighting with his father in the Social War (90-88 B. C.), and taking sides with Sulla and the aristocratic party in the contest with Marius. In 81 B. C., contrary to all precedent and rule, he was granted a triumph, and was greeted by Sulla with the cognomen *MAGNUS*, which he continued to bear through life, and even passed on to his son. After Sulla's death he was recognized as the leader of the aristocratic party. His successes in the war against Sertorius in Spain, and in the suppression of the rebellion of the slaves, were not indicative of great military talent, but they stood out by contrast to the failures of the leaders who had preceded him with sufficient brilliancy to make him a successful candidate for the consulship before he had passed through the usual preliminary grades of office. However, it was only by accepting the programme of the democratic party that he could secure the coveted prize, thus alienating himself from the senatorial party with which he had hitherto been identified. Although as consul (70 B. C.) he carried out the popular measures in abolition of the constitution of Sulla, he did not make himself a leader of the democratic party. For several years after his consulship he took no active part in public affairs, but his military skill was too great and too much needed to be long unused. A popular measure proposed that he be intrusted with extraordinary and absolute powers for the purpose of clearing the Mediterranean of the pirates who infested it, and who had so harassed the carrying trade that the price of grain was intolerably high. The bill was passed against the united opposition of the aristocracy, which saw in the proposition nothing less than the abolition of the constitution and the inauguration of an absolute one-man rule. The pirates were speedily driven from the sea, and in less than a year the supreme command of the operations against Mithridates was intrusted to him (66 B. C.). In this mission he was also successful, and had attained a political and military influence which seemed to the aristocracy a menace to the constitution, and which would have been so in the case of a bolder and more discerning man; but on his return in 61 B. C. Pompey found himself in a position of complete isolation. He had disbanded his army, losing thereby his power of intimidation, and, feared by the democrats and disliked by the aristocracy, he ventured on no escape from his embarrassment in individual action, and was therefore forced into the coalition with Cæsar and Crassus (the first triumvirate), for the sake of having his wishes in regard to the reward of his army and himself carried out. Although Pompey enjoyed with Cæsar a position almost supreme in Roman politics, it became more and more apparent that Cæsar was the heir to the opportunity which Pompey had let slip. In the distribution of political prizes among the members of the coalition Pompey secured largesses of land with which to reward his army, and a formal approval of his settlement of affairs in the East. Again, after the renewal of the triumvirate in 56, Pompey and Crassus were made consuls for the following year, and the provinces of Spain were intrusted to Pompey for a period of five years. He, however, governed them only through his representatives. The course of events from the year 53 on, by which Pompey once more became the leader of the senatorial party against Cæsar, the advance of Cæsar on Rome (early part of 49 B. C.), and the retreat of Pompey through Italy into Epirus, belong equally to the history of CÆSAR (*q. v.*). The final contest took place at Pharsalus in Thessaly, and Pompey was completely routed. He fled to Egypt, and there, as he was disembarking, he was treacherously murdered. G. L. HENDRICKSON.

Pompey's Pillar (so called): a stone pillar erected, according to an inscription on its base, by one Publius, prefect of Egypt, in honor of Diocletian, about 296 A. D. It stands on an eminence just S. of Alexandria. The shaft, 73 feet long, is of beautiful highly polished red granite. The total height of the column is 98 ft. 9 in.

Pompeimoose: See *SHADDOCK*.

Pompo'nius, Lucius: a Latin poet from Bologna (Bononia), who flourished about 90 B. C.; famous as a writer of *Fabula Atellana*. Some seventy titles and nearly 200 verses have been preserved in the citations of grammarians. See Ribbeck, *Comicorum Romanorum Fragmenta*. M. W.

Pomponius Mela: See MELA.

Ponce Indians: See SIQUAN INDIANS.

Ponce, pōn'thā: the second city in size and one of the most important ports of the Spanish island of Puerto Rico; on a plain a mile back from a bay of the southern coast (see map of West Indies, ref. 6 J). A tramway connects it with its port on the bay, which forms a somewhat imperfectly sheltered harbor. Near the town are the celebrated mineral springs of Quintana, much frequented by invalids. Ponce has a thriving trade, principally in coffee. Population of the district (1887) 42,388; of the city proper probably 25,000. HERBERT H. SMITH.

Pon'ee de Leon', JUAN: conqueror and discoverer; b. in Aragon, Spain, about 1460. He was of noble family, served in the conquest of Granada, and in 1493 went with Columbus to Española; later he was governor, under Ovando, of the eastern part of that island, whence he passed over to Puerto Rico in 1508 and began its conquest; in 1510 he was appointed its governor. From the Indians he heard of an "island" called Bimini, to the N. W., and it was reported that this contained a miraculous spring which would restore the aged to youth; probably the supposed island was Florida. Ponce de Leon received in 1512 a grant to discover and settle Bimini; he sailed from Puerto Rico in Mar., 1513, discovered some of the Bahamas, coasted along the Atlantic side of the mainland to lat. 30° 8' N., and on Easter Sunday, Apr. 8, landed and took possession, calling the country Florida, from Pascua Florida, the Spanish name for Palm Sunday. He also explored the Gulf coast to lat. 27° 30' N., and returned to Puerto Rico in September. His grants were renewed, but owing to Indian wars in Puerto Rico he could not again sail for Florida until 1521. He then attempted to plant a colony, but was driven off by the Indians and was himself so badly wounded that he died shortly after reaching the coast of Cuba. HERBERT H. SMITH.

Ponce de Leon, LUIS: See LEON, de.

Ponchielli, pon-kē-el'lē, AMILCARE: opera-composer; b. at Paderno Fasolaro, Cremona, Italy, Aug. 31, 1834; after being educated at the Milan Conservatory produced his first opera, *I Promessi Sposi*, at Cremona, in 1856. Following this he wrote *La Sarparda* (1861); *Roberto* (1864); *La Stella del Monte* (1867); *Le Due Gemelle* (ballet, 1873); *Clarina* (ballet, 1873); *I Litvani* (1874); *Gioconda* (1876); *Il Figlio Prodigio* (1880); *Marion Delorme* (1885); together with several other less successful operas, some cantatas, and smaller works. D. at Milan, Jan. 16, 1886. D. E. HERVEY.

Pond, JOHN, F. R. S.: astronomer; b. in London in 1767; educated at Trinity College, Cambridge; studied astronomy under Wales, the companion of Capt. Cook; succeeded Dr. N. Maskelyne as astronomer-royal 1811; devoted himself to cataloguing and determining the exact places of the fixed stars; translated Laplace's *System of the World* (2 vols., 1809); and published numerous papers in the *Transactions of the learned societies*. D. at Blackheath, Sept. 7, 1836.

Pondicherry, pōn-di-she'r'i: a French possession in India; on the Coromandel coast, 83 miles S. W. of Madras, in lat. 11° 55' N. (see map of South India, ref. 6-F). It comprises an area of 107 sq. miles, with 172,941 inhabitants. It consists of a low, flat plain, with a sandy, not very productive soil, and is only partly watered by the river Gingee. The town of Pondicherry, which is the capital of all the French possessions in India, is regularly laid out and well built, with fine promenades and plantations. Its manufactures of fine cotton cloth and cotton thread are important; it has no harbor, vessels are compelled to anchor in an open roadstead, and landing is difficult on account of the surf. Pop. (1889) 41,253. Revised by M. W. HARRINGTON.

Pondoland: a district of Cape Colony, Africa; inhabited by the Ama-Pondo, a branch of the Kaffir family. Pop., estimated, 200,000. It is the most eastern coast-region of Cape Colony, and is chiefly watered by the St. John's or Umzimvubu river. It was the last of independent Kaffraria to fall (1878) into the hands of the British, by whom a military post is maintained on the St. John's river, where the resident commissioner appointed by the Cape is stationed. See KAFFRARIA. C. C. ADAMS.

Pond-scums: small fresh water plants of the order *Conjugatae* and the family *Zygnemaceae*. See VEGETABLE KINGDOM.

Pondweed Family: the *Alismaceae*; aquatic or helophytic cotyledonous herbs, with alternate or opposite submerged or floating leaves; flowers perfect or dioecious; perianth usually wanting, sometimes of six or more segments; pistils one to six, simple, superior, with two to many ovules. The species, which are found in all regions, number about 120. They occur in most ponds and ditches, especially in still, shallow waters. They are to be regarded as modified from the *Alisma* type by a suppression of the perianth and a reduction in the stamens and pistils. The species (sixty-four) indigenous to the U. S. are described and figured by Dr. Thomas Morong in his *Revision of the North American Naiadaceae* (1893). CHARLES E. BESSEY.

Poniatow'ski: the name of a celebrated princely family of Poland directly descended from the Italian family of the Torelli, which settled in Poland in the middle of the seventeenth century, and closely allied to the Leszczynskis and Czartoryskis. The most prominent members of the family were (1) STANISLAS AUGUSTUS, the last King of Poland, b. in Lithuania, Jan. 17, 1732; ascended the throne in 1764 by the influence of Catherine II. of Russia; resigned in 1795, and died at St. Petersburg, Feb. 12, 1798. He was weak, irresolute, and utterly incapable of grappling with the party fury of his subjects and the treachery of his allies. The principal events of his unhappy reign are told in the history of POLAND (q. v.).—(2) JOSEPH ANTONY, b. at Warsaw, May 7, 1762, a nephew of the king; received a military education; served in the Austrian army in the Turkish war; entered the Polish army in 1789 as a major-general; commanded against the Russians in 1792, but retired from service when the king joined the confederation of Targovitz; fought again in 1794 against Russia under Kosciuszko; repaired to Vienna in 1795, but returned to Warsaw in 1798, and lived on his estates, at that time under Prussian dominion. In 1807 he commanded the Polish army which aided Napoleon against Russia, and when the duchy of Warsaw was established by the Peace of Tilsit he was appointed minister of war. In 1812 he commanded the Polish contingent of the grand army during the Russian campaign, and distinguished himself by his valor and tactical talent. Shortly before the battle of Leipzig he was made a marshal of France, and after the battle he was charged with covering the retreat of the army, but was drowned (Oct. 19, 1813) in crossing the river Elster.—(3) JOSEPH, b. at Rome in Feb., 1816; became known as a composer of several operas and masses. *Don Desiderio* was performed at Paris in 1868 with considerable success. D. in London, July 3, 1873. Revised by F. M. COLBY.

Ponka Indians: See SIQUAN INDIANS.

Ponsard, pōn'saar', FRANCIS: dramatist; b. at Vienne, Isère, France, June 1, 1814; studied law in Paris, and began to practice at Vienne, but removed to Paris and gave up law for literature. He was first an admirer of Hugo, and in 1837 translated Byron's *Manfred*. He did not follow the romantic progress of Hugo, and profited by the new favor won for classical plays by the brilliant interpretations of Rachel and the recoil from the extremes of Hugo to bring out *Lucrèce*, an attempt to reconcile the old classical tragedy with a modest romanticism. His success was immense, and he was hailed as the founder of the school of "good sense." After the further tragedies, *Agnès de Méranie* (1846), *Charlotte Corday* (1850), and *Ulysse* (1852), he renewed his success with the comedies *L'Honneur et l'Argent* (1853), *La Bourse* (1856), *Le Lion Amoureux* (1866), and *Galilée* (1867). D. in Paris, July 13, 1867. His *Œuvres complètes* (3 vols.) were published in 1876. A. G. C.

Ponson du Terrail, pōn'son dū'tā'rail, PIERRE ALEXIS DE PONSON, Vicomte de: novelist; b. at Montmaur, Isère, France, July 8, 1829; intended for the navy, his weakness in mathematics unfitted him for it, and he turned to writing. He began in 1850 with *feuilletons* in *La Mode* and *L'Opinion publique*, *Les Contesses du Monde* (1854), his celebrity and gained him a special public. He supplied the cheaper papers with a vast number of novels of sensational adventure and incident, which were very popular. D. at Bordeaux, Jan. 20, 1871. A. G. CAXFIELD.

Pons Varolii: See BRAIN.

Ponta Delgada, pōn'tā-del-ga'dā: a town on the Azores islands, situated on the southern coast. See AZORES. Its

harbor is shallow and the roadstead outside the harbor unsafe, yet it has a large trade, especially in oranges to Great Britain, grain to Portugal, and earthenware to Brazil. Pop. about 17,500.

Pontchartrain, *pon-char-trân'*, **Lake** [named after Jérôme Phélypeaux, Comte de Pontchartrain, Minister of Marine under Louis XIV.]: a lake of Louisiana, about 40 miles in its longest dimension E. and W. and 25 miles N. and S., the southern shore of which is but about 5 miles distant from and nearly parallel to the Mississippi river in its local easterly course in this region. It is separated on the W. by a peninsula of cypress-swamp from Lake Maurepas (named after Count Maurepas, son and successor of Pontchartrain), a much smaller lake, with which it is connected by the Pass Manchac. New Orleans communicates with the lake by a branch of the Louisville and Nashville Railroad, and by two canals navigable by schooners and smaller craft, one of which (see **BORGNE**) enters the head of the bayou St. John, by which the navigation is continued to the lake; the other is wholly artificial. These canals have their heads in "basins" in the rear of the city; they do not communicate with the Mississippi. The lake communicates with Lake Borgne and Mississippi Sound by the passes of the Rigolets and Chef Menteur, through which there is a tidal flow of the sea-water. Fort Pike and Fort Macomb defend these passes. An important commerce in lumber, firewood, bricks, etc., is carried on through the lake and the Rigolets. The northern shore of the lakes, a continuation westerly of the "pine-woods" region, is elevated and healthful. There are many places of resort on the shores of the lake.

Pont du Gard, *pôn'dü-gaär'*: the remains of one of the most magnificent Roman structures in France, consisting of three tiers of arches, on which the aqueduct which brought the water of the Aure to Nîmes crossed the Gard 10 miles N. E. of that city. See **AQUEDUCTS**.

Pontecorvo, *pôn'tā-kōr'vō*: town; in the province of Caserta, Italy; on the Garigliano, about 28 miles S. of Sora and 37 miles N. W. of Capua (see map of Italy, ref. 6-E). The old walls and towers, once very strong, are now in a ruinous condition. A bridge of Pelasgian construction connected the city with its suburbs. This bridge was broken down to check the march of Hannibal, and afterward restored. In 1860 it was blown up by the Bourbon troops, but was rebuilt soon after. In and near the town there are some fine churches, containing frescoes, and among the archives of the cathedral are Lombard, Gothic, and mediæval Latin MSS. The ruins of the ancient *Fregellæ* are distinctly traceable, and among them are found mosaics of great beauty. Bonaparte created Bernadotte Prince of Pontecorvo in 1806. Macaroni and works in plaster constitute the chief industries. Pop. 5,172.

Ponte da: See **BASSANO**.

Pontefract, *pom'fret*, or **Pomfret**: town of Yorkshire, England; on the Aire; 13 miles S. E. of Leeds (see map of England, ref. 7-I). It has two churches, a grammar-school (founded in 1549), a town-hall, a market-hall; trades chiefly in grain, cattle, malt, and garden-produce. Pop. (1891) 9,702; of the parliamentary borough (which returns one member), 16,407.

Pontevedra, *-vā'drā*: town; in the province of Pontevedra, Spain; at the head of the Bay of Pontevedra; on the Lerez, which is crossed by a noble bridge (*pons vetus*) built in Roman times (see map of Spain, ref. 13-A). The city is substantially built, and the surroundings are among the most fertile regions of Spain. There are sardine-fisheries and manufactures of hats and cloth. Pop. (1887) 19,996. The province of Pontevedra lies on the Atlantic Ocean, between the Minho and Ulla rivers. Area, 1,739 sq. miles. Pop. (1887) 443,385.

Pontiac: Indian chief; b. near the river Ottawa about 1720; son of an Ojibway woman; through the alliance of the Ojibways and Pottawatamies with the Ottawas became chief of the three tribes; became an ally of the French in Northern Michigan, and in 1746 defended Detroit against Indian attacks. He was present, it is believed, at Braddock's defeat in 1755. After the British in 1760 had displaced the French in the Northwest, Pontiac organized a conspiracy among the Indian tribes between the Ottawa and the lower Mississippi with the purpose of murdering the British garrisons at all points. In May, 1763, eight garrisons (ranging from Western Pennsylvania to Mack-

inaw) were destroyed or dispersed on the same day, and the whole frontier was ravaged. The attack on Detroit, led by Pontiac himself, was anticipated by the British, but the chieftain besieged the town May 12-Oct. 12, 1763, maintaining his force by food received from the Canadian settlers, who received in return promissory notes written on birch-bark, all of which Pontiac subsequently redeemed. Deserted by his followers, he still endeavored to arouse his people to the dangers in store for them, but in 1766 he was obliged to submit to the British rule. He was murdered at Cahokia, Ill., in 1769, by an Illinois Indian. See Parkman's *Conspiracy of Pontiac* (1867).

Pontiac: city; capital of Livingston co., Ill.; on the Vermilion river, and the Chi. and Alton, the Ill. Cent., and the Wabash railways; 33 miles N. N. E. of Bloomington, 93 miles S. S. W. of Chicago (for location, see map of Illinois, ref. 4-F). It is in an agricultural, coal-mining, and stock-raising region, and contains several mills, iron-foundry, shoe-factories, straw-paper factory, the Illinois State Reformatory, 2 national banks with combined capital of \$100,000, and 3 weekly newspapers. Pop. (1880) 2,242; (1890) 2,784.

Pontiac: city; capital of Oakland co., Mich. (for location, see map of Michigan, ref. 7-K); on the Clinton river, and the Detroit, Gr. Haven and Mil. and the Pontiac, Oxford and N. railways; 26 miles N. W. of Detroit. Within the county and a few miles from the city are over 400 lakes, with a total area of about 30,000 sq. miles, teeming with choice fish, and having on their shores the Michigan Military Academy and many club-houses, hotels, and summer residences. The city has a large trade in wool and agricultural productions, and contains the Eastern Michigan Asylum for the Insane, gas and electric lights, a national bank (capital \$100,000), 2 State banks (combined capital \$150,000), and 5 weekly newspapers. Pop. (1880) 4,509; (1890) 6,200; (1894) 7,276. EDITOR OF "GAZETTE."

Pontianak': town of Borneo; on the west coast of the island, at the confluence of the Landak and the Kapuas, which from here to its mouth is called the Pontianak, and lined on both sides with impenetrable forests (see map of East Indies, ref. 7-D). Pontianak is the capital of the Dutch dominions of Western Borneo, the residence of the governor, and is defended by Fort du Bus. Its trade in diamonds, gold-dust, sugar, rice, cotton, and coffee is important. Pop., estimated, 15,000, most of whom are Chinese, and very few Europeans. Revised by M. W. HARRINGTON.

Pontifex [= Lat. *pons*, *pontis*, bridge (perhaps originally a path, road) + *fa cere*, make]: a priest of the college of the pontifices, the foundation of which tradition carried back to Numa. Before the banishment of the kings the king himself was at the head of this college, but after that time it was presided over by a member of the college called the pontifex maximus, or chief priest, whose official residence was the old royal palace, the regia. The pontifices did not, like the flamens, have charge of the worship of particular divinities, but they exercised a general supervision over the public religion, interpreted and declared the pontifical law, managed the complex machinery of the Roman calendar, and acted as official advisers to the senate and magistrates in all religious matters requiring their attention. The college originally consisted of five members, including the pontifex maximus, but by the end of the republic it had been increased to fifteen, while under the empire new members were added to it without reference to a fixed number. At first vacancies were filled by the choice of the college itself (*cooptio*), later the pontifex maximus, and finally all of the pontifices were elected by the people. In imperial times the emperor was always the pontifex maximus. G. L. H.

Pontifical States: See **PAPAL STATES**.

Pontine Marshes [*Pontine* is from Lat. *Ponti'nus*, *Pompti'nus* for **Pometi'nus*, Pometian, deriv. of *Pometia*, ancient name of the place near which these marshes are situated]: a tract of marshy ground in the province of Rome in Italy. The marshes extend from the vicinity of Cisterna S. W. to the sea at Terracina, a distance of about 28 miles, with a mean width of little more than 5 miles. The level near Cisterna is about 30 feet above the sea, while at Terracina it dips below the sea-level. Both the marshes and the boggy and tangled forest on the low sands which bound them on the S. W. are very unhealthy during the warm season, and the miasma they exhale is borne by the south winds even to Rome. The ancient Romans made many par-

tially successful attempts to drain and reclaim this territory, built the Appian Way through the center of it, and constructed a navigable canal not far from the line of the road, quite down to Terracina. Pliny states that this district was once thickly inhabited and contained twenty or thirty large towns, besides numerous villages and hamlets. Several drainage schemes were promoted by the popes, especially by Pius VI., in the last quarter of the eighteenth century. See Prony, *Description hydrographique et statistique des Marais Pontins* (1813); Giordani, *Gli alluvioni Pontine* (1872).

Revised by M. W. HARRINGTON.

Pontois, pōn twā, JEAN-FÉLIX HONORÉ; lawyer and writer; b. at Thouars, France, July 26, 1837. After he came of age he took up legal work (1859) as a digester, and was made a judge of the tribunal of Annecy; was transferred to the tribunal of Algiers 1874; made judge of the appellate court of Algiers 1879; and successively judge of the court of Bourges, president of the tribunal of Tunis 1883, and president of the division of the court of appeals at Nîmes 1886; resigned in 1889, and entered into active and successful political work in opposition to the Boulangerists, with whose administration of affairs in Tunis he had been dissatisfied while there. He is a member of the Legion of Honor. He has published *Les Petits-fils de Tartuffe* (1864); *Réforme du Code d'Instruction criminelle et du Code pénal* (1871); *La Conscription du Général Berton* (1877); and other political and judicial studies, as well as some theatrical plays, as *Les Homotons*, *Die Minutes d'Arret*, *La Robe de Chambre de Diderot*, etc. F. STURGES ALLEN.

Ponton: See BRIDGES, MILITARY.

Pontopîdan, ERIK LUDVIGSEN; historian and theologian; b. at Aarhus, Jutland, Denmark, Aug. 24, 1698; studied theology at the University of Copenhagen; became professor in 1738; Bishop of Bergen, Norway, in 1747; chancellor of the University of Copenhagen in 1755. D. at Copenhagen Dec. 20, 1764. As a theologian he was a disciple of Spener; as an historical writer he was careful, generally accurate, and possessed of immense learning. His principal works, written in German, Danish, and Latin, are *Everriculum fermenti veteris* (1736); *Psalmebog* (1740); *Gesta et Vestigia Danorum extra Danicum* (3 vols., 1740); *Memora* (3 vols., 1742), a theological romance; *Glossarium Norvegicum* (1749); *Annales ecclesie Danice diplomatici* (1741-52); *Norges naturlige Historie* (1752; translated into English, London, 1755); *Den Danske Atlas* (7 vols., 1763-81), a topographical account of Denmark. D. K. DODGE.

Pontor'mo, JACOPO, di; painter; b. at Pontornovo, near Empoli, Italy, in May, 1494; family name CARUCCI or CARRUCCI. He studied painting with his father, and afterward with Leonardo da Vinci, Albertinelli, and Piero di Cosimo successively, until in 1512 he became a follower of Andrea del Sarto, whose manner he finally adopted. His finest work is the fresco-painting of the *Visitation* in the court of the Annunziata in Florence. The fresco paintings of the *Deluge* and the *Last Judgment* for the Church of San Lorenzo in Florence have disappeared. He was the master of Bronzino, who painted under him in many of his works. Pontormo died at Florence, and was buried in the Church of the Annunziata, Jan. 2, 1557. A *Holy Family* and a portrait of Giovanni delle Corniole, in the Louvre, are good examples of his art; also the portrait of a boy in the London National Gallery. W. J. STILLMAN.

Pontus: an ancient territory of Asia Minor, lying S. of the Black Sea, between the Phasis and Halys. The name was first applied by Xenophon. Afterward it became an independent kingdom, and included the territory between Colchis, Armenia, Cappadocia, Galatia, and Paphlagonia. Its historic celebrity is mainly due to Mithridates VI. the Great (120-63 B. C.), who made it a great power, but who was conquered by Pompey 65 B. C. It became a Roman province 63 B. C. It is now comprised in the Ottoman vilayets of Sivas and Trebizond. E. A. GROSVENOR.

Pontus Euxinus: See BLACK SEA.

Pontzen, ERNEST; civil engineer; b. at Budapest, Hungary, Jan. 20, 1838; studied in the Polytechnic School of Vienna, and in the École de Ponts et Chaussées of France, graduating in 1860 at the head of his class; he was for four years in the service of the Austrian Railway Company; in 1864 was engaged by the Southern Railway of Austria, first as inspector of operation, and afterward placed in charge of the railways in Venice, upon completion of which he was for three years in charge of the works of the port of Trieste.

In 1869-70 he was head of the main office of Kleim Brothers, where he worked out the complete plans of the Arlberg Railway and built a railway in Transylvania; in 1870-75 he was consulting engineer to the Anglo-Austrian Bank. In 1873 he visited the U. S. for study; in 1876 was member of the juries on railways and on industries of the Centennial Exposition. On his return he took up his permanent residence in Paris. He was a delegate of the French Government to the railway conference at Berne in 1886, and to that of St. Petersburg in 1892. He was sent to Russia by the French Government in 1890 to study the transportation of grain. His plans for the sewerage of Havre and of Cairo received first prizes. He is general manager of the Southern Railway of Spain and consulting engineer of the Peloponnesian railway in Greece. He has published many pamphlets, papers, etc., upon engineering subjects, has written many papers for the Society of Civil Engineers of France, and has published a treatise on *Methods of Construction*. His most important work, in which he was associated with E. Larvinne, is upon the railways of America. W. R. HUTTON.

Pony [probably of Celtic origin; cf. Gaelic *ponaidh*]: a small form of the horse. The most famous European ponies are the Shetland, Iceland, Welsh, Dartmoor, Corsican, and Greek. In North America there are the Canadian, Sable Island, Gay Head, Sea Island, and mustang. These little animals are tough and spirited, but often vicious. The smallness and unusual growth of the hair, mane, and tail of many are due to exposure and scanty food for many generations.

Poodle [loan-word from Germ. *pudel*, small dog]: a dog distinguished by the extremely long and curly hair. This may vary from the wiry texture found in the Russian poodle to the woolly curls of the French breed, but should in all be thick and elastic. The color may be brown, white, or black, but not mottled, and the weight may vary from 5 to 40 lb. The head should be broad and carried high, ears long and well-clad, tail carried with an upward curve. Poodles are very intelligent and usually play an important part in exhibitions of trained dogs. F. A. LUCAS.

Pool: in the U. S. and elsewhere, a game played on a table similar to that used in billiards, except that at each corner and midway of the two sides "pockets" are inserted. (See BILLIARDS.) One cue-ball and object-balls numbered consecutively from one to fifteen are employed. In the beginning of a game the latter are usually arranged in the form of a pyramid, with the apex on what corresponds to the red-ball spot of a billiard-table. The cue-ball is placed anywhere behind the string-line, and is played at the numbered balls, the object being to drive them into the pockets; a player's turn ends with the first shot in which he fails fairly to pocket one, and the next player plays the cue-ball from where he finds it, or, if pocketed, from behind the string-line. There are many varieties of the game, each with elaborate rules. In *pyramid pool* each ball pocketed counts one, and (when only two play) the first to secure eight wins. Failing to hit any object-ball, or driving the cue-ball off the table or into a pocket, involves the forfeiture of one ball (together with any balls pocketed in the shot itself), and this is placed on the spot or as near as may be directly behind it. In *fifteen-ball pool* the forfeit is three points, and each ball secured counts its number. *Continuous pool* is played in tournaments; it is like pyramid pool, except that the game consists of any number of balls or points agreed on, and forfeitures are deducted from the player's score, instead of a ball being replaced on the table.

In Great Britain games like the above are called *pyramids*, the term pool being applied to a game played for a stake on a pool-table, each player having one ball. The object of this game is to drive the balls of opponents into the pockets; for each ball so pocketed the player receives from its owner a stipulated sum; when one's ball has thrice been so pocketed the player withdraws from the game and his share of the stake, but he may on certain conditions secure another "life" by adding a further sum to the stake. The player whose ball last remains on the table wins the game.

Poole: town: in Dorsetshire, England; on the estuary of the Frome (see map of England, ref. 14-C). It has some ship-building and manufactures of sail-cloth and cordage, and exports pipeclay and potter's clay. Pop. (1891) 15,405.

Poole, JOHN: humorist; b. in England in 1792; author of a large number of successful dramas and farces, of which the best known were *Paul Pry* (1825), *Deaf as a Post*, *Turn-*

ing the *Tables*, and an adaptation of Shirley's *Wife's Stratagem*. He also wrote novels, essays, and character sketches, among which *Little Pedlington and the Pedlingtonians* (2 vols., 1839) took high rank for originality and racy humor. In his last years Poole enjoyed a pension from the civil list. D. in London, Feb. 5, 1879.

Poole, MATTHEW: author; b. at York in 1624; educated at Emmanuel College, Cambridge; took orders in the Church of England, and became rector of St. Michael-le-Querne, London, but was ejected for nonconformity in 1662; wrote much against Roman Catholicism; is said to have narrowly escaped being murdered at the time of the "Popish plot," and removed to Amsterdam, where he died Oct., 1679. Author, among other works, of a famous compendium of the critical views of 150 biblical commentators, entitled *Synopsis Criticorum* (5 vols. fol., London, 1669-76), and of *Annotations upon the Holy Bible* (2 vols. fol., 1683-85), left unfinished, but completed from Isaiah lviii. by eminent Nonconformists (reprinted 1842, 3 vols.).

Poole, WILLIAM FREDERICK, LL.D.: bibliographer; b. at Salem, Mass., Dec. 24, 1821; graduated at Yale College 1849; published while there an *Index to Subjects in Reviews and Periodicals* (1848), subsequently expanded into the valuable *Index to Periodical Literature* (1853, and 3d ed. 1882). He was librarian of the Boston Mercantile Library 1852-56, of the Boston Athenæum 1856-69, of the Cincinnati Public Library 1869-73, of the Chicago Public Library 1873-87, when he became librarian of the Newberry Library, Chicago. Author of *The Battle of the Dictionaries* (1856); *Websterian Orthography* (1857); and *Cotton Mather and Salem Witchcraft* (1869). D. at Evanston, Ill., Mar. 1, 1894. H. A. BEERS.

Poo'na: town of British India; capital of the district of Poona, in the Presidency of Bombay; on the Mula, near its influx in the Mula; on a dry and treeless plain, 2,000 feet above the sea (see map of South India, ref. 3-C). Although the climate is hot and dry, and water is scarce, the place is considered healthful, and has been made the station of the army of Bombay. The city is well built, and contains the palace of the former Mahratta rulers, many fine barracks, a college, and several other educational institutions. It is connected with Bombay by railway. Pop. (1891) 160,460.

Poore, BENJAMIN PERLEY: journalist; b. at Newbury, Mass., Nov. 2, 1820; learned the printing business; edited *The Southern Whig* at Atlanta, Ga., 1838-40; became an *attaché* of the U. S. legation in Belgium 1841; made a valuable collection of historical MSS. from the French archives for the State of Massachusetts 1844-48; traveled in Egypt, Palestine, and other Eastern countries as correspondent of the Boston *Atlas* 1843-48; published *The Rise and Fall of Louis Philippe* (1848); *Campaign Life of Gen. Taylor* (1848); *The Early Life of Napoleon* (1851); became editor and proprietor of *The American Sentinel* (1851); became editor of *Congressional Directory* in 1867; compiled *A Descriptive Catalogue of the Government Publications of the United States, 1774-81* (1885); and *Reminiscences of Sixty Years in the National Metropolis* (1886). D. at Washington, D. C., May 30, 1887.

Poor Laws: See PAUPERISM.

Poorten-schwartz, J. M. van der: novelist, whose pen-name is *Maarten Maartens*; b. in Holland in 1857; lived when a child in England, but was educated in Germany and at Utrecht University; became a barrister, and was destined by his parents for a political career, but devotes himself entirely to literature and the life of a country gentleman. His works which are written in English include *The Sin of Joost Avelingh* (1890); *An Old Maid's Love* (1891); *God's Fool and A Question of Taste* (1892); *The Greater Glory* (1894); and *My Lady Nobody* (1895).

Popayan': capital of the department of Cauca, Colombia; 3 miles from the left bank of the Cauca, near the source of that river; on the inland route from Bogotá to Quito, and 200 miles S. W. of the former (see map of South America, ref. 2-B). It is built on a beautiful plain near the foot of the Puracé volcano, 5,712 feet above sea-level. It was founded by Benalcázar in 1536, on the site of the Indian village which had been ruled by the chief Payan; for a time the district formed the province or "kingdom" of Popayan. The city was important for its commerce, for gold-mines, and for a mint established in 1749; but it suffered greatly during the revolution and in subsequent civil wars, and is now much decayed. It is a bishop's see, and has a university and college. Pop. about 8,000. HERBERT H. SMITH.

Pope [O. Eng. *pāpa*, from Lat. *pāpa*, papa, father, bishop, (later) pope]: the ordinary name of the Bishop of Rome.

Origin of the Name.—The name was originally given to all bishops as signifying among other things the spiritual generation in baptism and their supreme responsibility. From the beginning of the sixth century there was a growing tendency in the West to restrict its use to the Bishop of Rome. Since Gregory VII. (1073-85) it has been formally reserved to the Bishop of Rome, as the usual title signifying his primacy of honor and jurisdiction within the Roman Catholic Church.

Beginnings of the Papacy.—The papal idea can be traced from primitive times. No other see ever claimed the supreme ecclesiastical primacy as the Roman see has from the most remote antiquity, and there are strong arguments to show that this claim was allowed. The magisterial letter of St. Clement to the Corinthians (about A. D. 96); the visit of St. Polycarp to Rome (Euseb., H. E. V., 24); the testimony of St. Irenæus (*Adv. hæreses*, iii., 3); St. Victor's display of world-wide authority and his power to exclude from the "common unity"; the claim to the "power of the keys," and the citation of Matt. xvi. 19, made by some pre-Constantinian pope, whom Harnack thinks to be Victor (see opp. S. Cyprian, ed. Hartel., vol. iii., p. 92, *seq.*); St. Stephen's judicial action in hearing appeals, and his vindication of the true tradition on baptism (*ibid.*, vol. ii.); St. Dionysius of Alexandria writing to his namesake of Rome for guidance, "so that he might not err" (St. Athanasius, *De Sententia Dionysii*); the conduct of the Emperors Decius and Aurelian; the ambition of early arch-heretics to obtain the favor of the Roman Church—all these indications, and several others previous to the peace of the Church (A. D. 312), show that Christian public opinion recognized at Rome the chief authority of the new religion. That this authority has been exercised since then in every age, both East and West, needs no proof, nor need the revolts against it, the disuse of it, the minimizing of its range, blind us to the fact of its existence or tempt us to modify its essential outlines. Of the latest definitions of the papal authority the highest and most authentic are those of the general councils of Florence (1439), Trent (1563), and the Vatican (1870). These great assemblies of Catholic bishops and doctors added nothing new to the ancient concept of the papal authority, but asserted in detail and in more definite phraseology what had been the rule in the Catholic Church from the remotest times. For a compendious collection of the earliest references to the papal authority, see Allnatt, *Cathedra Petri* (London, 1883). Among the best works on the early history of the Roman Church are Doellinger, *Hippolytus und Calixtus*; Hagemann, *Die römische Kirche* (Freiburg, 1864); and Schroedl, *Geschichte der Päpste und der römischen Kirche in der Urzeit des Christenthums* (Mentz, 1888). The prefaces of Duchesne in his edition of the *Liber Pontificalis* are henceforth indispensable. See Rivington, *The Primitive Church and the See of Peter* (London, 1894).

Authority of the Pope.—The pope enjoys a primacy or supremacy of honor and jurisdiction over the whole Church, individually and collectively. He is the supreme teacher or doctor, and in this capacity is infallible when speaking as such—i. e. *ex cathedra*—or defining a doctrine of faith or morals to be held by the whole Church. He is the supreme legislator in the Church, and can interpret, modify, and dispense in all matters of ecclesiastical law. He is the supreme judge of the faithful, whether members of the hierarchy or laymen, and can hear and decide all major causes and appeals from lower tribunals. He is the supreme administrator, and as such has power to watch over the divine service, and to appoint, remove, or transfer bishops. He is the supreme supervisor, and in this quality receives regularly relations from bishops and other chief ecclesiastical authorities of the state of religion within the limits of their jurisdiction. This is supplemented by stated personal visits paid by the bishops, and known as the Visitation to the Tombs of the Apostles (SS. Peter and Paul). The universal ecclesiastical jurisdiction of the pope is immediate, ordinary, and truly episcopal, and includes the right to send agents who may represent his person and authority before the churches, or even before the temporal authorities. The authority described is vested in the pope by divine right, because he is the legitimate successor of St. Peter, and as such truly the Vicar of Christ, the chief bishop of the Catholic world, the visible and ministerial head of the whole Church, whose invisible and eternal head is Jesus Christ. The honorary distinctions of the pope in title,

dress, and functions are many. For an account of them see Laemmer, *Institutionen des Katholischen Kirchenrechts* (Freiburg, 1892). Cf. also Smith, *Elements of Ecclesiastical Law* (vol. i., New York, 1887).

The election of the pope, originally performed by the clergy of Rome and the suburban bishops, with participation of the faithful, has undergone many vicissitudes, as may be seen in Lucius Lector, *Le Conclave* (Paris, 1893). It was Nicholas II. who definitely placed it (1059) in the hands of the cardinals, and, with some modifications, this is the present method of the election. The cardinals meet on the eleventh day after the pope's decease in a series of double cells (conclave), one for each cardinal, his secretary and chamberlain, and on the twelfth day the election begins. They are not bound to elect a cardinal—only heretics and simoniacal persons are excluded—and the closing act of the election takes place in a chapel specially reserved for that purpose. Certain Catholic courts have been wont to exercise the right to exclude objectionable candidates, but there exists no juridical acknowledgment of this so-called "right of exclusion." When the pope-elect accepts the result of the conclave he changes his baptismal name (as a rule) and chooses another. If he be not a bishop, he is always consecrated by the Cardinal-bishop of Ostia. The reception of the pallium, the solemn coronation, and the "possession" of the Lateran Church take place after this, but the entire papal jurisdiction passes into his hands when he accepts the election.

Temporal Power of the Pope.—The origins of the temporal power are visible in the last decades of the sixth century, especially under Gregory the Great. National and religious feeling contributed to its growth in the first half of the eighth century, and in the latter half of the same the papacy entered the list of European states by the formal donations of Pepin and Charlemagne. The spurious *Donatio Constantini* has been greatly overrated in the discussion of the evolution of the temporal power (*English Historical Review*, July, 1894). Under various forms and with varying boundaries the papal state existed through the Middle Ages as a spontaneous, legitimate growth, and its long, pacific possession through twelve centuries was no despicable element in the propagation of Christian faith and culture. The violent usurpation of Napoleon I. was undone by the Congress of Vienna (1815). Beginning with 1860 the Piedmontese government encroached on the states of the Church, and in 1870 they were incorporated into the kingdom of Italy. The popes have never recognized the fact, nor accepted the law of guarantees by which the Italian kingdom undertook to regulate its internal relations with the papacy.

The Papal Government.—The ordinary administration of the papal authority is carried on through the *Curia Romana*—i. e. the body of officials and agents whom the pope employs in his government, whether in the character of supreme head of the Church, as chief metropolitan of Italy, as Bishop of Rome, or as a temporal authority. The curial jurisdiction, though not distinct from the papal, is ordinary, i. e. legally fixed and attached to the office. The curia consists in general of cardinals, prelates, and *curiales*, or minor officials. The cardinals form the papal senate, and are the ordinary advisers of the pope. The solemn assembly of all the cardinals in the latter capacity is known as the *consistory*, which in turn may be either private or public; the latter kind usually takes place twice a year, and is only a formal ratification of acts already accomplished.

Since Sixtus V. (1585-90) the supreme jurisdiction of the pope is regularly exercised through a number of congregations, over which, as a rule, some cardinal presides in the quality of prefect, aided by assessors, consultants, secretaries, advocates, etc. Questions of law and finance, petitions of the faithful, the expedition of bulls, briefs, apostolic letters, etc., have each their special tribunal or agency, some of them very ancient, like the *Sacra Rota* and the *Cancellaria apostolica*. The cardinal-secretary of state is the official representative of the pope before foreign courts or states, and is the ordinary head of the body of legates, nuncios, alegates, etc., through whom the pope keeps in touch with the temporal and spiritual affairs of Christendom.

AUTHORITIES AND LITERATURE.—The oldest lives of the popes are found in the *Liber Pontificalis* (ed. Duchesne, Paris, 1886-92), and in Watterich, *Vite Romanorum Pontificum* (Leipzig, 1862). There is a *catalogue raisonné* of their letters for the first twelve centuries in Jaffé, *Regesta Romanorum Pontificum* (2d ed.). The papal correspondence since the beginning of the thirteenth century is (1894) being

published from the Vatican archives through a number of investigators, individual and collective. The *Bullarium Romanum* (ed. Coquelines, 19 vols., Rome, 1739-44, with later continuations, Turin, 1857-72) contains the text of a great many public papal documents in later centuries. Platina, Onofrio, Panvinio, Ciacconio, and Oldreinus are the post-Renaissance continuators of the "old lives of the popes." It is difficult to recommend any one work as absolutely reliable for the lives of all the popes. A multitude of monographs on individual popes, fixed epochs, and problems appear yearly. Their spirit differs according to the education and prepossessions of the writer, but there is a growing tendency toward a more calm and objective view of the papal history. A model of this new method is Pastor's *History of the Popes in the Period of the Renaissance* (Freiburg, 1886). Similar monographs of Creighton and Ranke on the popes since the Renaissance, of Gregory VII., by Voigt, and Innocent III., by Hurter, are valuable. An excellent means to obtain accurate information concerning a given pope is to consult U. Chevalier's *Répertoire des sources historiques du Moyen Âge* (Paris, 1877-88), where the sources and the relative literature up to date are given. Artaud de Montor's *History of the Popes*, and Groene's *Geschichte der Päpste* (Regensburg, 1875), are popular and useful books. The books of De Maistre, *Du Pape*, Doellinger, *Kirche und Kirchen, Papstthum und Kirchenstaat*, and Murphy, *The Chair of Peter*, are also to be read. Several foolish fables once current are exploded in Doellinger's *Papstfabeln* (Stuttgart, 1890).

List of the Popes.—The following list is taken from the chronological work of Father Gams, O. S. B., *Series Episcoporum Ecclesie Catholicae* (Regensburg, 1873). The dates of accession of the popes up to the first part of the third century are approximative, but rest on sound calculations, as may be seen from the writings of Duchesne, De Rossi, Lightfoot, and others, as against the theory of Lipsius. Toward the end of the tenth century the custom arose of taking a new name on the occasion of election to the papacy. The usual mode of cessation of the papal office is by death, but it can be resigned, as was done by Celestine V. and Gregory XII. SS. Liberius, Silverius, and Martin were exiled for a time or forever, but they remained juridically popes to their death. There are some knotty problems in the long chronology, but they are not unsolvable, as may be seen from the prefaces and notes of Duchesne in his edition of the *Liber Pontificalis*. For a charming account of the tombs of the popes see Ampère's translation of Gregorovius's *Die Grabdenkmäler der Päpste*.

Name.	Date of accession.	Name.	Date of accession.
Peter	41	St. Hilarius	461
St. Linus	6	St. Simplicius	468
St. Cletus	Anencletus about	St. Felix III.	483
St. Clement I.	91	St. Gelasius	492
St. Evaristus	109	St. Anastasius II.	496
St. Alexander	109	St. Symmachus	484
St. Sixtus (Xystus)	119	St. Hormisdas	514
St. Telesphorus	128	St. John I.	524
St. Hyginus	148	St. Felix IV.	526
St. Pius	142	St. Boniface II.	530
St. Anicetus	156	St. John II.	532
St. Soter	168	St. Agapetus I.	535
St. Eleutherus	177	St. Silverius	536
St. Victor I.	190	Vigilius	527
St. Zephyrinus	202	Pelagius I.	555
St. Calixtus I.	218	John III.	560
St. Urban I.	222	Benedict I.	574
St. Pontianus	230	Pelagius II.	578
St. Anterus	235	St. Gregory I.	590
St. Fabianus	236	Sabinianus	604
St. Cornelius	251	Boniface III.	607
St. Laurens	253	St. Boniface IV.	608
St. Stephen I.	254	St. Benedict II.	615
St. Sixtus (Xystus) II.	257	Boniface V.	619
St. Dionysius	260	Hormisdas	625
St. Felix	269	Severinus	630
St. Eutychianus	275	John IV.	640
St. Gelasius	293	Theodorus I.	642
St. Marcellinus	296	St. Martin	649
St. Marcellus	307	St. Eugenius I.	655
St. Eusebius	309	St. Vitalianus	657
St. Melchior	310	Adedatus	660
St. Sylvester	311	Donus	670
St. Marcus	336	St. Agatho	680
St. Julius	337	St. Leo II.	682
St. Liberius	352	St. Benedict II.	685
St. Damasus	366	John V.	685
St. Siricius	384	Conon	686
St. Anastasius	388	St. Sergius I.	688
St. Innocent I.	402	John VI.	705
St. Zosimus	417	John VII.	705
St. Boniface I.	418	Sisinnius	708
St. Celestine I.	422	Constantine I.	730
St. Sixtus III.	432	St. Gregory II.	715
St. Leo I.	440	St. Gregory III.	731

Name.	Date of accession.	Name.	Date of accession.
St. Zacharias.....	741	Clement III.....	1187
Stephen II.....	752	Celestine III.....	1191
Stephen III.....	752	Innocent III.....	1198
St. Paul I.....	757	Honorius III.....	1216
Constantine II.....	767	Gregory IX.....	1227
Stephen IV.....	768	Celestine IV.....	1241
Hadrian I.....	772	Innocent IV.....	1243
St. Leo III.....	795	Alexander IV.....	1254
Stephen V.....	816	Urban IV.....	1261
St. Paschal I.....	817	Clement IV.....	1265
Eugenius II.....	824	Gregory X.....	1271
Valentinus.....	827	Innocent V.....	1276
Gregory IV.....	827	Hadrian V.....	1276
Sergius II.....	834	John XXI.....	1276
St. Leo IV.....	847	Nicholas III.....	1277
Benedict III.....	855	Martin IV.....	1281
St. Nicholas I.....	858	Honorius IV.....	1285
Hadrian II.....	867	Nicholas IV.....	1288
John VIII.....	872	St. Celestine V.....	1294
Marinus I.....	882	Boniface VIII.....	1294
Hadrian III.....	884	Benedict XI.....	1303
Stephen VI.....	885	Clement V.....	1305
Formosus.....	891	John XXII.....	1316
Boniface VI.....	896	Benedict XII.....	1334
Stephen VI (VII).....	896	Clement VI.....	1342
Romanus.....	897	Innocent VI.....	1352
Theodorus II.....	897	Urban V.....	1362
John IX.....	898	Gregory XI.....	1370
Benedict IV.....	900	Urban VI.....	1378
Leo V.....	903	Boniface IX.....	1389
Christopher.....	903	Innocent VII.....	1404
Sergius III.....	904	Gregory XII.....	1406
Anastasius III.....	911	Alexander V.....	1409
Laudo.....	913	John XXIII.....	1410
John X.....	914	Martin V.....	1417
Leo VI.....	928	Eugenius IV.....	1431
Stephen VII.....	929	Nicholas V.....	1447
John XI.....	931	Calixtus III.....	1455
Leo VI (VII).....	936	Pius II.....	1458
Stephen IX.....	939	Paul II.....	1464
Marinus II.....	942	Sixtus IV.....	1471
Agapetus II.....	946	Innocent VIII.....	1484
John XII.....	955	Alexander VI.....	1492
Leo VIII.....	963	Pius III.....	1503
Benedict V.....	964	Julius II.....	1503
John XIII.....	965	Leo X.....	1513
Benedict VI.....	973	Hadrian VI.....	1522
Benedict VII.....	974	Clement VII.....	1523
John XIV.....	983	Paul III.....	1534
Boniface VII.....	984	Julius III.....	1550
John XV.....	985	Marcellus II.....	1555
Gregory V.....	996	Paul IV.....	1555
Sylvester II (Gerbert).....	999	Pius IV.....	1559
John XVII (Sicco).....	1003	St. Pius V.....	1566
Sergius IV.....	1003	Gregory XIII.....	1572
Benedict VIII.....	1009	Sixtus V.....	1585
John XIX.....	1012	Urban VII.....	1590
Benedict IX.....	1024	Gregory XIV.....	1590
Gregory VI.....	1033	Innocent IX.....	1591
Clement II.....	1045	Clement VIII.....	1592
Damasus II.....	1046	Leo XI.....	1605
St. Leo IX.....	1049	Paul V.....	1605
Victor II.....	1055	Gregory XV.....	1621
Stephen X.....	1057	Urban VIII.....	1623
Benedict X.....	1058	Innocent X.....	1644
Nicholas II.....	1059	Alexander VII.....	1655
Alexander II.....	1061	Clement IX.....	1667
St. Gregory VII.....	1073	Clement X.....	1670
Victor III.....	1086	Innocent XI.....	1676
Urban II.....	1088	Alexander VIII.....	1689
Paschal II.....	1099	Innocent XII.....	1691
Gelasius II.....	1118	Clement XI.....	1700
Calixtus II.....	1119	Innocent XIII.....	1721
Honorius II.....	1124	Benedict XIII.....	1724
Innocent II.....	1130	Clement XII.....	1730
Celestine II.....	1143	Benedict XIV.....	1740
Lucius II.....	1144	Clement XIII.....	1758
Eugenius III.....	1145	Clement XIV.....	1769
Anastasius IV.....	1153	Pius VI.....	1775
Hadrian IV.....	1154	Pius VII.....	1800
Alexander III.....	1159	Leo XII.....	1823
Lucius III.....	1181	Pius VIII.....	1829
Urban III.....	1185	Gregory XVI.....	1830
Gregory VIII.....	1187	Pius IX.....	1846
		Leo XIII.....	1878

JOHN J. KEANE.

POPE, ALEXANDER: poet; b. in London, May 21, 1688; d. at Twickenham, May 30, 1744. His father was a retired linen-draper and a Roman Catholic, and shortly after the poet's birth the family took up their residence at Binfield, in Windsor Forest. Pope was sickly and deformed, and was educated at home by the family priest and at two small schools. He was very precocious, and at the age of fifteen translated into verse the first book of the *Thebais* and wrote an epic poem, *Alexander*, which was never published. His first publication was a series of *Pastorals* (1709), musically versified, but, like all Pope's poetry of natural description, tame and artificial. These were followed by the *Essay on Criticism* (1711), a didactic poem on the rules of taste; *The Rape of the Lock* (1712, and much enlarged in 1714), a brilliant mock-heroic, occasioned by a quarrel between Lord Petre and Miss Arabella Fermor; the *Messiah* (1712), a sacred pastoral modeled upon Vergil's *Pollio*; *Windsor Forest* (1713), a

descriptive piece; *The Temple of Fame* (1715), a paraphrase of Chaucer's *House of Fame*; and a collection of his poetical works in 1717, which included his only experiments in the poetry of pathos and passion, the *Elegy to the Memory of an Unfortunate Lady* and *Eloisa to Abelard*. Meanwhile he had undertaken a verse-translation of Homer. The first volume of the *Iliad* appeared in 1715, and the last in 1720; the *Odyssey*, in which he had the help of Fenton and Broome, in 1725. Pope's *Homer* was published by subscription and brought him about £9,000. After his father's death in 1717 he bought a little villa, with five acres of ground, at Twickenham on the Thames. This was his home for the remainder of his life, where he amused himself with landscape-gardening and received his friends, among whom were Swift, Gay, Arbuthnot, and Henry St. John, Lord Bolingbroke. Pope was sensitive and spiteful. He had literary or personal quarrels with Addison, Colley Cibber, Curll the bookseller, John Dennis the critic, Lady Mary Wortley Montagu—for whom he had formerly professed warm admiration—Theobald the Shakspeare editor, and many others. He paid off his grudges in his clever and malicious satires. Stung by the incessant lampoons of the small Grub Street hacks and penny-a-liners, he crucified them all in his *Dunciad*, an epic of the dunces, the first edition of which was published in 1728, and a final edition, with *The New Dunciad*, or fourth book, added in 1743. In 1732–34 was published the *Essay on Man*, a moral didactic poem in four books. This poem abounds in pithy sayings and sententious maxims which have become universally current. As a philosophical poem it is neither coherent nor consecutive. It expresses in popular shape and with great verbal cunning ideas taken from the Leibnitzian optimism which Pope had caught from the conversations of his friend Bolingbroke, but which he himself imperfectly understood. From 1731 to 1738 he wrote and published the satires and verse-epistles which, under the titles *Moral Essays* and *Imitations of Horace*, form, perhaps, his most characteristic and most enduring work. Pope was not a great poet; he seldom touches the heart or stimulates the imagination. His translation of Homer is brilliant but false. His much-admired *Eloisa to Abelard*, though splendid in expression, is rhetoric rather than poetry; but he was a great verbal artist, and excelled especially in the art of putting things. He is more frequently quoted than any English poet with the exception of Shakspeare. He brought the mock epic of artificial society, the Horatian verse-essay, and the formal satire to the highest perfection, and he gave the heroic couplet, which was his favorite medium of expression, the greatest possible smoothness, variety, and point. His influence in English poetry was supreme throughout nearly the whole of the eighteenth century. H. A. BEERS.

POPE, JOHN: soldier; b. at Louisville, Ky., Mar. 16, 1822; graduated at the U. S. Military Academy, and commissioned brevet second lieutenant of topographical engineers July 1, 1842, captain 1856. Appointed brigadier-general of volunteers May 17, 1861, he held important commands in Missouri, and in Dec., 1861, surprised a Confederate camp at Milford, which he captured with large supplies, thus forcing the Confederate general Price to Southeastern Missouri; following up his success, now in command of the Army of the Mississippi, in co-operation with Admiral Foote New Madrid was taken (Mar. 14, 1862). He was made major-general Mar. 21, 1862, and on Apr. 8 captured Island No. 10 in Mississippi river, with upward of 6,500 prisoners and about 125 cannon and 7,000 small-arms. Uniting with the combined armies under Gen. Halleck, he participated in the advance upon Corinth, and upon the evacuation of that place (May 30) pursued the Confederate army as far as Baldwin. He was made a brigadier-general in the regular army (July 14, 1862) and placed in command of the Army of Virginia, to which was added the Army of the Potomac. The unsuccessful battle of Manassas, or Second Bull Run, was fought Aug. 29–30, and the next day (Sept. 1) that of Chantilly; a few days later Pope resigned his command, and resumed command of the department of the Northwest. He charged the failure of his operations in Virginia to the misconduct of Gen. Fitz John Porter at the battle of Manassas. (See PORTER, FITZ JOHN.) Subsequently he commanded the departments of the Missouri, the Lakes, and the Mississippi. He became major-general Oct. 26, 1882; retired Mar. 16, 1886. D. at Sandusky, O., Sept. 23, 1892. He published *Campaign of Virginia of July and August, 1862* (Washington, 1865).

Pope, JOHN HENRY: statesman; b. in the Eastern Townships, Province of Quebec, Canada, in 1824; educated at the High School in Compton; was a farmer in early life. He represented Compton in the Canadian Assembly 1857-67, and in the Dominion Parliament 1867-89; was Minister of Agriculture 1871-73 and 1878-85, and Minister of Railways and Canals 1885-89. In 1880 he visited London with Sir John A. Macdonald and Sir Charles Tupper, and took active part in the negotiations which led to the Pacific Railway contract. D. Apr. 1, 1889. N. M.

Popham, Sir JOHN: b. at Wellington, Somersetshire, England, in 1531; entered Baliol College, Oxford, then the Middle Temple, and in 1571 became sergeant-at-law; afterward was appointed solicitor-general and gave up his sergeantship; Speaker of the House of Commons 1581; attorney-general 1585, in which office he conducted the trials of those implicated in the Babbington conspiracy; lord chief justice of the king's bench June 8, 1592, which office he held for fifteen years, during which he was noted for his extreme severity to prisoners and his impartiality in trials involving party disputes. He presided at the trials of Sir Christopher Blunt, Sir Walter Raleigh, Guy Fawkes, and other noted persons. He was the author of a part of Popham's *Reports*, which are of little authority. D. June 10, 1607. He was active in colonization schemes, and was one of the patentees associated with Sir Ferdinando Gorges and George Popham. —**GEORGE POPHAM**, b. in Somersetshire, England, about 1550, was a brother of Sir John Popham, and was, with him and Sir Fernando Gorges, one of the patentees of an extensive territory in the present State of Maine in the U. S. He sailed from Plymouth May 31, 1607, with two ships and 100 men, and landed Aug. 15 at the mouth of the Kennebec or Sagadahoc river, where they built a rude fort which they named Fort George. This was the first English settlement in New England, but in the spring of 1608, after the death of Popham (Feb. 5), it was abandoned by the colonists, who returned to England. —**SIR FRANCIS POPHAM**, probably a son of Sir John, was also a patentee of New England and was a member of Parliament in 1620. F. STURGES ALLEN.

Popish Plot: See OATES, TITUS.

Poplar [M. Eng. *popler*, from O. Fr. *poplier* > Mod. Fr. *populier*, *popule*; Ital. *pioppo*; Span. *pobo*; Lat. *pōpulus* and Vulg. Lat. **plōpus*, poplar]; properly the name of any tree belonging to the genus *Populus* and family *Salicaceæ*, but popularly and very incorrectly extended to the TRILIP-TREE (q. v.) of the U. S. The true poplars have a light, white wood, which is very perishable if exposed to the weather or if not carefully seasoned. The common balsam-poplar, tacamahac, or balm-of-Gilead tree (*P. balsamifera*) produces a copious fragrant resin on its buds; it is a handsome tree of North America and Asia. Several of the poplars of the U. S. are called cottonwood, although this name is properly applied to the Carolina poplar (*P. monilifera*). (See COTTONWOOD-TREE.) The cottonwoods are useful for fuel and timber, but liable to warp unless prepared with care. The white poplar, or American aspen, *P. tremuloides*, is a handsome tree, as is the *P. grandidentata*. *P. heterophylla* is a large cottonwood with large, downy leaves. The aloe, or silver-leaf poplar of Europe, *P. alba*, is frequently planted in the U. S. It spreads rapidly by the roots. Its timber is excellent, as also is that of the gray and black European poplars, *P. canescens* and *nigra*. The Lombardy poplar (*P. nigra*, var. *italica*) is remarkable for the singular upward tendency of its branches. One of the most important of the more recent economic uses of the poplars is the manufacture of paper-pulp from their wood. Several poplars from Russia have been introduced into the U. S. for planting in the northern prairie States. Of these the best is *P. laurifolia*, the Certinensis poplar, which is the European representative of the American cottonwood. For an account of the cultivated poplars, see Bulletin 68, Cornell University experiment station. Revised by L. H. BAILEY.

Poplar Bluff: city; capital of Butler co., Mo.; on the Big Black river, and the St. L., Iron Mt. and Southern Railway; 74 miles W. S. W. of Cairo, 166 miles S. of St. Louis (for location, see map of Missouri, ref. 8-J). It has manufacturing of lumber, staves, pottery, brick, and tile, and contains a State bank with capital of \$50,000, and 2 daily and 2 weekly newspapers. Pop. (1880) 791; (1890) 2,187.

Popocatepetl [Aztec, smoking mountain]: a quiescent volcano of Mexico; on the confines of the states of Mexico and Puebla; 43 miles S. E. of Mexico city; height about

17,800 feet, or 380 feet less than Orizaba, the highest peak in Mexico. From about 14,800 feet (in January) it is covered with snow; below this there is a broad zone of pine and oak forest. The ascent is difficult. There are two principal craters; the upper and more recent one is about 1,000 feet deep and has large deposits of sulphur, which are regularly mined. There is no clear record of an eruption within historical times; sulphur fumes and occasionally smoke are given out. HERBERT H. SMITH.

Poppy [M. Eng. *poppy* < O. Eng. *popig*, from Lat. *papaver*, poppy]; any plant of the genus *Papaver* of the family *Papaveraceæ*. The flower is large and showy, the corolla being generally four-petaled and the calyx two-leaved. The stigma is in the form of rays, ranging from four to twenty in number. It springs directly from the ovary and persists upon the capsule. The latter is one-celled, though with imperfect partitions, and contains numerous seeds which escape by pores under the flaring stigma. The poppy is an annual or perennial herbaceous plant, and abounds in a milky juice. There are about a score of species, natives of Europe and Asia, most of which are found only in the warm temperate regions. By far the most important species is *P. somniferum*, from which the drug opium is obtained. (See OPIUM.) There are several varieties of this species, of which the most prominent are called the *white* and *black* poppy, respectively, from the color of the seeds. The flower of the former is white—that of the latter generally red or violet, though also sometimes white. This species of poppy has been known from a remote period in the countries bordering on the eastern coast of the Mediterranean, and is now extensively grown in Asiatic Turkey, Persia, Egypt, Europe, India, and China. In the Oriental countries it is cultivated for opium, but in France and Germany principally for a bland fixed oil, *poppy-oil*, found in the seeds. This oil exists in the seeds in about the proportion of 40 per cent., is entirely devoid of narcotic properties, and is used extensively for the same purposes as olive-oil, which it much resembles. In England there occurs in abundance a species of poppy called the *red poppy* or *corn-rose* (*P. rhæas*), having a fiery-red flower, the scarlet petals of which are used in pharmacy to impart a brilliant color to mixtures. In the U. S. the *P. somniferum* has been naturalized, but is cultivated principally as a garden-flower. The Iceland poppy (*P. nudicaule*), with white and yellow long-stalked flowers, is a spring-flowering species which is grown for ornament. Revised by L. H. BAILEY.

Poppy Family: the *Papaveraceæ*; dicotyledonous herbs, with a white or red latex; leaves alternate; flowers perfect; perianth double, the sepals two, the petals four to eight, or more; pistil one, superior, compound, one-celled, of two to sixteen carpels, placentæ two to many, parietal; ovules usually many. About 160 species are known, mostly natives of the temperate and sub-tropical regions of the northern hemisphere. As here treated the family includes a considerable number of plants cultivated for their beautiful flowers and foliage, e.g. the California poppy (*Eschscholtzia californica*), blood-root (*Sanguinaria canadensis*), prickly poppy (*Argemone*, of several species), poppy (*Papaver*, of many species, including *P. somniferum*, the opium-poppy), bleeding-heart (*Lamproloma spectabilis*), fumitory (*Adianthea fungosa*), and many species of *Corydalis* and *Fumaria*.

CHARLES E. BESSEY.

Population [from Lat. *popula* tio, liter., peopling, deriv. of *popula*re, people, populate, deriv. of *pōpulus*, people, whence Eng. *people*]: the total number of inhabitants of a country, district, city, or region. The population of any part of the earth's surface is determined by one or more of several causes. The most important of these may be enumerated as, first, adaptation of soil and climate to produce food; second, natural advantages for the manufacture of articles desired; third, facilities for moving products from regions where there is excess to regions where there is scarcity; fourth, enterprise and ingenuity of men in availing themselves of existing advantages; and, fifth, knowledge and public spirit in warding off the natural and artificial checks upon increase of population. See POLITICAL ECONOMY.

The tendency of all animal as well as vegetable life to increase in geometrical ratio is kept in check by various counteracting influences. In the case of man not only war and pestilence but also certain social conditions tend to retard the natural increase. In a complicated society where there are already marked social distinctions it is noteworthy that the increase among the poorer classes is more rapid than

among the rich. Malthus and others have accounted for this difference by an absence of prudential conditions on the part of the poor. Where there is no hope of bettering the condition there is a tendency to recklessness of indulgence, but where wealth and social distinctions have been established marriages on the part of the wealthier classes are often postponed and consequently the number of children born is diminished.

Until recently the various natural and artificial checks upon the growth of population have very nearly counterbalanced the tendencies to increase. The introduction of civilized methods of government into countries formerly barbaric has lessened war, famine, and pestilence, and thus removed some of the most powerful checks upon growth. The general advances of civilization have tended in the same direction. The more general prevalence of hygienic methods of life, greater care in furnishing supplies of untainted water, a better understanding of the causes of various diseases and the means of preventing them, and, above all, the more general adoption of sanitary drainage, have tended very greatly to diminish the death-rate and so remove some of the checks upon the increase of population. The most powerful of all influences in this direction have been the methods and facilities introduced within the nineteenth century for the more easy distribution of surplus products. Regions which formerly seemed incapable of supplying the necessities of mankind are now supplied from remote regions, and the consequence is that all over the civilized world population has increased with a rapidity hitherto entirely unknown. Within one century the population of the various countries of Europe has increased more than it had increased for several centuries before. The following table will show not only that this tendency is still going on in the Old World as well as in the New, but also will enable the reader to judge as to the comparative rate of increase in the cities and in the several countries:

TABLE SHOWING THE COMPARATIVE GROWTH OF POPULATION IN DIFFERENT COUNTRIES OF EUROPE AND AMERICA.

COUNTRIES.	1870-71.	1880 81.	1890-91.
EUROPE:			
England.....	21,495,131	24,613,934	27,482,104
Ireland.....	5,411,416	5,174,836	4,704,750
Scotland.....	3,360,018	3,735,573	4,025,647
Wales.....	1,217,135	1,360,505	1,518,914
Austria-Hungary.....	35,634,848	37,623,923	* 41,043,835
Austria.....	(1869) 20,217,521	21,981,821	23,707,906
Hungary.....	(1869) 15,417,327	15,642,102	17,335,929
Belgium.....	(1876) 5,336,185	5,520,000	6,069,321
Denmark.....	1,794,723	1,980,259	2,185,335
France.....	(1872) 36,102,921	37,672,048	38,218,903
Germany.....	† 41,060,000	45,234,000	49,428,470
Greece.....	1,457,894	(1879) 1,979,453	(1889) 2,187,208
Italy.....	26,801,154	28,459,628	† 30,347,291
Netherlands.....	(1869) 3,579,529	(1879) 4,012,693	4,621,744
Norway.....	1,701,365	No census.	2,001,000
Portugal.....	(1869) 3,995,152	(1878) 4,160,375	
Russia.....	78,281,447	No census.	(1887-89) § 86,782,574
Spain.....		(1877) 16,625,860	(1887-89) 17,550,246
Sweden.....	4,168,525	4,565,668	4,784,981
Switzerland.....	2,669,147	2,846,102	(1888) 2,917,754
Turkey.....		4,275,000	(1885) 4,786,545
AMERICA:			
U. S.....	38,558,371	50,189,209	62,654,302
Canada.....	3,739,235	4,324,810	4,829,411
Newfoundland.....	¶ 161,374	181,753	197,934

* Including Croatia and Slavonia.

† Statesman's Year-book for 1872 gives 40,111,265 (including Alsace and Lorraine).

‡ Estimated.

§ Excluding Poland and Finland.

¶ Excludes Newfoundland.

¶ Estimated.

TABLE SHOWING THE COMPARATIVE GROWTH OF POPULATION IN THE PRINCIPAL CITIES OF EUROPE AND THE U. S.

CITIES.	1870-71.	1880-81.	1890-91.
ENGLAND:			
London.....	3,254,260	3,832,441	4,211,056
Liverpool.....	493,405	552,425	517,951
Manchester.....	379,374	462,303	505,343
Birmingham.....	343,787	400,757	429,171
Leeds.....	259,212	309,126	367,506
Sheffield.....	239,916	284,410	324,243
Bristol.....	132,557	206,503	220,665
Bradford.....	145,830	183,032	216,361
Nottingham.....	86,621	186,656	211,984
Hull.....	121,892	154,250	199,991
Salford.....	124,801	176,233	198,136
Portsmouth.....	113,569	127,953	159,255
SCOTLAND:			
Glasgow.....	477,156	555,289	618,471
Edinburgh.....	196,379	228,075	261,261
Dundee.....	121,925	140,463	153,066
Aberdeen.....	88,108	105,818	121,905

TABLE SHOWING THE COMPARATIVE GROWTH OF POPULATION IN THE PRINCIPAL CITIES OF EUROPE AND THE U. S.—CONTINUED.

CITIES.	1870-71.	1880-81.	1890-91.
IRELAND:			
Belfast.....	174,412	207,671	255,896
Dublin.....	246,326	249,486	254,709
Wales—Cardiff.....	56,911	85,378	128,849
AUSTRIA-HUNGARY:			
Vienna.....	(1875) 1,001,999		1,364,384
Budapest.....	309,708	347,536	506,384
Prague.....	157,713	162,318	184,109
Trieste.....	109,324	144,437	158,344
Lemberg.....	87,109	110,250	128,419
Graz.....	81,119	97,726	113,540
BELGIUM:			
Brussels.....	310,217	391,393	476,810
Antwerp.....	126,663	159,579	227,225
Ghent.....	121,469	130,671	153,740
Liège.....	111,853	119,942	149,789
DENMARK:			
Copenhagen.....	197,576	273,727	312,387
FRANCE:			
Paris.....	(1876) 1,988,806		2,447,957
Lyons.....	(1866) 323,954		401,938
Marseilles.....	(1866) 300,131		376,143
Bordeaux.....		194,241	252,415
Lille.....		154,749	188,272
Toulouse.....	(1872) 126,936		147,617
GERMANY:			
Berlin.....	826,341	1,122,385	1,579,244
Leipzig.....	127,387	148,760	202,325
Munich.....	169,693	229,343	348,317
Breslau.....	207,997	272,390	335,174
Hamburg.....	236,279	290,055	323,923
Cologne.....	129,233	144,751	281,273
Dresden.....	177,089	220,216	276,085
Magdeburg.....	84,401	97,529	202,325
Frankfort.....	91,040	137,600	179,850
Hanover.....	87,626	122,860	165,499
Königsberg.....	112,092	150,396	161,528
GREECE:			
Athens.....	48,107	63,374	107,251
ITALY.*			
NETHERLANDS:			
Amsterdam.....	274,931	308,948	417,539
Rotterdam.....	123,097	147,082	201,136
Hague (The).....	93,083	111,016	160,531
NORWAY:			
Christiania.....	57,381	119,407	150,444
SPAIN:			
Madrid.....	381,470	397,690	470,283
Barcelona.....	249,106		272,481
Valencia.....	107,703	143,856	170,763
Seville.....	118,298	133,938	143,182
Malaga.....	94,732	115,882	134,006
SWEDEN:			
Stockholm.....	124,691	169,429	246,154
Gothenburg.....	58,164	74,418	104,657
UNITED STATES:			
New York.....	942,292	1,206,299	1,515,301
Chicago.....	298,977	503,185	1,099,850
Philadelphia.....	674,022	847,170	1,046,964
Brooklyn.....	396,090	566,663	806,343
St. Louis.....	310,864	350,839	451,770
Boston.....	250,526	362,839	434,479
Baltimore.....	267,354	332,313	434,139
San Francisco.....	149,473	239,959	298,997
Cincinnati.....	216,239	255,139	296,908
Cleveland.....	92,829	160,146	261,353
Buffalo.....	117,714	155,134	255,664
New Orleans.....	191,418	216,090	242,039
Pittsburg.....	86,076	156,389	238,617
Washington.....	109,199	177,624	230,392
Detroit.....	79,577	116,340	205,876
Milwaukee.....	71,440	115,587	204,468
Newark.....	105,059	168,508	181,830
Minneapolis.....	13,066	46,887	164,738
Jersey City.....	82,546	120,722	163,003
Louisville.....	100,753	123,758	161,129

* No census since 1879.

The density of the population per square mile in various countries in 1891 is indicated by the following figures: Belgium, 535.81; the Netherlands, 359.55; Great Britain, 311.88; China, 295.07; Japan, 264.59; Italy, 263.59; Germany, 234.05; France, 187.26; Switzerland, 184.69; Denmark, 162.72; Austria-Hungary, 161.88; India, 150.43; Spain, 84.23; Russia, 45.75; U. S., 20.77. The most recent estimate of the total population of the world is fourteen hundred and eighty millions.

C. K. ADAMS.

Porbeagle: a shark of the genus *Lamna*, especially *L. cornubica*, a species common in the North Atlantic, which reaches a length of 10 feet. The porbeagles have rather slender teeth and feed on fishes.

Porcelain: See POTTERY and PORCELAIN.

Porcelain, Réaumur's: a porcelain-like substance, first obtained by Réaumur by devitrifying ordinary glass. Excessively slow cooling will sometimes produce devitrification, particularly in very calcareous glasses, but it often oc-

curs in actual glass-working as an effect of careless and repeated heating and cooling. The glass becomes opaque, tougher, and less susceptible to fracture from sudden heating and cooling, having really something of a porcelain-like character. It is attributed to the formation of crystalline compounds in the mass, which, when once formed, are difficult of refusion.

Porch: a covered and partly inclosed approach to an entrance-door, as of a church or dwelling-house; also, by extension, a covered or partly inclosed room or hall not necessarily leading into or connected with an inclosed building; a covered promenade, or portico; in this sense the term is going out of use; no one would call the Stoics the philosophers of the *porch*, but the word portico or stoa would be used. In the first sense, the porch of a Greek or Roman temple, the *pronaos*, might be the first thing entered from without, or might be inclosed by the peristyle or continuous portico of columns; it was an outer vestibule. The porch of a Gothic church was sometimes such a vestibule, projecting like a small wing or pavilion from the larger structure, and was sometimes merely a deeply recessed doorway, as in the great cathedrals. In this latter case the actual working thickness of the wall of the building was often added to by an outer gable or screen, so as to make the depth of the porch greater. In modern times the *carriage-porch* is built well outside of the main structure, and has this peculiarity that the carriage is not to enter the building, but only to discharge or take up its passengers and then pass on. A carriage-porch differs from a marquise in being more solid and architectural.

RUSSELL STURGIS.

Porcupine [M. Eng. *porkepyn*, from O. Fr. *porc espin*, liter., spine-hog < Lat. *porcus*, pig + *spina*, spine, thorn]: any one of various rodents characterized by the development of sharp spines among the hairs. These spines or quills are really greatly exaggerated hairs, and almost every degree of development, from soft hairs to strong, stiff spines, may be found in the same animal. These quills, which are the weapons of the porcupine, can be erected by means of peculiar muscles, and the animal, when attacked, bristles up and charges backward. The spines are finely barbed at the tip, and frequently become detached and stick in the assailant's hide or nose, and this has given rise to the fable that the porcupine shoots his quills. Porcupines belong to two distinct groups—the *Hystriidae*, with the genera *Hystrix*, *Acanthion*, and *Atherura*, peculiar to the Old World, and the *Scalacopidae*, with the genera *Erethizon*, *Cercolabes*, and *Chetomys*, restricted to America. By many zoölogists these two groups are considered as divisions of one family. The best-known species, the African porcupine (*Hystrix cristata*), found in Spain, Sicily, Italy, and Northern Africa, is a stout, heavily built animal, a little over 2 feet in length, with a crest of very long, stiff hairs down the nape. The quills on the hinder part of the body are very long, and, like the hairs, marked with rings of black and white. The quills upon the short tail are truncated and open at the ends. The animal dwells in burrows or crannies among the rocks, lives on vegetables, and is sometimes sold in the markets for food. The common porcupine of North America, *Erethizon dorsatum*, is prevalently gray or blackish, and large specimens attain a total length of nearly 3 feet. The quills are abundant and very sharp, but are comparatively short, being in winter almost concealed by the long hair. The tail is of considerable length, and the animal strikes with it very effectively. This species is found from Maine westward through the northern part of the U. S. and over a great part of British America. In the West it is replaced by another species, *Erethizon epixanthus*, distinguished by the yellowish color of the long outer hairs. These animals climb readily, live on leaves and bark, and are extremely fond of salt, sometimes eating into barrels of salt provisions stored by lumbermen. The South American porcupines of the genus *Cercolabes*, or *Syntheres*, which range from Mexico to Brazil, are distinguished by long prehensile tails. They are thickly clad with short spines. The Brazilian porcupines of the genus *Chetomys* are characterized by short, weak, wavy spines, which, except about the shoulders, are scarcely more than very strong bristles. The species of *Atherura*, known as brush-tailed porcupines, found in the Malay Peninsula, some of the large adjacent islands, and Africa, have short and rather weak flattened spines.

F. A. LUCAS.

Porcupine Ant-eater: the ECHIDNA (q. v.).

Pordenone: town; in the province of Udine, Italy: on the right bank of the Noncello; about 30 miles from the

city of Udine (see map of Italy, ref. 2-E). Of its ancient walls and splendid castle only the ruins remain. In the Palazzo Comunale, the cathedral (begun 1347), and in several smaller churches may be seen oil-paintings and frescoes by Licinio, also called Il Pordenone, and others of his school. Pordenone has utilized its abundant water-power, and has cotton, silk, and earthen and iron ware manufactories. Pop. 5,100.

Pordenone: See LICINIO.

Pore [viâ Fr. from Lat. *porus* = Gr. *πόρος*, pore, ford, means, etc., liter., way, passage]: a very narrow passage in any solid substance; particularly an efferent duct of the glands in the skin of animals. The largest and least abundant of these are the ducts of the sebaceous glands, which secrete an oily substance. They are numerous on the head and face and near the orifices of the body, but elsewhere fewer or even wanting. The ducts of the sweat-glands are most numerous on the palm of the hand, where 2,800 have been counted in 1 sq. inch. Krause estimates the number on a single person at 2,381,248.

Porfirio Di'az, Ciudad' (formerly *Piedras Negras*): a frontier town of the state of Coahuila, Mexico; on the Rio Grande, opposite Eagle Pass, Tex.; on Mex. Internat. Railroad (see map of Mexico, ref. 3-G). It is in the "free zone," and its custom-house has to do principally with goods in transit.

H. H. S.

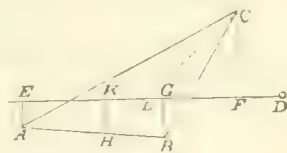
Porphyrius: See OPTATIANUS.

Porgy: a name applied in different localities to any one of several different fishes. In Europe it is given to *Pagrus vulgaris*; on the eastern coast of the U. S. to the scup, *Stenotomus argenteus*, and sometimes to the menhaden, *Brevoortia tyrannus*; rarely to the moonfish or angel-fish, *Chætodipterus faber*. See FISHERIES.

F. A. L.

Porifera: See SPONGES.

Porism [viâ Fr. and Lat. from Gr. *πόρισμα*, thing procured, hence a deduction from a demonstration, corollary, deriv. of *πρίσκειν*, carry, bring, furnish, procure]: a name given by ancient geometers to a class of propositions having for their object to show what conditions will render certain problems indeterminate. In order that the solution of a problem may be determinate, there must be as many independent conditions as there are parts to be determined. If, therefore, any supposition can be made on the data of the problem that will cause one of the given conditions to depend upon one or more of the others, the solution will become indeterminate; that is, the problem will have an infinite number of solutions. The object of the porism is, then, to discover an hypothesis that will make one of the given conditions of a determinate problem dependent upon one or more of the others. The nature of a porism will be illustrated by an example: Let ABC be a given triangle, and D any point in its plane; it is required to draw a line through D such that the sum of the perpendiculars to it from the two vertices on one side shall be equal to the perpendicular to it from the vertex on the other side. Suppose the problem solved, and let DE be a line such that the sum of AE and BG is equal to CF . Draw CH bisecting AB at H and cutting DE at L ; also draw HK perpendicular to DE ; then will $HK = \frac{1}{2}(AE + BG)$, or $CF = 2HK$. From the similar triangles LKH and LFC we have $HK : HL :: CF : CL$, or $CF = 2HL$. Hence the line DE must cut HC at a point one-third of the distance from H to C , and this no matter what may be the position of D . In the general case



that is, when D and L do not coincide, the problem is determinate, and admits of but one solution. Now let it be required to find the condition that will make the problem indeterminate. If we suppose D to coincide with L , the preceding proportion will be true whatever may be the direction of EK ; hence the condition required is that D shall coincide with L , and the finding of this condition constitutes the essential part of the porism. The porism just considered may be enunciated as follows: To find in the plane of a triangle a point such that if any line is drawn through it, and perpendiculars let fall upon it from the vertices, the sum of the perpendiculars on one side shall be equal to the perpendicular on the other side.

REVISED BY A. ROBERTS.

Porosity [deriv. of *porous*, deriv. of *pore*. See **PORE**]: a property of matter in accordance with which its molecules are separated by intervals or pores. The porosity, for instance, of stone or wood is proved by immersing the object in water under the receiver of an air-pump; when the air is exhausted from the surface, that inclosed in the pores of the object will rise to the surface in the form of bubbles. The porosity of cast iron has been proved by forcing water through the pores of a plate 4 inches thick, and the porosity of liquids is exhibited by mixing alcohol and water, when the volume of the mixture is found to be less than the sum of the volumes of the components.

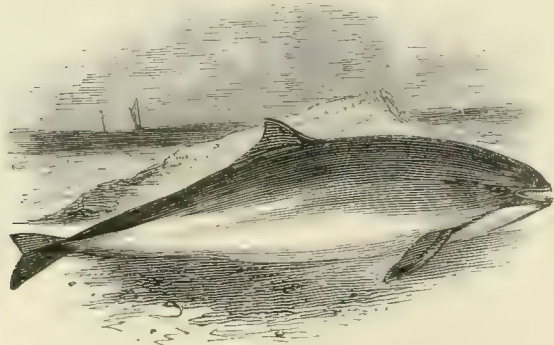
Porphyrio, POMPONIUS: a Latin grammarian of the fourth century, perhaps from Africa, whose commentary on the works of Horace is still extant. Edition by W. Meyer (Leipzig, 1874).

Porphyrogenitus: See **CONSTANTINE VII.**

Porphyry [Gr. *πορφύρεος*, from *πορφύρα*, purple]: See **ROCKS** and **BUILDING-STONE**.

Porphyry, or (Lat.) **Porphyrius**: Neoplatonist philosopher; b. at Batanea, Syria, 233 A. D.; received the instruction of Origen at Casarea; studied afterward at Athens under Longinus, and finally in Rome under Plotinus, of whom he became a passionate disciple; traveled in Sicily and other countries, but returned subsequently to Rome, where he died about 305. Of his numerous works, the greater part is not extant. The most important of his lost productions was his work against Christianity, which was publicly burned by order of Theodosius II. in 448. Among the works which have come down to us are biographies of Plotinus and Pythagoras; a commentary on Aristotle's *Categorizæ*, generally printed as an introduction to the *Organon*; a treatise *de Abstinencia*, etc. There is no collected edition of his works.

Porpoise [M. Eng. *porpeys*, from O. Fr. *porpeis*, liter., hogfish < Lat. *porcus*, hog + *pisces*, fish]: any one of various small cetaceans, rarely over 8 or 9 feet in length, belonging to the family *Delphinidæ*, properly distinguished from the dolphins (see **DOLPHIN**), which are also called porpoises, by not having the anterior part of the head prolonged into a distinct beak. They have sharp conical teeth in both jaws, adapted for seizing slippery living prey. They go in



The porpoise.

shoals, sometimes containing many hundreds, and are found in nearly all seas, but more especially in temperate latitudes, and usually not very far from land. The common species, *Phocaena communis*, known also as puffing-pig and puffer, attains a length of 6 feet, has peculiar compressed teeth, and is glossy black above, lighter beneath. It sometimes ascends rivers for considerable distances. The skunk-porpoise, *Lagenorhynchus acutus*, of the North Atlantic, is larger, with broad stripes of white and yellow on the sides. In favorable localities various species are taken for their blubber, which yields oil, and for their skins, which make good leather.

F. A. LUCAS.

Porriço: See **FAVUS**.

Porro, EDUARDO, M. D.: gynecologist; b. near Padua, Italy, Sept. 17, 1842; studied medicine in Pavia, graduating M. D. in 1865; from 1865-68 was assistant at the Milan Ospedale Maggiore; in 1868 he was appointed assistant and subsequently Professor of Obstetrics at the University of Milan. He accepted the same chair in the University of Pavia in 1875, and remained there until 1883, when he re-

turned to Milan. In 1876 he published a method of amputating the uterus that served to give him worldwide prominence. He is the author of a number of monographs on gynecological topics. S. T. ARMSTRONG.

Por'sena (less correctly *Porsen'na*): king of the Etrurian city of Clusium, under whose leadership the Etruscans compelled Rome to capitulate, and, as Pliny the elder reports, to surrender all weapons and agree to employ iron henceforth only for agricultural implements. How long this subjection continued and how the Romans regained their independence we do not know. The disgrace of the event, knowledge of which we owe to incidental remarks of Tacitus and Pliny, was concealed under the romantic stories, narrated by Livy, of Horatius at the bridge, of Scævola's sacrifice of his hand in the flame to show Porsena the character of Roman patriotism, and of the consequent voluntary withdrawal of the Etruscan forces. G. L. HENDRICKSON.

Porson, RICHARD: Greek scholar; b. at East Ruston, Norfolk, England, Dec. 25, 1759; was educated at Eton and at Trinity College, Cambridge, where he won the Craven scholarship, the chancellor's medal, and a fellowship 1782; began the publication of a series of critical labors upon the texts of classical authors; published in 1790 his famous *Letters* on the spuriousness of the text of the three witnesses; resigned his fellowship 1791 from conscientious scruples about subscribing to the Thirty-nine Articles; became Regius Professor of Greek at Cambridge, and librarian of the London Institution 1806. Next to Bentley, Porson is the greatest text-critic whom England has produced. Published critical editions of Euripides's *Hecuba* (with a famous introduction on Greek versification), *Orestes*, *Phænissæ*, and *Medea*; *Æschylus* (2 vols.); and many contributions to the text of Greek authors. D. in London, Sept. 25, 1808. See *Tracts and Miscellaneous Criticism of Richard Porson* (edited by Kidd, 1815), and J. S. Watson's *Life of Richard Porson* (1861). Revised by A. GUDEMAM.

Por'ta, CARLO: b. at Milan, 1776; was an intimate friend of Alessandro Manzoni and of Tommaso Grossi. Of his poems in the Milanese dialect, which have passed through many editions, the most celebrated is the one entitled *Disgrazi de Giovanin Bongee*. Porta was an amiable satirist, most true to nature, and full of power and vigor. D. 1821.

Porta, BACCIO della: same as **BARTOLOMMEO (q. v.)**.

Porta, GIACOMO, della: architect; b. at Milan, Italy, in the beginning of the sixteenth century. He began modeling stucco bas-reliefs under Gobbo, but he studied architecture under Vignola, whom he succeeded as architect of St. Peter's. He finished the Palace of the Senator on the Capitol of Rome, which Vignola had continued after the drawings of Michelangelo. He constructed the Gregorian chapel for Gregory XIII., which cost the pope 80,000 scude, the Greek church in Via Babuino, the Church of the Madonna dei Monti, and a portion of that of the Florentines in Via Giulia in Rome. At the Certosa of Pavia he designed the tomb of the Conte di Virtù, and worked on the façade of the church. In 1531 he was invited to Genoa, where he built in the cathedral the chapel of St. John the Baptist, which was decorated with sculpture by his nephew William. Lastly, together with Fontana, he constructed the cupola of St. Peter's, changing, with Sixtus V.'s permission, Michelangelo's design by making the curve of the dome more elliptical than in the original model. He built also the façade of San Pietro in Vincoli, besides many fountains in Piazza Navona, Piazza Colonna, and Piazza del Popolo. D. in 1604. W. J. STILLMAN.

Porta, GIAMBATTISTA, della: philosopher; b. in Naples about 1543; traveled much in Italy, Spain, and France; founded in his native city the first society for the study of physical science in Italy, called *Academia Secretorum Naturæ*, which held its meetings in his own house, and to which no one was admitted unless he had made some discovery in natural philosophy; was accused of magic, and, though acquitted by the pope, was compelled to dissolve his academy; wrote many volumes on natural magic, geometry, optics, the human physiognomy, etc.; and invented the camera obscura. D. in Naples, Feb. 4, 1615.

Portadown: town; in the county of Armagh, Ireland; on the Bann; 25 miles by rail S. W. of Belfast (see map of Ireland, ref. 5-I). It has large distilleries and manufactures of linen and linen yarn, and an active trade in agricultural produce. It communicates by canal with the sea at Newry. Pop. (1891) 8,430.

Portage: city (founded in 1838, formerly called Winnebago Portage); capital of Columbia co., Wis. (for location, see map of Wisconsin, ref. 6 D); on the Wisconsin river, the ship-canal connecting the Wisconsin and Fox rivers, and the Chi., Mil. and St. P. and the Wis. Cent. railways; 30 miles N. of Madison, 85 miles N. W. of Milwaukee. It is in an agricultural and lumbering region, has important commercial and manufacturing interests, and contains a State bank with capital of \$75,000, and a daily newspaper and four weekly ones. Pop. (1880) 4,346; (1890) 5,143; (1895) 5,419. **EDITOR OF "STATE REGISTER."**

Portage la Prairie: town; in the province of Manitoba, Canada; on the Assiniboine river; 56 miles by rail W. of Winnipeg; on the Canadian Pacific, Manitoba and North-western, and Northern Pacific railways. It is the market-town of a rich farming country, has flour-mills, grain-elevators, a biscuit-factory, paper-mill, etc., and a semi-weekly and two weekly newspapers. Pop. (1891) 3,363.

Portalis, *pōrtā-lēs*, JEAN ÉTIENNE MARIE: jurist; b. at Bausset, in Provence, France, Apr. 1, 1745; attended the university at Aix, and became an advocate in 1765 and later the leader of the bar at Aix. He was for some years active in politics in opposition to the party of Mirabeau, and opposed the measures of the Constituent Assembly, but in 1790 abandoned politics, retiring to Lyons. In 1793, after the proclamation of the republic, he returned to Paris and resumed his law practice, and after the death of Robespierre became the leader of the moderate party opposed to the Directory; was later proscribed and escaped to Switzerland, whence he returned after Bonaparte became the First Consul. He early showed a thorough insight into the spirit of the French law and a marked ability in the matter of developing and systematizing it. By Napoleon he was made a member of the commission for drawing up the Civil Code, of which he was the principal author, the treatment of many of the most important subjects, especially those of marriage and heirship, being intrusted to him, and to those labors he chiefly owes his fame. In 1801 he was put in charge of the department of public works, and in this capacity had the chief share in the drawing up of the Concordat; in 1803 was a member of the Institute; in 1804 Minister of Public Worship, in which capacity he was the leader in reorganizing the French Church; in 1805 was made a Knight Grand Cross of the Legion of Honor. D. in Paris, Aug. 25, 1807. See René Lavollée's *Portalis, sa vie et ses œuvres* (Paris, 1869). **F. STURGES ALLEN.**

Port Arthur: town; in the province of Ontario, Canada; on Thunder Bay, an arm of Lake Superior; on the Canadian Pacific Railway; 993 miles from Montreal and 431 miles from Winnipeg. Steamships ply between it and Owen Sound on Georgian Bay. The town has docks, a grain-elevator, some manufactures, and a trade in lumber. It has a daily and two weekly newspapers. Pop. (1891) 2,698.

Port Arthur (called by the Chinese *Lü-shun-k'ow*): a landlocked harbor on the Strait of Pechili, near Kin-chow-t'ing and the southwest extremity of the province of Liao-tung or Shing-king, Manchuria (see map of China, ref. 3-K). The harbor is almost surrounded by hills from 300 to 1,500 feet in height, with cultivated valleys between. In 1881 it was merely a good wind-bound harbor for junks trading along the coast. It was then decided to make it the chief naval station of China, and the necessary docks, dry-docks, refitting-basins, foundries, workshops, and dockyards, were completed (1891) by French contractors. The harbor entrance, which is from 200 to 300 yards wide, was deepened so as to admit the heaviest war-vessels, and well-constructed forts armed with modern guns were constructed to defend the port both from land and sea attacks. The village, consisting (1881) of about sixty mud huts, became a well-built town (1893) of about 1,000 houses and shops, with 6,000 inhabitants, exclusive of the garrison of 7,000 soldiers. It had 4 native banks, 2 temples, and 2 large theaters. The port is free from ice throughout the winter. Port Arthur was captured (Nov. 22, 1894) by the Japanese under Marshal Oyama, and held until Jan., 1896. **C. C. ADAMS.**

Port-au-Prince: capital and most important city and port of the republic of Haiti; on a deep bay of the western coast (see map of West Indies, ref. 5-G). The harbor is good and safe. The city, built on sloping ground, is regularly laid out, with wide streets; but it is very dirty, there are few pretentious edifices, and numerous ruins attest the ravages of the civil wars. Nearly all the houses are of wood,

as building with stone was abandoned after the disastrous earthquakes of 1751 and 1770; the place has suffered even more from fires, some of them the work of political leaders. The surrounding scenery is very beautiful, but the mountains shut off the winds and make Port-au-Prince one of the hottest places in the island. Except during epidemics of yellow fever it is not, however, very unhealthy. The commerce is important, the principal exports being coffee, log-wood, hides, and cacao. The city was founded in 1749. Pop. from 30,000 to 60,000.

HERBERT H. SMITH.

Port Chester: village (incorporated in 1868); Westchester co., N. Y. (for location, see map of New York, ref. 8-J); on Long Island Sound, and the N. Y., N. H. and Hart. Railroad; 26 miles N. E. of New York city, 30 miles W. S. W. of Bridgeport, Conn. It contains a national bank with capital of \$100,000, a savings-bank with deposits of over \$925,000, 2 primary schools, public high-school, an institute, a public library, 3 carriage-factories, 2 iron-foundries, 2 screw- and bolt-factories, woolen-mill, shirt-factories, carriage-coupling works, and a monthly and 2 weekly periodicals. Pop. (1880) 3,254; (1890) 5,274.

EDITOR OF "JOURNAL."

Port Clinton: village; capital of Ottawa co., O.; on Lake Erie at the mouth of the Portage river, and on the Lake Shore and Mich. S. Railway; 14 miles W. N. W. of Sandusky, 35 miles E. S. E. of Toledo (for location, see map of Ohio, ref. 1-E). It has considerable lake commerce, is engaged principally in fishing and in grape and peach culture, and contains a high-school, a State bank with capital of \$35,000, and four weekly newspapers. Pop. (1880) 1,600; (1890) 2,049.

Port Deposit: town; Cecil co., Md.; on the Susquehanna river, and the Penn. and the Phila., Wilm. and Balt. railways; 41 miles E. N. E. of Baltimore (for location, see map of Maryland, ref. 1-G). It has a large lumber-trade, and contains valuable granite-quarries, foundry, grist-mill, a national bank with capital of \$100,000, and a weekly newspaper. Pop. (1880) 1,950; (1890) 1,908.

Porte cochère: a door in the outer wall of a house, large and high enough to allow a carriage and horses to pass in and out. Such a door generally leads to a stable beyond the house or opening on the court. The use of this term for a carriage-porch is improper.

Port Eliz'abeth: the principal seaport of the eastern part of Cape Colony, South Africa; 839 miles from Cape Town, and connected with that city and with Kimberley by rail (see map of Africa, ref. 10-F). It was founded in 1820, and is situated on Algoa Bay. Its growth has been steady and rapid. The wool-trade of all the eastern districts of the colony is concentrated here, and fine warehouses line the bay. Pop. (1891) 23,266.

Revised by C. C. ADAMS.

Porte, Ottoman Porte, or, more commonly, **Sublime Porte:** an official title of the Ottoman Government. The Ottomans liken their government to a tent, at whose porte or door justice is administered and deliberations held. At Constantinople the name *Bab-i-Humayoun*, Exalted or Sublime Porte, is also applied to the main entrance of the Seraglio. **E. A. G.**

Porter: See BEER.

Porter, ALEXANDER: jurist; b. near Armagh, Ireland, in 1786; removed to the U. S. 1801; engaged in mercantile pursuits in Nashville, Tenn.; studied law and was admitted to the bar in 1807; settled at St. Martinsville, La., 1810; was a member of the convention which formed a State constitution 1811; gained prominence as a jurist and as a Whig politician; became a judge of the Supreme Court of Louisiana 1821; was U. S. Senator 1834-37, and opposed the abolition of slavery in the District of Columbia and advocated the recognition of the independence of Texas; again elected in 1843, and served till incapacitated by ill-health. D. at Attakapas, La., Jan. 13, 1844. The moulding of the jurisprudence of Louisiana in its present form is largely due to the labors of Judge Porter.

Porter, ANDREW, A. M.: soldier; son of George Bryan Porter, Governor of Michigan; b. at Lancaster, Pa., July 10, 1820. Educated as a civil engineer at Lafayette College, Pennsylvania, he practiced his profession for several years, and was appointed first lieutenant U. S. Mounted Rifles May 27, 1846; captain May, 1847. He served in the Mexican war, and was breveted major for gallantry at Contreras

and Churubusco, and lieutenant-colonel at Chapultepec; colonel Sixteenth Infantry May 14, 1861, and brigadier-general of volunteers May 17, 1861. He served in the Bull Run campaign and battle, and was subsequently provost-marshal of Washington, D. C. Honorably mustered out of volunteer service Apr., 1864, he resigned from the army May, 1864. D. in Paris, Jan. 3, 1872. JAMES MERCUR.

Porter, CHARLES T.: mechanical engineer; b. at Auburn, N. Y., Jan. 18, 1826; graduated at Hamilton College, 1845; studied law and was admitted to the bar 1847; practiced in Rochester and New York city, but after a few years abandoned the law for mechanical pursuits, especially steam-engineering; patented the central counterpoise governor for steam-engines 1859, and an isochronous centrifugal governor for marine engines 1861; became associated with John F. Allen in the manufacture of the Porter-Allen engine, the constructive features of which were designed by him; was the first manufacturer to use high rotative speeds in stationary steam-engines with success. He published an essay on the use of the Richards indicator (1874), and a volume entitled *Mechanics and Faith: a Study of the Spiritual Truths in Nature* (1885). He was one of the organizers of the American Society of Mechanical Engineers, and was for several years a member of its council.

Porter, DAVID: naval officer and diplomat; b. in Boston, Mass., Feb. 1, 1780; served from boyhood on board a merchant-vessel under his father, who was a sea-captain; entered the U. S. navy as midshipman Apr., 1798; was on board the *Constellation* during her engagement with a French frigate 1799; became a lieutenant Oct., 1799; was wounded in an action with pirates on the coast of Santo Domingo Jan., 1800; took part in the naval war upon Tripoli 1801-06; was captured in the Philadelphia Oct., 1803, and held for eighteen months a prisoner; was given command of the frigate *Essex* (32 guns) in 1812; captured the *Alert*, the first man-of-war taken from the British; sailed to the Pacific Jan., 1813; captured several whalers and trading-vessels, but his own ship was captured in the harbor of Valparaiso Mar. 28, 1814, by two British vessels after a severe fight; published a *Journal of the Cruise of the Essex* (2 vols., Philadelphia, 1815; 2d ed. New York, 1822); was a navy commissioner 1815-23; commanded an expedition against West Indian pirates 1824; was court-martialed and suspended for six months in 1825 for disobedience to orders in a difficulty with the Spanish authorities of Puerto Rico; resigned his commission Aug. 18, 1826, and accepted the command of the Mexican navy; was sent as consul to Algiers 1829; was made *chargé d'affaires* to Turkey 1831; was afterward appointed minister resident and negotiated several treaties with the Porte. D. at Pera, near Constantinople, Mar. 3, 1843. His remains were buried in the grounds of the U. S. Naval Asylum at Philadelphia. From his letters to a friend a work was compiled, *Constantinople and its Environs* (2 vols., 1835). See the *Life* by his son David D. Porter (Albany, 1875).

Porter, DAVID DIXON: naval officer; b. at Chester, Pa., June 8, 1813. His father, the gallant Porter of *Essex* fame, having accepted the position of commander-in-chief of the naval forces of Mexico during her war with Spain, obtained an appointment for his son as a midshipman in the Mexican navy. Two years after David D. Porter entered the U. S. navy as a midshipman, and as a lieutenant eighteen years later was actively engaged in all the operations of the navy on the east coast of Mexico. When the civil war broke out, Porter, then a lieutenant, was dispatched in the Powhatan to the relief of Fort Pickens, Fla. He then fitted out a mortar-flotilla for the reduction of the forts guarding the approaches to New Orleans by the lower Mississippi. After the fall of New Orleans the mortar-flotilla was actively engaged at Vicksburg, and in the autumn of 1862 Porter was placed in command of all the naval forces on the western rivers above New Orleans, with the rank of rear-admiral. His ability as a commander-in-chief was then exhibited, not only in the battles which he fought, but also in the creation of a formidable fleet out of river-steamboats, which he covered with such plating as they could bear. In 1864 Porter was transferred to the Atlantic coast to command the naval forces destined to operate against the defenses of Wilmington, N. C., and on Jan. 15, 1865, the fall of Fort Fisher ended his arduous war-service. In 1866 he was made vice-admiral, and appointed superintendent of the Naval Academy; and on the death of Farragut (1870) he became the admiral of the navy. He was the author of *Allan Davy*

and *Robert le Diable* (New York, 1885); *The Adventures of Harry Marline* (1885); *Incidents and Anecdotes of the Civil War* (1885); and was a contributor to current literature. D. at Washington, D. C., Feb. 13, 1891.

Porter, FITZ JOHN: soldier; b. at Portsmouth, N. H., 1822; graduated at U. S. Military Academy; entered the army as brevet second lieutenant July 1, 1845; served in the war with Mexico; from 1849 to 1855 was stationed at West Point either as instructor or adjutant of the Military Academy; was appointed assistant adjutant-general June, 1856; served as chief of staff in department of the West during the Kansas troubles (1856) and on the Utah expedition 1857-59. In Apr., 1861, he was assigned to the duty of maintaining railway communication through Baltimore to Washington. While at Harrisburg, and when communication with Washington was broken, Porter was shown telegrams from Hon. Francis P. Blair through Gov. Curtin to the President, asking that the Missouri troops be mustered and used for the protection of that State. He at once assumed the authority of the Secretary of War in giving the orders requested. This was approved by the authorities in Washington. Until Aug., 1861, he served in Maryland and Virginia with the army under Gen. Patterson and his successor, Gen. Banks; and was then appointed colonel of U. S. infantry and brigadier-general of volunteers and assigned to duty in Washington.

In 1862 he took part in the Virginia peninsular campaign; was made director of the siege of Yorktown, and upon the evacuation of that place was placed in command of the Fifth Army-corps, with which he fought several battles, including those of Mechanicsville and Gaines's Mill. In the transfer of the Army of the Potomac from the peninsula to Northeastern Virginia he was ordered to stop at Williamsburg and become the rear guard of the army, which would pass through his lines to Yorktown and Fortress Monroe. Reliably informed that Lee was hastening to crush Pope before he could be re-enforced by the Army of the Potomac, and knowing that the army in withdrawing was not molested, Porter instead continued the march and thereby joined Pope several days earlier than if he had complied with orders. Pope highly approved of this action. Porter fought under Pope the memorable second battle of Bull Run. (See BULL RUN, SECOND BATTLE OF). He was then placed in command of the defenses of Washington, S. of the Potomac; then was ordered to rejoin the Army of the Potomac, at that time in Maryland, and was permitted to select a division of 12,000 men. At the battle of Antietam this division was held in reserve, but after it Porter followed the enemy into Virginia and with his corps alone fought the battle of Shepherdstown, capturing many prisoners and a battery of artillery which had been lost at the first battle of Bull Run.

On Nov. 12 he was relieved from command and ordered to Washington. Here he was tried by court martial on alleged disobedience of orders under Pope, declared guilty and cashiered. A re-examination was made of the charges in 1878, resulting in his complete vindication. Against many difficulties in Congress from 1879 to 1886 a bill was finally passed restoring him (Aug. 6, 1886) to the army as a colonel of infantry from May 14, 1861, and, at his own request, he was immediately placed on the retired list.

Porter, HORACE: soldier; b. at Huntington, Pa., Apr. 15, 1837; son of David Rittenhouse Porter, Governor of Pennsylvania (1838-45); graduated at U. S. Military Academy 1860; chief of artillery at capture of Fort Pulaski; on staff of Gen. McClellan 1862; chief of ordnance on staff of Gen. Rosecrans 1863; aide-de-camp of Grant till the close of the war, and his private secretary during his first presidential term. He was breveted brigadier-general for gallant and meritorious services. He is noted as an after-dinner speaker.

Porter, JANE: novelist; b. at Durham, England, in 1776; daughter of a surgeon in the Sixth Dragoons, who died during her childhood; was educated at Edinburgh; afterward lived with her mother successively at London, at Ditton-on-Thames, and at Esher; published in 1803 her popular novel, *Thaddeus of Warsaw*; in 1810 the equally successful *Scottish Chiefs*; wrote, at the request of George IV., *Duke Christian of Luneburg, or Traditions from the Hartz* (3 vols., 1824); and, besides several other novels issued in 1831, a fictitious but highly circumstantial *Narrative of the Shipwreck of Sir Edward Seaward*, which by some reviewers was deemed a genuine narrative of facts. D. at Bristol, May 24, 1850.

Revised by H. A. BEERS.

Porter, JOSIAS LESLIE, D. D., LL. D., D. Litt.: clergyman and author; b. at Burt, Ireland, Oct. 4, 1823; was educated at the Universities of Glasgow and Edinburgh, and at the Free Church College, Edinburgh; was pastor at Newbattle-on-Tyne in the Presbyterian Church of England 1846-49; missionary of the Presbyterian Church of Ireland in Damascus 1849-59; was Professor of Biblical Criticism in the Assembly's college in Belfast 1860-77; commissioner of education in Ireland 1878; president of Queen's College, Belfast, 1879, till his death there Mar. 16, 1889. He is the author of *Four Years in Damascus* (London, 2 vols., 1855; 3d ed., 1870); *Handbook for Syria and Palestine* (1858; 2 vols., 3d ed., 1875); *The Pentateuch and the Gospels* (1864); *The Giant Cities of Bashan* (1865); *The Life and Times of Henry Cooke, D. D., LL. D.*, his father-in-law (1871; 3d ed., 1877); *The Pew and Study Bible* (1876), etc.

Revised by S. M. JACKSON.

Porter, NOAH, D. D., LL. D.: educator and author; b. at Farmington, Conn., Dec. 14, 1811; son of Rev. Noah Porter, D. D., minister of Farmington nearly sixty years (b. 1781; d. Sept. 24, 1866); graduated at Yale College 1831; master of Hopkins grammar school, at New Haven, 1831-33; was tutor at Yale 1833-35, pursuing theological studies at the same time; became pastor of the Congregational church at New Milford, Conn., Apr., 1836; settled at Springfield, Mass., 1843; was chosen Clark Professor of Metaphysics and Moral Philosophy at Yale College 1846; spent a year (1853-54) in Europe, chiefly in Germany, where he made a close study of modern German philosophy; was elected president of Yale College on the resignation of Dr. Woolsey in 1871. President Porter resigned the presidency in Oct., 1885, to take effect at the following commencement. He retained the office of Clark Professor of Metaphysics and Moral Philosophy until his death in New Haven, Conn., Mar. 4, 1892. He was author of a prize essay on *The Educational Systems of the Puritans and the Jesuits compared* (New York, 1851); *The Human Intellect, with an Introduction upon Psychology and the Soul* (New York, 1868); *Books and Reading* (1870); *American Colleges and the American Public* (1870; 2d ed., with additions, 1878); *Elements of Intellectual Philosophy* (1871), being an abridgment of the larger work; *The Science of Nature versus the Science of Man* (1871); *Science and Sentiment* (1882); *Elements of Moral Science* (1885); *Bishop Berkeley* (1885); and *Kant's Ethics* (1886). Dr. Porter was the principal editor of the revised edition of *Webster's Dictionary* (1864, 1880, and 1890), and contributed abundantly to religious and literary reviews and periodicals. He was one of the ablest of metaphysicians, and a man of varied talents and attainments.

Revised by G. P. FISHER.

Porter, PETER BUEL: soldier; b. at Salisbury, Conn., in 1773; studied law; settled in New York State; was elected to Congress in 1808, re-elected in 1810, and the year following, as chairman of the committee on foreign relations, prepared and introduced the celebrated report recommending war with Great Britain. Hostilities having begun, he resigned his seat in Congress and served throughout the war with distinction, holding important commands. In acknowledgment of his services the city of New York presented him with the freedom of the city, the State of New York voted him a sword, and he received the thanks of the Congress of the U. S., with a gold medal. He was appointed in 1816 by President Madison a commissioner under the treaty to settle the boundary-line between Canada and the U. S. An early projector of the Erie Canal, he with Morris and Clinton constituted the first board of commissioners for selecting its route. In 1828 he was appointed Secretary of War, and held the office during Adams's administration. D. at Niagara Falls, N. Y., in 1844.

Porter, Sir ROBERT KER: historical painter and traveler; brother of Jane Porter, the novelist; b. at Durham, England, about 1775; went to Spain with Sir John Moore 1808; was knighted in 1811; was consul in Venezuela 1826-41; lived many years in Russia. Among his most remarkable paintings are *The Siege of Acre*; *Peter the Great planning the Port of Cronstadt and St. Petersburg*, a fresco painted on the walls of the admiralty in St. Petersburg; and *Christ blessing the Little Children*, which, together with an *Ecce Homo*, was painted in Caracas. D. in St. Petersburg, May 4, 1842. He was the author of *Travels in Russia and Sweden* (1808); *Letters from Portugal and Spain* (1809); *An Account of the Russian Campaign* (1813); and *Travels in Georgia, Persia, and Armenia* (1821-22).

Porter, THOMAS CONRAD, D. D., LL. D.: botanist; b. at Alexandria, Pa., Jan. 22, 1822; educated in Harrisburg Academy, Lafayette College, and Princeton Theological Seminary; minister of the Gospel 1844-49; Professor of Natural Sciences in Marshall College 1849-53; same in Franklin College 1853-66; Professor of Botany in Lafayette College, Easton, Pa., 1866. Among his scientific publications are *Sketch of the Flora of Pennsylvania* (1872); *Sketch of the Botany of the United States* (1873); *A Synopsis of the Flora of Colorado* (prepared conjointly with John M. Coulter, 1874); *A List of the Carices of Pennsylvania* (1887); *A List of the Grasses of Pennsylvania* (1893); and many shorter papers in *The Botanical Gazette* and *Bulletin of the Torrey Botanical Club*.

CHARLES E. BESSEY.

Porter, WILLIAM DAVID: naval officer; son of David Porter, naval officer; b. at New Orleans, La., Mar. 10, 1809; entered the U. S. navy as midshipman Jan. 1, 1823; became lieutenant Dec. 31, 1833; was the originator of the light-house system in use in the U. S.; served in the Gulf of Mexico during the war between the U. S. and Mexico; was retired 1855; re-entered the navy 1859; built and commanded the ironclad Essex in the Mississippi flotilla 1861-62; participated in the attacks on Forts Henry and Donelson; sailed down Mississippi river to New Orleans, forcing a passage by several Confederate batteries; took part in engagements at Vicksburg, Baton Rouge (where he effected the destruction of the Confederate ironclad Arkansas), Natchez, and Port Hudson, and was made commodore July 16, 1862. Owing to feeble health he took little part in subsequent naval service. D. in New York, May 1, 1864.

Porteus, BEILBY, D. D.: bishop; b. at York, England, May 8, 1731; was educated at Christ's College, Cambridge, where he obtained a fellowship and gained the Seatonian prize for poetry; became chaplain to Archbishop Secker 1762, and to George III. 1769; was appointed Bishop of Chester 1776, and of London 1787. D. in London, May 13, 1809. Author of *A Review of the Life and Character of Archbishop Secker* (1797), in which the efforts of the primate to accomplish the introduction of bishops in the American colonies were detailed and defended; *A Summary of the Evidences of Christianity*; and other works, of which a collected edition, preceded by a memoir, was published in six volumes, 1811.

Revised by W. S. PERRY.

Port Glasgow: town of Renfrewshire, Scotland; on the Clyde; 20 miles W. N. W. of Glasgow (see map of Scotland, ref. 11-F); has large quays, ship-building docks, extensive manufactures of sail-cloth and ropes, iron- and brass-foundries, and considerable importation of American timber. Pop. (1891) 14,647.

Port Hamilton: a spacious harbor in the island of Kù-wùn, one of the Nanhow group, lying S. of Korea, just N. of 34° N. lat. (see map of China, ref. 5-M). Only three of these islands are of importance. When Great Britain and Russia seemed (Apr., 1885) on the verge of war over their conflicting Asian interests Great Britain seized Port Hamilton, against the protests of China and Japan, as a coaling-station and naval port of much strategic value, commanding the Korea Strait. It was found that the anchorage-ground was poor, that adequate fortifications would cost enormously, and Great Britain (Jan., 1887) transferred the islands to China.

C. C. ADAMS.

Port Hudson: post village; in East Baton Rouge parish, La. (for location of parish, see map of Louisiana, ref. 9-E); on left bank of the Mississippi. Pop. (1890) 250. Port Hudson stands on a high bluff at a sharp bend of the river. During the late summer and autumn of 1862 Confederate batteries, heavily mounted, well-protected, and strongly manned, had been erected along the bluffs for a distance of about 3 miles, completely commanding the river. On the night of Mar. 14-15, 1863, the Union fleet of four sloops-of-war and five gunboats, under Farragut, attempted to pass these batteries. Of these the Hartford and the gunboat Albatross succeeded, but the remainder were driven back, one being destroyed and four disabled. The place was invested by Gen. Banks, May 21-26, 1863, and a general assault was made May 27, which was repulsed, the Union loss being 1,995 killed and wounded; the Confederate loss was not more than 300. An effort to carry the works by storm (June 14) was repulsed with a Union loss of about 1,805. On July 7 tidings were received that Vicksburg had fallen three days before, and negotiations for the surrender of Port Hudson were at once opened. T

July 9. There were about 6,400 prisoners of war, 51 guns, 5,000 small-arms, much ammunition, and 2 steamers were also captured. The siege had lasted forty-five days. The entire Union loss was about 4,300 men; the Confederate loss about 800, exclusive of prisoners. The capture of Port Hudson opened the entire course of the Mississippi.

Revised by JAMES MERCUR.

Port Huron: city (settled by whites in 1686, originally called Desmond, incorporated as a city in 1857); port of entry; capital of St. Clair co., Mich.; on the St. Clair and Black rivers, at the foot of Lake Huron, and on the Grand Trunk, the Chi. and Gr. Trunk, and the Flint and Pere Marquette railways; 56 miles N. N. E. of Detroit (for location, see map of Michigan, ref. 7-K). It contains 13 churches, 14 public-school buildings, public-school property valued at over \$200,000, Academy of the Sacred Heart, several parochial and private schools, 5 public parks, Holly system of water-works, with supply from Lake Huron, public library, U. S. Government building that cost \$250,000, hospital, a national bank with capital of \$135,000, 3 State banks with combined capital of \$250,000, a private bank, and 2 daily, 6 weekly, and 3 monthly periodicals. It has 16 miles of paved streets, 7 of electric railway, electric-light plant, 2 fuel and gas-light plants, 25 hotels, and many handsome business buildings. It has a large grain-, lumber-, and wool-trade. Among the industrial works are the locomotive-shops of the Grand Trunk Railway, which also has car- and repair-shops, threshing-machine manufactory, 7 grain-elevators, 3 flour-mills, 3 dry-docks, 4 foundries, 6 carriage- and wagon-shops, 4 marble-works, 5 cigar-factories, 1 planing-mill, 2 engine-works, 2 breweries, 4 bottling-works, 2 lime-kilns, and a plant for manufacturing paper from spruce wood. The city is connected with Sarnia, Canada, by a steam-ferry and by a tunnel constructed to accommodate the connecting U. S. and Canadian railways. Pop. (1880) 8,883; (1890) 13,543; (1894, State census) 18,140.

L. A. SHERMAN, EDITOR OF "TIMES."

Portici, pōr'tēe-chēe: town; in the province of Naples, Italy; on the Bay of Naples, at the western foot of Vesuvius; about 5 miles S. E. of the city of Naples (see map of Italy, ref. 7-F). Since 79 A. D. the volcano has poured its burning lava seven times over the spot on which Portici now stands, and as many times it has been rebuilt. The excavations in search of the treasures of HERCULANEUM (*q. v.*) were begun here in 1714. The modern town contains a long street, a fine square, a mole for the convenience of the shipping, a little fort which commands the roadstead, and an agricultural college, formerly a royal palace, built in 1737. The industry of Portici consists of fishing, a small coasting trade, and the manufacture of silk and ribbons. Pop. 12,272.

Port Jervis: village; Orange co., N. Y. (for location, see map of New York, ref. 7-J); at the confluence of the Never-sink and the Delaware rivers, and the intersection of the boundary-lines of New York, New Jersey, and Pennsylvania; on the Erie and the Port Jervis, Monticello and N. Y. railways, and the Del. and Hudson Canal; 21 miles W. S. W. of Middletown, 88 miles N. W. of New York city. It is widely noted for the beauty of its location and surrounding scenery, and contains 2 national banks with combined capital of \$230,000, a soldiers' monument (unveiled in 1886), a district-school library, repair-shops of the Erie Railroad, 2 glass-factories, 2 foundries, and boot- and shoe-, saw-, harness-, shirt-, and glove-factories, and a monthly, 2 daily, and 3 weekly periodicals. Pop. (1880) 8,678; (1890) 9,327.

EDITOR OF "GAZETTE."

Portland, N. B.: a suburb of St. JOHN (*q. v.*).

Portland: town; Middlesex co., Conn. (for location, see map of Connecticut, ref. 9-H); on the Connecticut river, and the N. Y., N. H. and Hart. Railroad; nearly opposite Middletown. It is best known for its quarries of brown sandstone. Other industries are ship-building and the manufacture of steam-governors and various kinds of tinware. It has water-works, electric lights, a national bank with capital of \$150,000, a savings-bank, and a weekly and a monthly periodical. Pop. (1880) 4,157; (1890) 4,687.

EDITOR OF "MIDDLESEX COUNTY RECORD."

Portland: city; capital of Jay co., Ind.; on the Salamonie river, and the Grand Rapids and Ind. and the Lake Erie and West. railways; 43 miles N. of Richmond, 49 miles S. by E. of Fort Wayne (for location, see map of Indiana, ref. 5-G). It is in a natural-gas region, has a large lumber-

trade, and contains several manufactories, 2 State banks with combined capital of \$110,000, and a daily and 4 weekly newspapers. Pop. (1880) 1,694; (1890) 3,725.

Portland: city (settled by the English in 1632, incorporated as a town in 1786, as a city in 1832); port of entry; capital of Cumberland co., Me. (for location, see map of Maine, ref. 10-B); on Casco Bay, and the Boston and Maine, the Maine Cent., the Gr. Trunk, and the Portland and Rochester railways; 63 miles S. S. W. of Augusta, 108 miles N. N. E. of Boston. It is the largest and most important city in the State, is built on a peninsula jutting into the bay, and has a picturesque harbor dotted with islands and defended by Forts Preble, Scammel, and Gorges, by earth-works on Portland Head and Cushing's island (projected), and by a modern torpedo system. Communication by water is afforded by a daily steamboat-line to Boston and a semi-weekly line to New York city, and in winter two weekly steamship-lines to Europe. The city is the winter port of the ocean steamships connecting with the Grand Trunk Railway at Montreal in summer. The harbor is accessible without a pilot in all kinds of weather, and has been the scene of commercial activity, particularly in the line of trade with the West Indies, for many generations. Portland constitutes a U. S. customs district; in 1891 merchandise to the value of \$7,423,518 was imported and domestic products to the value of \$9,559,080 were exported. The city contains a U. S. custom-house of granite, a U. S. post-office and court building of white marble, an imposing city-hall of olive-colored freestone, 8 national banks with combined capital of \$3,650,000, a State bank with capital of \$100,000, 2 savings-banks with aggregate deposits of \$13,889,300, 6 private banks, and 4 daily, 11 weekly, 9 monthly, and 4 quarterly periodicals. The principal churches are the Cathedral of the Immaculate Conception (Roman Catholic), St. Luke's Cathedral (Protestant Episcopal), the Payson Memorial, the First Baptist, the First Parish, the double-spired Chestnut Street Methodist Episcopal, St. Paul's and St. Stephen's (Protestant Episcopal), and St. Dominic's (Roman Catholic). The public-school property is valued at over \$400,000, and comprises 17 school-buildings. There are 9 libraries of all kinds, containing over 71,000 volumes. Those of the Maine Historical Society and the Portland Society of Natural History are in a building erected by James P. Baxter in 1889 and presented to the two societies for use in common. Among the notable buildings is the Longfellow homestead on Congress Street, which was erected in 1785-87 and presented to the Maine Historical Society in 1893. The principal industries are meat-packing and the manufacture of locomotives, foundry and machine-shop products, and boots and shoes. In 1893 the assessed valuation of the city was \$36,823,990, and in 1894 the net debt was \$1,482,760. The original settlement was destroyed by the Indians in 1676, and its successor by the French and Indians in 1690. In 1775 the village was bombarded and burned by a British fleet, and in 1866 a third part of the city was destroyed by fire. Pop. (1880) 33,810; (1890) 36,425.

GEORGE S. ROWELL, EDITOR OF "ADVERTISER."

Portland: city (laid out in 1845, incorporated as a city in 1851, enlarged by the annexation of Albina and East Portland in 1891); capital of Multnomah co., Ore.; on the Willamette river, 12 miles above its confluence with the Columbia, and the N. Pac., the S. Pac., the Union Pac., and the Portland and Willamette Valley railways (for location, see map of Oregon, ref. 2-C). The city is built on sloping ground, the river dividing it nearly in the middle. A range of hills on the W., within easy walking distance, rises to an elevation of 1,000 feet. The Cascade Mountains, with the snow-capped peaks of Mt. Hood, Mt. Adams, Mt. St. Helen, and Mt. Rainier, and the picturesque gorge of the Columbia, are in plain view. Although the city is 120 miles from the ocean, its location at the head of deep-water navigation on the two rivers makes it in reality a seaport. The largest steamships are able to go direct to the city wharves at all seasons of the year, and the city has regular water-communication with the greater part of the State of Washington, with Astoria, The Dalles, Albany, Corvallis, and Dayton, in Oregon; with Lewiston, in Idaho; with Puget Sound, British Columbia, Alaska, and San Francisco; and with the principal Chinese and Japanese ports. Lying in the heart of a great producing region, with exceptional shipping facilities by rail and water, the city is an important center of commercial activity. In 1892 the deep-sea commerce of the port was, foreign, \$7,350,000; coastwise, \$3,909,000—total,

\$11,259,000; and the shipments of produce and merchandise eastward aggregated \$1,600,000. There were 24 manufacturing houses having a capital of more than \$1,000,000 each, the wholesale jobbing trade exceeding in value \$124,000,000. The aggregate banking capital was over \$16,000,000, and the bank clearings of the year over \$109,500,000. The census returns of 1890 show that 504 manufacturing establishments (representing 88 industries) reported. These had a combined capital of \$16,808,028, employed 9,240 persons, paid \$7,179,733 for wages and \$12,427,971 for materials, and had products valued at \$24,429,449. The principal industries, in the order of capital employed, were those connected with lumber, printing and publishing, malt liquors, furniture, awnings, tents and sails, bridges, and slaughtering and meat-packing. Portland is supplied with water from a stream 30 miles distant, which has its source on Mt. Hood; is lighted with gas and electricity; has over 125 miles of street-railway; contains a number of massive buildings, including the U. S. Government building, city-hall, Chamber of Commerce, Union Depot, and the Hotel Portland; and has 3 daily, 23 weekly, a semi-monthly, and 15 monthly periodicals. There are 30 churches, 15 public-school buildings, public-school property valued at over \$600,000, the Bishop Scott Academy (Protestant Episcopal, opened 1870), St. Helen's Hall (Protestant Episcopal, chartered 1869), St. Michael's College (Roman Catholic, opened 1871), Portland Academy (non-sectarian), the medical departments of the State and the Willamette Universities, and a business college. In 1893 the assessed valuations of the city aggregated \$54,332,500, and on Jan. 1, 1894, the bonded debt was \$2,721,500, of which \$1,150,000 was in water bonds. Pop. (1880) 17,577; (1890) 46,385; (1891) after the consolidation of Albina, East Portland, and Portland, estimated, 72,000.

W. H. SCOTT, EDITOR OF "OREGONIAN."

Portland, Dukes of: See BENTINCK.

Portland Cement: See CEMENT.

Portland, Isle of: a peninsula on the coast of Dorsetshire, England; about 4 miles by rail S. of Weymouth. It is connected with the mainland by a ridge of loose shingle, the Chesil Bank, and reaches 495 feet in height at the Verne, from which it slopes gradually to Portland Bill, its southern extremity, where there are two lighthouses. Portland is noted for its quarries of excellent building-stone, the stone of which St. Paul's Cathedral, in London, is built; other features are the old castle erected by Henry VIII.; the magnificent breakwater, with which are connected a naval station and a harbor of refuge; its prisons, capable of accommodating 1,500 convicts; Bow and Arrow Castle, ascribed to Rufus; and the Pennsylvania Castle (1800), built by Governor Penn. (See BREAKWATER.) Pop. (1891) 11,000.

Portland Vase: See GLASS (*Glass in Artistic Use*).

Port Lávaca: town; capital of Calhoun co., Tex.: on Matagorda Bay, and the S. Pac. Railroad; 20 miles from the Gulf of Mexico (for location, see map of Texas, ref. 6-I). Indianola, the former capital of the county, a port of entry, and a town of large commercial importance, was almost entirely swept away by a flood in 1875, and what was left was destroyed by a second flood in 1886. The business of the town was then transferred to Port Lavaca, which was made the county-seat. The principal industries are fishing, oystering, and fruit-cultivation. Pop. (1890) 365.

Port Lou'is: capital of the British colony of MAURITIUS (*q. v.*); on the northwest of the island. It is well built and strongly fortified, has a good harbor, barracks, a public library, a theater, a botanic garden, and is the commercial center of the colony. Pop. (1891) 62,046.

Port Mahon' (anc. *Portus Magonis*): capital of Minorca, on the southern coast of the island (see map of Spain, ref. 6-M). It has a spacious and safe harbor, capable of accommodating a fleet of men-of-war. It was made a first-class fortress by the British, who held Minorca twice during the eighteenth century. Cattle, cotton, shoes, and honey are exported. Pop. (1887) 18,445.

Portneuf: village; Portneuf County, Province of Quebec, Canada; on the St. Lawrence at the mouth of the Portneuf river, and on the Can. Pac. Railway; 35 miles S. W. from the city of Quebec (see map of Quebec, ref. 4-C). The St. Lawrence has a beautiful appearance as it bends into the bay which forms the harbor of the village. Opposite is Point Platon with its picturesque village. There are several mills, the chief industry being the manufacture of paper. Pop. of the parish about 1,850.

J. M. HARPER.

Porto Ale'gre: capital and largest city of the state of Rio Grande do Sul, Brazil; beautifully situated on the Guahyba or broadened lower part of the river Jacuhy; 38 miles from its mouth in the Lagoa dos Patos, and by the latter and the Rio Grande, 246 miles from the sea (see map of South America, ref. 7-F). The town is built partly on flat land, partly on a low promontory. There are few pretentious edifices. The outskirts, reached by horse railways, are adorned with beautiful gardens. Porto Alegre is one of the cleanest, prettiest, and most thriving cities of Brazil, and it is very healthful. Vessels which can pass the Rio Grande bar ascend to this place and load directly at wharves; and small steamboats connect the port with towns on the Jacuhy and with numerous German and Italian colonies on the branch rivers; much of the trade is in the hands of German merchants. The city is the emporium of the agricultural region in the northern part of Rio Grande do Sul, and is growing rapidly. Pop. (1894) about 45,000. H. H. S.

Porto-Ferraio, *pōrtō-fer-raa'yō*: capital of the island of ELBA (*q. v.*). Pop. 3,737.

Port of Spain: capital and principal town and port of the island of Trinidad, West Indies; on the Gulf of Paria (west coast of the island), fronting a small bay (see map of West Indies, ref. 9-M). It is well laid out on flat ground, and has many handsome buildings, especially in the outskirts, where the houses of the better class are surrounded by extensive gardens. The Botanical Garden is one of the finest in the British colonies. The governor's residence, a fine edifice, is in this garden. Port of Spain has most of the commerce of the colony, and is the entrepôt for much of the English trade with the northern part of South America; regular lines of steamers connect it with Europe, the U. S., the Venezuelan ports, and the Orinoco. The harbor is safe, but vessels are obliged to anchor at some distance from the shore. The climate is hot, but generally healthful. Pop. (1896) 31,858.

HERRICK H. SMITH.

Porto Maurizio, *mā-ō-ri'ti-si-ō* (anc. *Portus Mauriti*): chief town in the province of the same name, Italy; about 14 miles from San Remo and 41 miles by rail E. by N. of Nice (see map of Italy, ref. 4-B). It consists of an old town on a hill and a new one by the sea. The former was once well fortified and walled. The harbor is formed by two moles, and is entered from the S. S. W. There is a large production of olives and a considerable coasting trade. Pop. 6,309. The province has an area of 455 sq. miles. Pop. (1892) 142,200.

Port Orchard: naval station (name changed from Sidney, 1894); capital of Kitsap co., Wash.; on Port Orchard Bay, an arm of Puget Sound, 18 miles W. of Seattle (for location, see map of Washington, ref. 3-C). A tract of 200 acres was secured by the U. S. Government in 1891, and Congress appropriated \$700,000 for the construction of a timber dry dock 600 feet long, 75 feet wide on the floor, and of sufficient depth to accommodate vessels of 30 feet draught, the largest dry dock in the U. S. Congress also authorized a survey for a canal to connect the sound at this point with Lake Washington, a fresh-water body 2½ miles inland, for the purpose of affording the station a harbor where vessels could be free from the attacks of shipworms.

Porto Rico: See PUERTO RICO.

Porto Seguro, BARON AND VISCOUNT OF: See VARNHAGEN, FRANCISCO ADOLPHO, de.

Portraiture, or Portrait-art: the fine art which has for its subjects the likenesses of men and women, and by extension ideal attempted likenesses of those who are dead. So little of what the oldest races did in this field remains to us that until Mariette's discovery in Lower Egypt of portrait-statues belonging to the third dynasty (B. C. 4449) it was believed by some that the art of portraiture was of recent origin. Coming down to historic times, the earliest portraits of which we have any mention are those Apelles made of Alexander and Antigonus. We have but little record of the subsequent history of portraiture in Greece, for nearly all traces of Greek painting have disappeared, and no well-authenticated portrait-bust or statue of antique Greek workmanship exists. The painters and sculptors of the Renaissance and the succeeding epoch were very much occupied with portrait-art. An important exception is Michelangelo, who left no portraits. Even the statues of Lorenzo and Giuliano in the Medici chapel he declared he did not intend for portraits. Raphael and his contemporaries, and their immediate successors, brought the art to its full perfection.

In Spain Velasquez is the greatest name, but less skill than his, which was supreme, would have sufficed to give pre-eminence in a country where portrait-painting was so little practiced as it was in the Peninsula. N. of the Alps, Van Eyck, Cranach, Dürer, Holbein, Rubens, Franz Hals, and Rembrandt distinguished themselves in portraiture. Holbein belongs, however, as much to England as to Germany; most of his finest portraits are in England. Since his time Germany has not produced any great portrait-painter. In France no native-born portrait-painter of any distinction appeared until the eighteenth century. Francis I. invited several Italian artists into France, chief among them Leonardo da Vinci, from whose hand the king hoped he might get other portraits equal to that of Mona Lisa del Giocondo, now in the Louvre, on which Leonardo worked for four years, and which Francis bought of him for 4,000 golden crowns; but, as is well known, Leonardo did not paint a single picture while he was in France.

In England, Holbein may be said to have created portrait-painting; he had many imitators, some of them most skillful, yet, though the country did not produce many portrait-painters of consideration before the eighteenth century, she welcomed good painters from other lands. In Mary's time, Antonio Moro came from Utrecht, and in Elizabeth's reign Federigo Zuechero, an Italian, was in vogue. A Dutch painter, Lucas de Heere, also found employment. Later were the two Olivers, of French extraction; they were miniature-painters, and contemporary with them was Nicholas Hilliard, one of the first Englishmen by birth who gained distinction in the art. The brief visit of Rubens gave, after Holbein, the second great impetus to the art of portrait-painting in England. He remained in the island only one year, but he painted many portraits. He was followed by his great pupil, Van Dyck, who became for England a standard of excellence in portraiture. Peter Lely, a Westphalian, went to England and established himself as a portrait-painter. Besides Cromwell and many of his chiefs, he painted all the beauties of Charles II.'s court. Cornelis Janssen, of Leyden, a good painter, went over in 1618. While Lely was flourishing, Gottfried Kneller, a native of Lubeck, arrived; he had already gained some distinction in Europe. He had great success in England, and painted Dryden, Addison, and Pope, and nearly every notable man and woman of his time in the island. With the appearance of Sir Joshua Reynolds (1723-92) began a new and more fruitful period, the third important influence affecting the growth of painting, and particularly of portrait-painting, in England; and from his time to the present the history of English portraiture has never lacked great names. Thomas Gainsborough, his contemporary (1727-88), would have been a dangerous rival if he had devoted himself as exclusively to portraiture as Reynolds did, but he preferred landscape-painting, and though his portraits are charming, he is most known as one of the founders of landscape-painting in England. Another notable painter of this time was Romney (1734-1802), whose reputation has increased with time. John Opie (1761-1807) also gained considerable distinction.

The modern French school began with David (1748-1825), who was before all a so-called historical painter, but who made some excellent portraits. France, however, has never had a great artist whose name is identified exclusively with portrait-painting, or even to any considerable extent so identified. With those even who have excelled in it, it has always been held of secondary importance. Yet Gérard (1770-1837) made many interesting portraits, and those of Ingres (1781-1867) must surely outlive all but two or three of the imaginative compositions on which he thought to build his fame.

Sculpture in England has been more successful in portraiture than in ideal work. It owed its modern impulse to a Frenchman, Roubiliac (1695?-1762), who went to England in 1720, and by the very excess of his dramatic conception and the superfluous energy of his execution gave an impetus to his art in England which in a dull, pedantic time bore down everything before it. He was followed by a number of distinguished sculptors—Flaxman, Banks, Nollekens—of whom Flaxman was the greatest artist, but less known as a sculptor of portraits than the others. More recent are Westmacott, Gibson, Foley, Bell, Marshall-Wood, Boehm, and Woolner. The portrait-busts of the last two are productions of singular merit; they include busts of Carlyle and Tennyson.

In the U. S. the art of portraiture properly begins with Copley, who was born in Boston in 1737, but lived in Eng-

land from 1774 till his death in 1815. His manner of painting was somewhat cold and hard, but he drew well, his color is agreeable, and he gave a good deal of life and animation to his heads. He was followed by John Trumbull, who, though he failed as an historical painter, deserves to be remembered for his miniatures. Another excellent miniature-painter was Malbone. The most distinguished name after Copley is, however, that of Gilbert Stuart (1756-1828), an artist who when at his best was one of the most excellent painters of his time. Other notable names are those of Leslie, Sully, Inman, Harding, Healy, Elliot, Baker, Huntington, Page, and Furness. Revised by RUSSELL STURGIS.

Port-Royal (or, more properly, **Port-Royal des Champs**): an institution founded in 1204 by Matthieu de Montmorency at Chevreuse, near Versailles, as a monastery for Bernardine or Cistercian nuns. In the course of time it became noted as an educational institution, to which the French nobility sent their young daughters, but at the same time it lost to some degree its religious character, until in the beginning of the seventeenth century the abbess, Mère Marie Angélique (see ARNAULD, MARIE ANGÉLIQUE), thoroughly reformed the establishment and revived the old religious discipline, with its rigid seclusion, poverty, and asceticism. She was a sister of Antoine Arnauld, "the great Arnauld," Professor in Theology at the Sorbonne and an ardent disciple of Jansen, and thus the monastery became Jansenistic. It flourished, and the number of nuns increased rapidly. In 1625 the Hôtel de Clugny, in the Faubourg de St. Jacques, Paris, was bought, and a branch institution was founded here under the title of Port-Royal de Paris, and in 1626 a new and extended abbey was erected at Port-Royal des Champs. Meanwhile a number of pious and learned men had established themselves at a farmhouse near Port-Royal des Champs, called Les Granges, for the purpose of leading a secluded and ascetic life, devoted to studies and religious exercises; and when the nuns removed to the new abbey these "solitaries of Port-Royal" were allowed to occupy the old place under the immediate jurisdiction of the Archbishop of Paris. They were all Jansenists, and soon Port-Royal became famous as the center of the whole Jansenistic movement and the focus of the opposition to the Jesuits. Here the Jansenists founded a school which numbered among its pupils some of the most famous men of the time, as, for example, Tillemont and Racine, and here were prepared those formidable attacks on the Society of Jesus which startled the whole world. In 1669 the two monasteries, Port-Royal des Champs and Port-Royal de Paris, were separated, and the latter reorganized under the influence of the Jesuits; and when the nuns of Port-Royal des Champs still refused to subscribe to the papal condemnation of Jansen, they were dispersed in 1709 and imprisoned in various other monasteries of France, and the buildings of their abbey leveled to the ground. See Fontaine, *Mémoires pour servir à l'Histoire de Port-Royal* (2 vols., 1736); Racine, *Histoire abrégée de Port-Royal* (1742); Sainte-Beuve, *Port-Royal* (5 vols., Paris, 1842-78); Beard, *Port-Royal* (2 vols., London, 1861). Revised by F. M. COLBY.

Port Royal: town; in Beaufort co., S. C.; terminus of Port Royal and Augusta Railway (for location of county, see map of South Carolina, ref. 8-E); noted for one of the earliest settlements made by the Spaniards within the present limits of the U. S., for important events during the civil war, and as the rendezvous of the North Atlantic squadron of the U. S. navy. The harbor is one of the finest in the world. A large dry-dock was completed in 1895. Pop. (1890) 524.

Port Saïd: town; in Egypt, at the junction of the Suez Canal with the Mediterranean (see map of Africa, ref. 1-F). No village existed here in 1859 when, near the present site, the first spadeful of earth was turned in digging the canal. Port Saïd is built mainly on earth since dug out. In 1894 the population was over 20,000. Its fine harbor, entirely artificial, is formed by two moles, that on the W. over 8,000 feet long. E. A. G.

Port Sarnia: See SARNIA.

Portsmouth: town of Hampshire, England; on the island of Portsea; 23 miles S. E. of Southampton and 74 miles S. W. of London (see map of England, ref. 14-I). The limits of the municipal and parliamentary borough, which are identical, comprise, in addition to Portsmouth proper, the town of Portsea, the suburbs of Landport and Southsea, and nearly the whole of Portsea island. Portsmouth and Portsea were encircled by a fortified enceinte, a portion of which has been removed as useless since 1872; but under

the action of the defense commission appointed in 1859 a chain of works was built on modern types from 3 to 5 miles distant. This includes the Hulsea lines and the forts of Portsmouth Hill on the land side, and the SPRINGMAN (q. v.) forts on the sea side. Portsmouth proper presents for the most part an unattractive appearance, but many improvements have been made. A new town-hall was opened in 1890. Among the old buildings may be mentioned the Church of St. Thomas, originally dating from the twelfth century, and the Early English garrison chapel, restored by Street in 1867. In Portsea there is a convict prison, and Landport has a people's park, opened in 1878. Southsea is a fashionable watering-place with assembly-rooms, a pier, and an esplanade 2 miles in length.

Portsmouth harbor, which is about 400 yards wide at its entrance between Portsmouth and Gosport (q. v.), expands into a spacious basin, stretching 4 miles inward N. W. of the town. It affords anchorage to large war-vessels at all times, as there are 24 feet of water in the channel at low water. The dockyard is the most important establishment of the kind in Great Britain. It covers an area of 293 acres and contains dry-docks capable of admitting the largest vessels, warehouses, anchor-forges, iron and copper mills, rope-houses, hemp-stores, sail-lofts, etc., in addition to the twelve wet-docks, which are from 22 to 36 feet deep, lined with solid masonry, roofed over, and closed by lock-gates.

The local trade is chiefly supported by the Government establishments. Brewing is carried on, and there is considerable traffic in coal, timber, cattle, and agricultural produce.

Portsmouth's importance began with Henry VIII., the town was fortified by Edward IV., and the works were continued at intervals afterward. In 1642 it was taken by the Parliamentary forces. It returns two members to Parliament. Pop. (1893) 167,277.

R. A. ROBERTS.

Portsmouth: city (settled in 1623, became Portsmouth township in 1653, incorporated as a city in 1849), port of entry, and one of the capitals of Rockingham co., N. H.; on the Piscataqua river, and the Boston and Maine and the Concord and Montreal railways; 54 miles N. by E. of Boston (for location, see map of New Hampshire, ref. 10-G). It is the only seaport in the State, is built on a peninsula $3\frac{1}{2}$ miles from the sea, and has a very spacious harbor, from 35 to 75 feet deep, which is never frozen. The harbor is protected by earthworks on Gerrish's island and Jerry's Point near its entrance, and farther up are two disused stone forts, Constitution and McClary. Bridges connect the city with Kittery, Me., and with Newcastle on Green island. The U. S. navy-yard, officially known as the Portsmouth navy-yard, is on Continental island, half a mile from the city, and belongs to Kittery, Me. It comprises 170 acres of ground, has a large balance dry dock and several ship-houses, and has turned out a number of noted wooden war-vessels. The city contains a U. S. Government building, a life-saving station, and a signal-service station. There are 12 churches, 9 public-school buildings, public-school property valued at over \$85,000, 2 libraries (the Athenæum, which also has a valuable museum, and the Free Public) containing over 26,000 volumes, 2 academies, 4 national banks with combined capital of \$800,000, 2 savings-banks, a trust and guarantee company, and 3 daily and 3 weekly newspapers. Portsmouth has been noted for its ship-building for more than two centuries. Among the early vessels of note built there were the Falkland, 54 guns, in 1690, and the America, 50 guns, in 1749, both on orders from the British Government, and the Ranger, 18 guns, in 1777, ordered by the Continental Congress. The latter vessel was first commanded by John Paul Jones, and was the first one to carry the Stars and Stripes and to receive a salute. The city contains a number of historic buildings, a hospital, Home for Indigent Women, Female Asylum, Home for Children, board of trade, marble-works, and several breweries, planing-mills, machine-shops, shoe-factories, copper and brass foundry, and hosiery, glove, and soap factories. Pop. (1880) 9,690; (1890) 9,827.

Portsmouth: city; capital of Scioto co., O. (for location, see map of Ohio, ref. 8-E); at the confluence of the Ohio and Scioto rivers; on the Balt. and O. S. West., the Norfolk and West., and the Cin., Ports. and Va. railways; at the S. terminus of the Ohio and Erie canal; 100 miles S. of Columbus, 114 miles S. by E. of Cincinnati. It is built on a plain partly inclosed by high hills, the ground on the opposite side of the Ohio river rising to a height of 500 feet. The region is rich in agricultural lands and in mineral resources, particularly iron ore, and the city is a shipping-point for a

large variety of productions. The industrial establishments include rolling-mills, iron and steel works, extensive shoe-factories, lumber and planing mills, flour-mills, stove-foundries, several distilleries, fire-brick plants, furniture and veneer factories, and wheel-works. The city has water supplied from the Ohio river by the Holly system, electric lights, 7 public-school buildings, public-school property valued at over \$180,000, public library (founded in 1879), the Ohio Military Academy (non-sectarian), 3 national banks with combined capital of \$475,000, a State bank with capital of \$50,000, an incorporated bank, and a daily and 5 weekly newspapers. Pop. (1880) 11,321; (1890) 12,394.

EDITOR OF "TIMES."

Portsmouth: city; capital of Norfolk co., Va.; on the east bank of the Elizabeth river and the Atlantic and Danville, the Seaboard Air Line, and the Norfolk and Carolina railways; opposite NORFOLK (q. v.), with which it is connected by ferry (for location, see map of Virginia, ref. 7-J). The U. S. navy-yard, officially known as the Norfolk navy-yard, is at Gosport, the southern extremity of the city. There are also a large dry dock, naval hospital, and marine barracks. The city has a steamboat line to Baltimore and regular steamship connection with the principal Atlantic ports, and with Norfolk constitutes a U. S. customs district, from which are exported large quantities of cotton, lumber, oak staves, naval stores, pig iron, and, to Northern cities, early vegetables. It contains the shops of the Seaboard Air Line Railroad, 3 State banks with combined capital of \$201,500, and a daily, a weekly, and a monthly periodical. Pop. (1880) 11,390; (1890) 13,268; with suburbs, 19,268.

EDITOR OF "PROGRESS."

Port Townsend: city (laid out in 1852), port of entry for the Puget Sound customs district, and capital of Jefferson co., Wash.; on Quimper peninsula, between Port Discovery and Port Townsend Bays, and on the Port Townsend Southern Railroad; 65 miles N. by W. of Seattle, 90 miles E. of the Pacific Ocean (for location, see map of Washington, ref. 2-C). It is in an agricultural, mineral, and lumbering region, and is a place of large strategic importance. The U. S. Government has established Fort Townsend on the west side of Port Townsend Bay, $2\frac{1}{2}$ miles by water and 5 miles by land from the city, and has reserved Point Hudson, Point Partridge, Marrowstone Point, and Admiralty Head as sites for fortifications. It has also established a quarantine station and a marine hospital. The city has gas and electric light plants, a system of water-works supplied from Little Quilcene river by gravity, several lines of street-railway, a line of daily steamers to Victoria, British Columbia, a national bank with capital of \$100,000, 3 State banks with combined capital of \$180,000, and 2 daily and 3 weekly newspapers. There are several foundries and machine-shops, saw and flour mills, steel, wire, and nail works, and other manufactories. Pop. (1880) 917; (1890) 4,558.

EDITOR OF "CALL."

Portugal. Port. pron. pōr-too-gal' [from Portug. and Span. *Portugal* < Late Lat. *Portus Cale*, liter., the Harbor of Cale, orig. name of the city of *Oporto*]; a kingdom of Europe, occupying the southwestern part of the Iberian Peninsula, between Spain and the Atlantic (see map of Spain and Portugal). Area (of the continental portion only), 34,308 sq. miles. The islands of MADEIRA and the AZORES (qq. v.) are directly united with it.

Physical Features.—Portugal is not naturally divided from Spain; as a whole, it is lower than Spain, with more low ground. The northern half is essentially mountainous, and its scenery is very picturesque. The Serra da Estrella crosses the center. Its peaks attain 6,539 feet, and are covered with snow during the winter months. Southern Portugal consists of plains and rolling lands, varied toward the S. W. by spurs of the Sierra Morena. One of these spurs, the Serra de Algarve, extends to the ocean. The principal rivers rise in Spain. The Minho and Guadiana, on the frontiers, are navigated by boats. The Douro, which crosses the mountain region, is also navigable for barges, and its mouth forms the harbor of Oporto. The Tejo or Tagus crosses the southern plain, and its broadened mouth is the splendid harbor of Lisbon. Seagoing vessels ascend to Santarém, about 40 miles. The northern and southern coasts are generally rocky. Between Oporto and Cape Carvoeiro there are extensive sand-dunes, backed by marshes. Almost the only good harbors are at Lisbon and Oporto.

Climate, Soil, and Natural Products.—The climate is mild and equable; on the coasts frosts are rare. Olives and

oranges grow well nearly everywhere, and palms flourish in the S. Rains are abundant. The available lands are generally very fertile; exceptions are the oak-barrens of Alentejo. Considerable tracts of forest remain. The common trees are oaks, pines, and chestnuts. The cork-oak grows wild and is cultivated. The coast fisheries of sardines, tunnies, etc., compete with those of France. The most important mineral products are copper, antimony, manganese, lead, and salt from the coast lagoons; a little gold, zinc, iron, and coal are obtained.

Agriculture.—Wine is the most important product and export, including port from the valley of the Douro and various light-red wines from near Lisbon. The Portuguese oranges, olives and olive oil, figs, tomatoes, etc., are known throughout the world. Cereals (maize, wheat, rye, and a little rice) occupy the largest area. Stock-raising is increasing. Large herds of swine run almost wild in the oak-barrens of Alentejo. Agricultural methods are backward, partly owing to ignorance and lack of tools, partly to excessive division of land and the absence and neglect of the large proprietors.

Manufactures.—Besides the numerous establishments for oil and wine making and for canning fruits, there are important factories, especially in Lisbon and Oporto. Cotton and silk thread and cloths, veil stuffs, gold and silver filigree work, shoes, gloves, etc., are made. Ship-building is now confined to a few yards.

Commerce and Communications.—The most important exports are wine, cork, fish, copper ore, and fruits. In 1891 the exports were valued at 31,872,000 milreis; the imports at 50,024,000 milreis. About one-fourth of the trade is with Great Britain. Portugal now has good roads and telegraph system and nearly 1,000 miles of railways. Over one-third of the latter belong to the state and the rest have state subventions.

People and Government.—The Portuguese, like the Spanish, are descended from Celto-Iberic tribes, more or less modified by Latin, Visigothic, and Moorish blood. The language, laws, and many arts and customs have come down with little change from the Romans. The educated class is comparatively small, but has nearly all the wealth and influence. The lower classes are ignorant and superstitious, but industrious and shrewd. Population in 1881, 4,708,178. The annual increase is slight, owing to the constant drain to Brazil. The Government is a constitutional monarchy. Parliament consists of a house of peers and a house of delegates. Adult males who can read and write and have a clear income of 100 milreis possess the right of suffrage. The state religion is the Roman Catholic, but other creeds are tolerated. Primary education is nominally compulsory, but the illiterate class is still very large. Lisbon and Oporto have schools of medicine, law, fine arts, technology, etc. The University of Coimbra is one of the oldest and most celebrated in Europe.

Weights, Measures, and Coins.—The metric system is in general use. The Portuguese *libra* is 1.012 lb. *avoldupois*; the *alqueire* is 0.36 bush. The *milreis* or 1,000 *reis* is equal to about \$1.07; the *conto* is 1,000 milreis. In expressing sums of money the milreis or dollar mark is written after the milreis but before the odd reis; thus 1,230\$178 means 1,230 milreis (or 1 conto and 230 milreis) and 178 reis. The *testoon* or *tostão* is 100 reis—about 10 cents—and the *vintem* is 20 reis. Gold is the standard. Gold coins of 10 milreis (coroa) and 5, 2, and 1 milreis are used, and there are smaller coins of silver and bronze.

Finances.—In June, 1893, the external debt was 281,824,700 milreis; the internal debt 244,886,060. Most of the debt is now funded at 4½ and 4 per cent. Of late years there has been an almost constantly recurring deficit, with defaults or delays in payments; measures have been taken for retrenchment. The annual revenue is about 45,000,000 milreis.

History. Portugal was one of the little kingdoms formed when the Christians began to drive back the Mohammedans. Henry of Burgundy married the daughter of Alfonso VI., and, about 1095, received her dowry, the lately conquered Portocallo, or Northern Portugal, as a fief of Galicia. By wars and conquests the region was consolidated and made independent. Henry's son, Afonso Henriques (1128–85), is called the founder of the monarchy, because he took the title of king (1139 or 1140), and drove the Moors far southward, capturing Lisbon in 1147. About 1250 the Moors were finally driven from Algarve. By a revolution in 1383 the throne passed from the line of Burgundy to that of

Aviz. John II. broke the power of the nobles, and made that of the crown absolute. Exploration was stimulated by Prince Henry, the Navigator, who conceived or adopted the idea of circumnavigating Africa to reach India. Madeira and the Cape Verde islands were discovered and colonized; and Bartolomeu Diaz reached the Cape of Good Hope (1486). Portugal became the center of maritime knowledge; a papal bull and the Treaty of Tordesillas (1494) gave the eastern hemisphere to Portuguese conquest and the western to Spain. In 1497 Vasco da Gama reached India by the Cape of Good Hope; trading-posts were speedily established on the Asiatic coasts; Ceylon and the Moluccas were conquered, and within a few years the whole stream of Eastern trade was turned into Lisbon. Brazil was discovered in 1500. The soldiers and statesmen seldom returned from the East, and the laborers were drained into Brazil. King Sebastian perished with his army in a war with the Moors of western Africa (1578), and Portugal was seized by Philip II. of Spain. At once the fabric fell to pieces; the Dutch seized the Eastern trade, the African posts, and part of Brazil, and Portuguese commerce was swept from the seas. The successors of Philip failed to keep his promise to preserve the autonomy of Portugal, and a revolution, begun in 1640 and supported by England, wrested the country from Spain and gave the crown to the house of Bragança, in which it still remains. The Brazilian possessions, recovered from the Dutch, became a new source of wealth, especially after the discovery of gold and diamonds. On Nov. 1, 1755, occurred the great earthquake which destroyed Lisbon, the only severe one in the history of Portugal. In 1807 the Portuguese court fled to Brazil before the armies of Napoleon. The French were soon driven out by the British. A popular revolution in 1820 ended in the adoption of a constitution: John VI., returning from Brazil soon after, was compelled to sign this. In 1822 Brazil became independent under Pedro I., son of the Portuguese king; this blow nearly ruined Portugal. By the death of John VI. in 1826 the crown fell to the Brazilian emperor, who resigned it in favor of his infant daughter, Maria da Gloria; she was, for a time, robbed of her rights by the usurpation of Dom Miguel (1828), but Dom Pedro, having resigned the Brazilian throne, headed a successful revolt in favor of his daughter, who became queen in 1834. Several petty political revolts followed until 1852, when the constitution was revised to suit all parties. Since then Portugal has been at peace and generally advancing, but she has incurred a crushing public debt, and the growth of the republican party threatens trouble for the future. The African colonies have been expanded into large possessions and are carefully cherished, but they have given rise to boundary disputes with Great Britain.

Colonies.—The following table shows the (approximate) extent and population of the Portuguese colonies:

POSSESSIONS.	Area in sq. m.	Population.
Cape Verde, Princess, and St. Thomas islands.	2,104	131,970
West African possessions.	489,500	2,800,000
East Africa.	261,700	1,500,000
Possessions in Asia and the East Indies (Goa, Macao, Timor, etc.).	7,900	939,320
Totals.	761,304	5,371,290

AUTHORITIES.—*Estadística de Portugal* (official 1892); Aldama-Ayola, *Compendio geográfico-estadístico de Portugal y sus posesiones ultramarinas* (1880); Crawford, *Portugal: Old and New* (1880); Herculano, *Historia de Portugal*; Stephens, *The Story of Portugal* (1891); Corvo, *Colonias Portuguezas* (1883–87); Major, *Prince Henry, the Navigator*; Salisbury, *Portugal and its People* (1893).

HERBERT H. SMITH.

Portuguese-Brazilian Literature: the literature of Brazil, from the time of its settlement down to the present. Since Brazil was colonized by the Portuguese, this literature is in the Portuguese language, and for this reason it would be possible to treat it as a part of Portuguese literature. Since Brazil has become an independent nation, however, it seems better to discuss the manifestations of Brazilian national feeling and thought in a distinct article.

I. *Colonial Period.*—During the colonial period of three centuries Brazil received nearly all its impressions of the outer world through Portugal. There were few schools except the Jesuit colleges, and hardly any libraries or books. Wealthy young men went to Portugal to study law or divinity, and either remained there or returned to take secular and Church offices. Under these circumstances there was

little chance for the growth of a distinctively Brazilian literature; the few writers of note generally followed Portuguese models. The Jesuit missionaries—commonly of European birth—were the first colonial authors. Laying among the Indians they imbibed the spirit of the forests and plains, and in their letters—especially in those of Anchieta—we may trace the first germs of a national literature. The same order gave to the colony its only great genius, Antonio Vieira, who was a Brazilian by education, though not by birth. He was the first of the Portuguese orators, one of the first prose-writers, and a statesman of worldwide fame. In history the sixteenth and seventeenth centuries produced only missionary chronicles like those of Vasconcellos and Jaboatão, or local accounts of wars and discoveries, like the *Castrioto Lusitano* of Frei Raphael de Jesus, or the *Notícias* of Vasconcellos; the endless *relatórios* and *relatórios*, most of them unpublished, are valuable as documents, but mere rubbish from a literary standpoint. In 1730 Rêchta Pitta, a native of Bahia, published his *História da América Portuguesa*, the first complete and really readable history of Brazil. This was followed by the local *Anaes historicos do Maranhão* (1749), by Berredo, a Portuguese governor; the *Memória sobre a capitania de São Vicente* (1797), of Frei Gaspar Madre de Dios, etc. In natural science, ethnology, and geography we have many scattered notices, but no special works of any note by Brazilian authors before the end of the eighteenth century; the reports of the naturalist Alexandre Rodrigues Ferreira and the engineer Ricardo Franco, who were attached to the boundary commission, 1783-93, have only been published in part in modern times. Perhaps the first Brazilian poet worth naming was Gregorio de Mattos Guerra (Bahia, 1633-96); his biting satires would have won him fame had not so many of them been defaced by obscenity. Later several poets of note clustered around the viceregal court at Rio de Janeiro, or found their way thence to Europe; such were Frei Francisco de São Carlos (1763-1829), whose sacred epic, *Assumpção da Santissima Virgem*, is, in some sense, comparable to *Paradise Lost*; Antonio Pereira da Souza Caldas (1762-1814), writer of sacred odes; the mulatto José Basílio da Gama (1740-95), best known for his historical poem, *Uruguay*; Manuel Ignacio da Silva Alvarenga, whose pastorals and love-songs are still widely read; the lyric poets Domingos Caldas Barbosa and Antonio Diniz; and Frei José da Santa Ritta Durão, author of *Caramuru* (1781), the first epic founded on Indian life. Antonio José da Silva (1705-39) went from Rio de Janeiro to Portugal, became famous as an author of comedies, and eventually met a tragic death at the hands of the Inquisition. Equally sad was the fate of a brilliant coterie of poets in Minas Geraes: Claudio Manuel da Costa, unrivaled for his sonnets and odes; Thomaz Antonio Gonzaga, with his melodious verses to "Marília"; and Alvarenga Peixoto. They were involved in an alleged conspiracy in 1789; Costa committed suicide, and the others went into penal servitude. To this list we may add Botelho d'Oliveira, a native of Bahia who published his *Musica do Parnaso* in 1705. All these follow, more or less, the Portuguese classic or romantic models; but here and there we can see the true national spirit struggling for utterance, as in some passages from Botelho and Gonzaga. Santa Ritta Durão clung to a severely classic measure and style; and the incongruity of Indians who talk and act like Greek heroes is too great a strain for the modern reader; it obscures the real merit of his verse.

II. *Modern Period.*—The sojourn of the Portuguese court at Rio de Janeiro (1807-21) was marked by increased literary activity, principally in the prose domains of history and geography; then appeared Pizarro's *Memórias historicas*, Sanctos's *Memórias do Reino do Brazil*, Ayres de Casal's *Corographia Brasileira*, and V. F. de S. F. *Flora Fluminense*. The independence brought a host of political writers, brilliant orators, such as the Andradas (one of them a well-known naturalist also), and economists. The King of Portugal had left one priceless legacy to Brazil—his historical library, which became the nucleus of the great public library at Rio de Janeiro. Distinguished naturalists visited the country and wrote enthusiastically about it; and Brazilian authors began to see that their inspiration lay in the magnificent scenes about them. French literature became very popular, and doubtless had a strong influence, but in the main the best writers became nationalized. The reign of Pedro II. saw the birth of a new school, which is still in its infancy, but has a brilliant future. Almost every page of it bears the impress of tropical nature—the forests and mountains,

the gigantic rivers, and vast plains of the interior; above all the Indians, who are so indissolubly connected with colonial history and country life. One poet of the first rank has appeared—Antonio Gonçalves Dias—and the brilliant coloring of his descriptive verses, combined with their tender sentiment, has made them household words in Brazil and Portugal. Poems like *Rosa no mar*, *Paço*, *A brancura*, and *O gigante de pedra* will live as long as the language does; and the lines beginning

Minha terra tem palmeiras
"Onde canta o sabiá,"

might almost be called the Brazilian national hymn. Magalhães, another poet of note, has been called the founder of the Brazilian school. It is certain that his Indian epic, *A canção dos índios Tupac*, contains passages of rare beauty, but it lacks the fire of Dias. Among a multitude of lesser poets we may mention Casimiro de Abreu, well known for his delightful love-songs; Sylvio Romero, Araújo Porto-Alegre, and Castro Alves. In romance Alencar is the best known. The popularity of his Indian stories is rather undeserved, though they contain excellent descriptive passages. Very much superior in plot, description, and character-drawing are the novels of Esmeralda Taunay. His *Inocência* has been translated into English, but only one familiar with country life in Brazil can appreciate its fidelity to nature. Taunay's descriptive powers are also well seen in his *Retraite de Laguna* (originally written in French) and *Scenas de Viagem*, both relating episodes of the Paraguayan war. Macedo is another novelist of note. The greatest of the Brazilian historians is Varnhagen (Viscount of Porto Seguro), whose *História do Brazil* is a classic. Other historians of note are Pereira da Silva, Lisboa (also noted for his essays), and Fernandes Pinheiro. The historical criticisms of Capistrano de Abreu are excellent. Caetano da Silva in historical geography; Beaurepaire Rohan, Cunha Mattos, and others in geography and travels; Couto de Magalhães in ethnology; and Bocayuva and Patrocínio in journalism, are all well-known names. In natural science foreigners as yet occupy the first place. See Pereira da Silva, *Os varões illustres do Brazil* (1858); Pinheiro, *Litteratura nacional* (1862); Mello Moraes Filho, *Curso de Litteratura Brasileira* (1882); F. Wolf, *Histoire de la Littérature brésilienne* (Berlin, 1863).

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Portuguese Language: the national language of Portugal, used also in the Portuguese colonies and Brazil, and (in a dialectal form) in the border province of Galicia in North-western Spain. The number of native speakers of the language can not be even approximately given; it is probably over 10,000,000, and may reach 20,000,000.

The system of sounds of the language is complex and ill indicated by the usual etymological spelling. Disregarding some minute shades we may describe it as follows: There are eleven oral vowels: two *i*'s (about as in English *machine*, written *i*, *y*, *e*; or English *hill*, written *i*); two *e*'s (one close, written *e*, *ê*; one open, written *e*, *è*, *é*); three *a*'s (one as in English *father*, written *a*, *â*; one differently described as like English *a* in *about* or French *a* in *dame*, written *a*, *â*; one about like the sound in English *hot*, written *a*, *ô*); two *o*'s (one close, written *o*, *ô*, *ou*; one open, written *o*, *ô*); a *u*, as in English *rule*, written *u*, *o*; a vowel comparable with the French mute *e*, written *e*, *i*. There are five nasal vowels: the nasal of the first *i*, written *im*, *in*; that of close *e*, written *em*, *en*; that of the second *a*, written *am*, *an*, *â*; that of close *o*, written *om*, *on*, *ô*; that of *u*, written *um*, *un*. These are not like the French nasal vowels. Noteworthy are also certain nasal diphthongs, as *de* and *de* (both these end in the sound of nasal *i*). The consonants, like the vowels, are differently given by different observers: we reckon here twenty-five: *p*, *b*, a bilabial *v* (written *b*), *f*, *v*, *w* (consonantal *u*, written *u*, *o*), *m*, *l*, *d*, *l*, *n* (these four more dental than in English), a dental spirant (as in English *that*, written *d*), a gutturalized *l*, *s* (written *s*, *e*, *ç*), *z* (written *z*, *s*), two varieties of *r* as in Spanish, one strongly rolled (written *r*, *rr*, *rh*), the other not so rolled (written *r*), both pronounced with the tip of the tongue, sibilants as in English *shut* (written *x*, *ch*, *s*, *z*) and *pleasure* (written *j*, *g*, *s*, *z*), a palatal *l* resembling English *li* in *million* (written *lh*), a palatal *n* resembling English *ni* in *union* (written *nh*), *y* (consonantal *i*, written *i*, *e*), *k* (as in English *cool*, *key*), *g* (as in English *good*, *gild*), and (not always recognized) the nasal sound in English *sing*, *song* (written *n*, which at the same time indicates nasality of the preceding vowel).

The grammatical structure of the language is similar to that of Spanish, and the same resemblance exists for the sources of its vocabulary, though it has borrowed more from France. A peculiar feature is the inflexion of the infinitive with personal endings, which helps to make clear the person thought of. The original pluperfect is now generally a conditional, as in Spanish, but the original sense also exists. The use of Portuguese in writings preserved dates from about the end of the twelfth century. In the sixteenth century, later than in Italy and Spain, appear the beginnings of grammatical treatment. A dictionary begun by the Academy in 1793 was not carried beyond the letter A, but Bluteau's *Vocabulário português e latino* (8 vols., 1712-21, with a supplement in 2 vols., 1727-28) is earlier, and the *Elucidário das palavras, termos e frases que em Portugal antigamente se usavam*, etc., of Joaquim de Santa Rosa de Viterbo appeared in 1798-99. The best historical study of phonology and inflexions is that of Cornu in Gröber's *Grundriss der romanischen Philologie*, i., 715 ff. The description of the modern sounds given above is based mainly on A. R. Gonçalves Vianna's *Exposição da pronúncia normal portuguesa* (Lisbon, 1892); see also his earlier study in *Romania*, xii., 29 ff., and the articles of Prince L.-L. Bonaparte in *Trans. of the Philological Society* (1880-81), p. 23 ff. (1882-84), p. 404 ff., and H. Sweet, *ib.* (1882-84), p. 203 ff. Work on Portuguese philology, including dialects, has been done by J. Leite de Vasconcellos, F. A. Coelho, Carolina Michaelis de Vasconcellos (e. g. *Der "portugiesische" Infinitiv in Romanische Forschungen*, vii., 49 ff.), H. Schuchardt (especially his *Kreolische Studien* in the publications of the Vienna Academy), H. R. Lang, and others; see articles in the *Revista lusitana* and other periodicals, and the bibliographies in the *Zeitschrift für romanische Philologie*.

Dictionaries: J. L. Roquette, *Dictionnaire portugais-français* (Paris, 1855); J. de Lacerda, *New Dictionary of the Portuguese and English Languages* (2 vols., Lisbon, 1866-71); D. Vieira, *Grande dicionário português* (6 vols., 1871-74); A. de Moraes Silva, *Dicionário da língua portuguesa* (7th ed. 2 vols., Lisbon, 1877-78); Caldas Aulete, *Dicionário contemporâneo da língua portuguesa* (Lisbon, 1881); J. Felix Pereira, *Vocabulário sonico* (Lisbon, 1888); F. A. Coelho, *Dicionário manual etimológico* (Lisbon, 1890); H. Michaelis, *New Dictionary of the Portuguese and English Languages* (2 vols., Leipzig, 1893, and a Portuguese-German dictionary by the same compiler, 1887-89), etc. Grammars: Elwes, *A Grammar of the Portuguese Language* (London, 1876; 2d ed. 1884); A. Vieyra, *A New Portuguese Grammar* (London, 1768 and since); C. von Reinhardstœtner, *Grammatik der portugiesischen Sprache* (Strassburg, 1878); J. Ribeiro, *Grammatica portugueza* (3^o anno) (3d ed. Rio de Janeiro, 1889); E. Monaci and F. d'Ovidio, *Manualetti d'introduzione agli studj neolatini*, iii. *Portoghese* (Imola, 1881), etc. See also ROMANCE LANGUAGES. E. S. SHELDON.

Portuguese Literature: the works in prose and verse, written in the Portuguese tongue, whether in Portugal or in the Portuguese colonies, with the exception of Brazil. (See PORTUGUESE-BRAZILIAN LITERATURE.) Owing to the comparatively restricted territory and population of Portugal, her literature can not be esteemed one of the great European literatures. Moreover, the national life has not had the fullness and original energy requisite for the creation of a really independent literary tradition. Portugal has, in the main, followed intellectual movements received from abroad, and the periods of her literature must all be denominated according to these successive foreign influences. At the same time, the temperament of the people is distinctly marked with its inclination to melancholy, to reverie, to sentimental longings—in short, to what the Portuguese themselves call by the untranslatable name *saudades*; and the literature, even where its matter is entirely borrowed, has an air and a charm all its own.

First Period (1200-1385); French and Provençal Influence.—During this period the Spanish province of Galicia, whose dialect had not yet become distinct from Portuguese, must be included with Portugal. Although there were certainly in this considerable region indigenous intellectual traditions dating from the Roman time, and although the neighborhood of the Arabs, since the eighth century, had had its effect on culture, still the first influences tending to arouse imaginative and literary activity in modern Portugal came from the N. of the Pyrenees—i. e. from France and Provence. These influences began to be felt as early as the

ninth century, when the shrine of St. James at Compostella became the chief object of veneration and goal of pilgrimages for all Western Europe. Then the wars against the Moors brought many French soldiers into the Peninsula; and after Toledo had been recovered (1085), many French clergy and scholars, and even colonists, were invited to settle in the new-won territory. Intermarriages also between the peninsular princes and nobility and the French became frequent, and finally came the establishment of the Burgundian family on the Portuguese throne. As early as the twelfth century—the great literary period of mediæval France—there was imitation among the Portuguese-Galician nobility of the courtly lyrics of their northern neighbors. The earliest of these that have come down to us, however, are of the beginning of the thirteenth century. In accordance with the essentially aristocratic character of the new poetry, the models followed were rather Provençal than French proper. During the thirteenth century the school of Portuguese-Galician troubadours rapidly developed, and, indeed, the Portuguese-Galician dialect became the regular language even for the Spanish lyric poets. The full splendor of this new art was reached in the second half of the century, especially at the court of King Dionysius (Dom Diniz, 1279-1325), who was a poet himself, and whose two natural sons were poets. The Spanish king Alfonso X., el Sabio (1252-84), had also given distinction to the style by writing his lyric poems, both sacred and profane, in the Portuguese-Galician tongue. The active production of such lyric poetry continued till about 1350, and the list of poets contains more than 150 names, many of them princes and other persons of high rank. The poems themselves, in so far as they are left to us, are contained in several song-books, or *Cancioneiros*, of which the most important are the so-called *Cancioneiro da Ajuda*, preserved in Portugal, and the Italian *Cancioneiro do Vaticano* (Cod. Vat., 4803) and *Cancioneiro Colocci-Brancuti* (belonging to Count Brancuti di Cagli). The numerous poetical forms include all the important varieties employed by the troubadours of Provence. The most serious defect of the mass of poems is their almost complete artificiality.

Contemporary with this lyric production we find traces in Portugal of general interest in the historic or romantic traditions treated in the narrative poems of Northern France and of Spain. The Arthurian legends, the heroic tales about Charlemagne and his peers, and certain of the Spanish popular historic themes were undoubtedly sung in Portugal. Perhaps at this time the famous romance of *Amadís de Gaula* began to take shape. (See LOBEIRA, Vasco, de.) No other considerable work, however, on any of these subjects seems to have been produced. The works in prose of this period are of slight account, being mainly either translations from Latin, French, and Spanish books, both religious and secular, or meager chronicles and genealogies of the Portuguese nobility (*Livros de Linhagens*, or *Nobiliarios*).

Second Period (1385-1521); Spanish Influence.—This period, intermediary between the Middle Ages and the modern world, was rather one of intellectual preparation than of actual literary achievement. A great change had to be undergone by Portugal, as by the rest of Europe, under the influence of that revival of classical studies which had been initiated in Italy by Petrarch and Boccaccio. The University of Lisbon had already been founded by Dom Diniz in 1291, and, though shifted several times from the capital to Coimbra and back again, speedily acquired great importance for Portuguese culture. During the fourteenth and fifteenth centuries we find a wide extension of the study first of the Latin and later of the Greek classics. At the same time intercourse with Italy became more constant, and Italian literary ideals gradually replaced the older French and Provençal traditions. The first effect of the readjustment was almost a cessation of poetical composition. From the middle of the fourteenth to the second half of the fifteenth century we have no Portuguese poetry of importance. Then there was developed at the royal court a school of poets, which, while not completely assimilating the new ideas, still served to introduce them. These singers, commonly called *poetas palacianos*, did not directly imitate the Italians, but instead the Spanish imitators of the Italians, like the Marques de Santillana, Juan de Mena, Jorge Manrique, etc. The number of the *poetas palacianos* was large, and included persons of the highest rank. Their verses were collected and printed in 1516 by the courtier and poet Garcia de Resende in the volume entitled *Cancio-*

neiro litoral, which contains about 1,000 poems, all written apparently after 1448.

The most noteworthy prose works of this period are the first great Portuguese chronicles. Four of these were written during the fifteenth century—those of Fernão Lopez, Gomes Eanes de Zurara, Vasco Fernandes de Lucena, and Ruy de Pina. Furthermore, there was a remarkably rich literature of translations, especially from the Latin classics.

Third Period (1521-80); Italian Influence.—This, the golden age of Portuguese literature, is ushered in by three writers still closely allied with the past, but at the same time innovators and indicators of tendencies destined to become dominant in the future—Gil Vicente (1502-36), Christovam Falcão (d. 1550?), and Bernardim Ribeiro (b. 1486?). The first of these was the founder of the Portuguese drama and at the same time one of the richest and most varied geniuses of his native land. The impulse to the creation of his dramatic pieces (*autos*) seems to have come from the *Autos or Eclogas* of the Spanish Juan del Encina (see ENCINA, JUAN, del), published in 1496; but the Portuguese poet far outdid his models in variety and originality. His dramas, which are both religious and secular, show the most remarkable commingling of all kinds of elements—medieval and Renaissance, popular and learned, sacred and profane. Falcão and Ribeiro, on the other hand, introduced that expression of sentimental feeling in pastoral form which, on the whole, has best fitted the Portuguese temperament. Their inspiration seems to have proceeded first from the pastoral works which the Italians began to write at the very dawn of the Renaissance (see PASTORAL POETRY); but certainly they owed much to the popular pastoral songs (*seranilhas*, etc.) which are among the most characteristic products of the Portuguese genius.

The note given uncertainly by these poets was first struck with fullness and power by Francisco de Sá e Miranda (1495-1557), the first classic writer of Portugal. After he had already become a learned man, this poet in 1521 undertook a journey to Italy and Spain with the avowed purpose of learning what was newest and best in literature and art. He remained five or six years in Italy, entering into relations with the most eminent writers and scholars, and after his return to Portugal he speedily became almost a literary dictator. Humanistic studies were, as a consequence, pursued with far greater zeal, and Portuguese poets cultivated ideals quite different from those of their predecessors. In particular, Sá e Miranda put forward Petrarch and his Italian disciples as the only true models for lyric poets; he greatly strengthened the impulse to the pastoral form; and his introduction of comedy after the manner of the Italians and of Plautus and Terence gave the drama a new direction. His followers and imitators were many, but only one can be mentioned here, Jorge Ferreira de Vasconcellos (d. 1585), whose tragedy in the antique style, *Ines de Castro*, still remains unsurpassed in Portugal.

The poet who combines within himself all these tendencies and who gave them ultimate expression was Luis de Camões (1524-80), the greatest figure in the history of Portuguese letters. Of passionate and impressionable temperament, yet capable of feeling to the full the glories of the great period of Portuguese discovery and conquest in the East and West Indies, Camões gave utterance to his own experiences and emotions in exquisite lyrics, and to the heroic history of his country in an epic, *Os Lusíadas*, which is among the best the moderns have produced. So commanding was his genius that the succeeding generation of poets in both kinds may best be grouped under the one name *Camonistas*, or disciples of Camões.

Despite the greater importance of poetry, prose also flourished greatly in this period. Its most remarkable monuments were historical works, of which may be mentioned the *Décadas* of João de Barros (1496-1570); the *Historia do Descobrimento da Índia* of Fernão Lopes de Castanheda (d. 1550); the *Historia da Província de Santa Cruz* of Pedro de Magalhães Gandavo; the *Chronica de D. Manoel* and *Chronica de D. João II.* of Damião de Góis (1501-72); the Latin *De rebus Emanuelis libri XII.* of Jeronymo Osorio (d. 1580), later made a classic in the translation of Francisco Manoel do Nascimento (publ. 1804); the *Chronica de D. João III.* of Francisco de Andrade (1540-1614); and the often too imaginative book of travels in Asia, *Peregrinações*, of Fernão Mendes Pinto (1509-80). Of other works in prose from this time the most notable are the romances of chivalry, the number of which is great.

The best of them, however, *Palmeirim de Inglaterra*, we have only in a garbled Spanish form. Worth mentioning here, though not written till about 1595, is the pastoral romance by Fernão Alvares do Oriente, entitled *A Lusitania transformada*, based on Sannazaro's *Arcadia*.

Fourth Period (1580-1700); Spanish Influence.—As in Spain, the golden age was followed by a long period of literary decay. That curious literary movement known in Italy and France as Marinism, in England as Euphuism, in Spain as Gongorism or Culteranism, extended also to Portugal. Command of the substance of poetry having been lost, poets strove to make up for it by intricacies and artificialities of style. The large and gracious manner of the classic writers was succeeded by the tortured and laborious efforts of the makers of *conceitos*. Accordingly, in all this long period we have but a few great names. Francisco Manoel de Mello (1611-66) showed both in lyric poetry and in the pastoral romance something of the old charm. Francisco Rodrigues Lobo (d. 1625) attained a certain success in the latter form. In the sacred and profane lyrics of D. Francisco de Portugal and of the nun Sor Violante do Ceo (1601-93) an occasional note of truth and power is struck. The numerous epic poets rarely produce a readable work—for example, the *Malacca Conquistada* of Francisco de Sá e Menezes (d. 1664), and the *Viriato tragico* of Braz Garcia de Mascarenhas. The oratory of the Jesuit preacher Antonio Vieira (1608-97) could become at times direct and strong. Most characteristic of the time was the formation of numerous literary academies, after the fashion of the Italians—some of them with the most fantastic names and the strangest conceptions of literary art.

Fifth Period (1700-1825); Pseudo-Classicism.—Like the rest of Europe, Portugal gave the eighteenth century to the contest between the old manner of thinking and living and rapidly invading science and rationalism; and here, as elsewhere, it was France that gave rise to the revolutionary impulses. Despite all the efforts of the conservative part of society, aided by the ruthless cruelties of the Inquisition, the movement could not be stayed. Gradually here and there one of the numerous academies became a meeting-place for enlightened men eager to share the scientific advances of their time. Such were the Academia Portuguesa, founded early in the century by Francisco Xavier de Menezes, Count of Ericeira, and the Arcadia Ulyssiponense, established in 1756 by Antonio Diniz da Cruz e Silva and others. At the same time literature began to adopt as models first the great French writers of the age of Louis XIV., and later Voltaire, the Encyclopædists, and to some extent Rousseau. While this process of regulating and rationalizing was going on, it must be admitted that the interest of literary art decidedly diminished. For some reason Brazil for the moment fairly eclipsed the mother-country. In the latter the chief names are Antonio Diniz da Cruz e Silva (1731-99), mentioned above, and Francisco Manoel do Nascimento (1734-1819). Serving as links to connect this with the following period, we have Manoel Maria Barbosa du Bocage (1765-1805) and José Agostinho de Macedo (1761-1831).

Sixth Period (since 1825); Romanticism.—The literary phenomena of the romantic movement were the same in Portugal as elsewhere. The scientific studies of the eighteenth century had greatly enlarged the range of intellectual interests, and the agitations of the revolutionary period turned the attention of the best spirits to the furthering of patriotic national life. These efforts only the more alarmed the Portuguese conservatives, and as a result many of the liberals were forced into temporary exile, thus becoming all the better acquainted with the tendencies of contemporary Europe. The true initiator of Romanticism in Portugal was João Baptista da Silva Leitão, Viscount of Almeida Garrett (1799-1854), who was equally influential in politics and in literature. It was he who established a national theater and provided it with a series of dramas full of national reminiscences and of patriotic feeling. He produced in his novel *O Arco de Santa Anna* (1846) one of the chief romantic historical novels in the language. He also encouraged the collection of popular songs and traditions, which have done much to strengthen the sense of national life among the Portuguese. Only less important than his efforts were those of Alexandre Herculano de Carvalho e Araújo (1810-77), the chief of the Portuguese historical novelists as well as an historian of the first rank. Somewhat aside from the romantic movement, on the other hand,

stood Antonio Feliciano de Castilho (1800-75), the master of an exquisite poetic style, with but little originality of ideas.

Romanticism everywhere in Europe easily degenerated into extravagance, and the succeeding generation of Portuguese writers did not escape the danger. While novelists like Rebello da Silva, Mendes Leal, and Andrade Corvo succeeded in giving something of measure to their work, too many others fell into the merest literary oddities. The poets, like Soares dos Passos (1826-60), abandoned wholesome and generous life for melancholy and dilettante sentiment. Since 1865, however, a strong reaction has set in, finding expression in the utterances of the so-called Coimbra school (*escola de Coimbra*). The representatives of this new movement have striven to replace the triviality and vagueness of the ultra-romanticists by serious studies in the literature, art, and history of Portugal as well as of other countries. Noteworthy names here are those of the Positivist and literary historian Theophilo Braga (b. 1843), the philologist F. A. Coelho, the critic and scholar J. Leite de Vasconcellos. To pure literature belongs the poet João de Deus (Nogueira Ramos), one of the most excellent of the contemporary lyric poets of Europe.

BIBLIOGRAPHY.—The best sketch of Portuguese literature is that of Carolina Michaëlis de Vasconcellos, in Gröber's *Grundriss der romanischen Philologie*, vol. ii., pt. 2 (Strassburg, 1894), which contains full bibliographical information. In Portuguese we have the long series of volumes by Theophilo Braga, which, though issued under various titles, form parts of the author's early conceived *História da Literatura Portuguesa* (1870, seq.). These are impaired by numerous inconsistencies and changes of view. See also Costa e Silva, *Ensaio Biographico-Critico sobre os melhores Poetas Portuguezes* (10 vols., Lisbon, 1850-56); Andrade Ferreira and C. Castello-Branco, *Curso de Litteratura Portuguesa* (Lisbon, 1875-76); Barbosa-Machado, *Bibliotheca Lusitana* (4 vols., 1741-52); Francisco da Silva, *Diccionario Bibliographico Portuguez* (continued by Brito-Aranha; 15 vols. up to 1890); R. Pinto de Mattos, *Manual Bibliographico Portuguez* (Oporto, 1878); Maxime Formont, *Le mouvement poétique contemporain en Portugal* (Lyons, 1893); Candido de Figueiredo, *Homens e letras* (1881). A. R. MARSH.

Portuguese Man-of-war: any one of the large siphonophores of the genus *Physalia*. See SIPHONOPHORÆ.

Portulacacæ: See PURSLANE FAMILY.

Port Whitby, Canada: See WHITBY.

Port Wine: See WINE.

Po'rus: a king of India, ruling E. of the Hydaspes; attacked Alexander when he tried to cross this river, but was defeated, wounded, and captured. He was treated with great kindness, however, by Alexander, and restored to his kingdom, which was much enlarged. As an ally of the Macedonians he afterward supported them on their further expedition into India, but after the departure of Alexander he was put to death by Eudemus, who was left in command of the Greek army of occupation.

Pöschl, THOMAS: religious leader; b. at Horetz, in Bohemia, Mar. 2, 1769; was appointed chaplain at Ampfellow, in Upper Austria, in the beginning of the nineteenth century, and caused great commotion there and in the adjacent districts by the singular doctrines he propounded—that women could hear confession and give absolution, that a certain process of purification which produced convulsions was necessary to salvation, etc. He found many adherents, and finally formed an independent sect, the Pöschlians; but, as the wildest excesses took place in their assemblies, the police interfered. Pöschl was arrested and found completely insane, and was taken to a lunatic asylum in Vienna, where he died Nov. 15, 1837. His followers, who went so far as to offer human sacrifices, were dispersed by force.

Posei'don (in Gr. Ποσειδών): in Grecian mythology, son of Cronus and Rhea, brother of Zeus, and husband of Amphitrite. When the universe was apportioned out, after the conquest of the Titans, he received as his portion the empire of the sea, an element of peculiar importance in the Greek mind. He is the equal of Zeus, he surrounds and holds the earth, he is lord over all other sea divinities, he sends storms and quiets the waves, he sends earthquakes (which the Greeks thought originated in the sea), he dwells in the sea. Like the sea, he is ever prone to stormy anger; the waves are his horses (and so he was regarded as the creator of the horse, and the patron of the chariot-race); the trident, a stroke of which

blasts rocks and makes water to spring forth, is his awful scepter. Relatively speaking, he is rarely depicted in art, but on this point see the article *Poseidon* in Baumeister's *Denkmäler*. J. R. S. STERRETT.

Posen, pō'zen: province of Prussia; bounded by Silesia, Brandenburg, Pomerania, West Prussia, and Poland. Area, 11,178 sq. miles. The land is a low and level plain, intersected by the Netze, the Warthe, and the Obra, tributaries of the Oder, and bounded for a short distance on the N. E. by the Vistula. It is dotted all over with small lakes, and covered to a great extent with fine forests. The soil is fruitful and well cultivated. Cattle of superior quality are reared, and large crops of wheat, rye, barley, and oats are raised. Manufactures of cloth, machinery, sugar, and tiles are carried on. Posen formed a part of Poland until the first partition of that country, when Prussia took the largest part of the present province. This was enlarged at the two following partitions, an act solemnly sanctioned at the Congress of Vienna in 1815. Nearly two-thirds of the inhabitants are Poles, who are principally Roman Catholics, while the Germans are mainly Protestants. Pop. (1890) 1,751,642.

Posen: capital of the province of Posen, Prussia; at the confluence of the Zybina and Warthe; 150 miles E. of Berlin and 90 miles N. of Breslau (see map of German Empire, ref. 3-1). The Prussian Government has made it one of its great fortified places, and surrounded it by a modern enceinte with citadel and outworks at a cost of 114,000,000 thalers. It contains many fine buildings, including a town-hall and a cathedral, many promenades and public squares, several good educational and benevolent institutions, and manufactures of tobacco, sealing-wax, wax candles, leather, furs, liqueurs, gold and silver ware, woolen and linen fabrics, arms and carriages. Posen is the seat of a Roman Catholic archbishopric. Pop. (1890) 69,627.

Posey, THOMAS: soldier; b. in Eastern Virginia, July 9, 1750; removed to Western Virginia in 1769; was quartermaster of Lewis's division of Lord Dunmore's expedition against the Ohio Indians, and took part in the memorable battle of Point Pleasant Oct. 10, 1774; was in the following year a member of the Virginia committee of correspondence, and captain of a company which he raised for the Seventh Virginia Regiment; participated in the defeat of Lord Dunmore at Gwynn's island July 8, 1776; joined the Continental army at Middlebrook, N. J., early in 1777; was transferred to Morgan's famous rifle regiment; distinguished himself in an action at Piscataway, N. J., and in the battles of Bemis Heights and Stillwater under Gen. Gates; commanded the regiment with the rank of major in an expedition against the Indians in the Wyoming valley Oct., 1778; commanded the Eleventh Virginia Regiment 1779, distinguishing himself at the head of a battery at Stony Point; was present at the surrender of Yorktown; served under Wayne in Georgia; defeated the Indians June 23, 1782; resided in Spottsylvania co., Va., for many years after the war; was appointed brigadier-general Feb. 14, 1793, and served under Gen. Wayne in his campaigns against the Indians in the Northwest; removed soon afterward to Kentucky, where he became lieutenant-governor and major-general, 1809; was U. S. Senator from Louisiana 1812-13; succeeded Harrison as Governor of Indiana Territory 1813, and became agent for Indian affairs 1816. D. at Shawneetown, Ill., Mar. 19, 1818. His *Life* was published in Sparks's *American Biography*.

Posido'nus (Gr. Ποσειδώνιος): Greek philosopher of the Stoic school; historian, physicist; b. at Apamea, in Syria (128 B. C.); founded a school in Rhodes, which Cicero attended; traveled far and wide. His great work was a history in fifty-two books, a continuation of Polybius, embracing the period from 145-82 B. C. D. 45 B. C. Fragments are given in Müller's *Fragmenta Historicorum Græcorum*, vol. iii., pp. 245-296. B. L. G.

Posilipo, pō-see'li-pō [Ital. < Lat. *Pausily'pum* = Gr. Πausίλυπον, liter., stopping or ending care]: the name of a villa of the notorious epicure Vedius Pollio, afterward extended to the entire eminence which bounds the city of Naples on the W. See NAPLES.

Positivism [deriv. of *positive*, in the sense of indubitable, certain]: the system of philosophy and religion founded by Auguste Comte (1798-1857). (See COMTE.) In his youth he showed a strong taste for mathematics, and it was while engaged in teaching geometry in Paris that he became associated (1818-24) with Saint-Simon, the celebrated founder of a sect of world-menders. It appears to have been during this period

that he began to conceive his great scheme for the reorganization of society by philosophy. Comte maintained that the phenomena of society conform to fixed and ascertainable laws, no less than the phenomena of chemical combination or planetary rotation. To discover the laws or most general aspects of the succession of social events was therefore the great task which Comte set before himself; but from his standpoint such a task as this required systematic preparation on an immense scale, for the phenomena of human society are by far the most complicated with which investigation has to deal. In two ways the successful study of them involves a previous study of the most general aspects of all other phenomena; for, in the first place, the human units of society conform to physical, chemical, and biological laws, so that these must be known before we can give a complete account of the actions of social units; and, in the second place, each science has devices for getting at the truth about things which are to some extent peculiar to itself, so that we must look over the whole field in order to equip ourselves adequately for a research which will call into play all the devices we can bring to bear. One science, for example, succeeds pre-eminently by the use of experiment, while another, in which experiment is less likely to return finally satisfactory answers, gets along best by using the comparative method. Let us, therefore, study each method in that science which best illustrates the proper use of it, and then we shall be the better prepared to investigate the excessively complex questions presented by the phenomena of human society.

Classification of the Sciences.—Thus in the attempt to inaugurate a scientific theory of social phenomena Comte was led incidentally to work up the elements of a grand theory of scientific method. As his acquaintance with physical science was wholly at second-hand, he fell into many errors in the details of his scheme, but he nevertheless accomplished so much as to entitle him to a very high place as a writer on method. His first task was to classify the various sciences in the order of their logical dependence. Having made a division between abstract and concrete sciences, corresponding nearly to the old division between natural philosophy and natural history, Comte arranged his so-called abstract sciences in a linear series. He began with the most simple and general phenomena, to proceed step by step to those which are most complex and special. Upon this principle the inorganic sciences, as a group, were manifestly to come before those which deal with organic phenomena. For example, we can study thermal radiations and chemical reactions without taking vital forces into the account, but we can not study living organisms without appealing to physics and chemistry at every step. In the region of inorganic science Comte placed astronomy first, as dealing (in his time) only with gravitative force as manifested in the relatively simple phenomena of the mutual attractions of the heavenly bodies; whereas physics, which he placed next, treats not only of gravitative force as manifested throughout relatively complex terrestrial phenomena, but also of such modes of forces as cohesion and capillarity, and of the varieties of wave-motion known as sound, heat, light, magnetism, and electricity. Chemistry, dealing with the still more complex phenomena in which the relative positions of molecules are altered heterogeneously, resulting in new compounds with new properties, was ranked third in order. Passing then to organic science, Comte grouped together, under the head of biology, the most general aspects of nutrition and reproduction, of muscular contractility and nervous sensibility; under the last-named head he included all the phenomena of mind, leaving no place for psychology as an independent science, and setting aside altogether the study of the subjective phenomena of consciousness by introspective observation. Last in the series, as obviously the most complex and specialized of all, was ranked the science of sociology. Mathematics, on the other hand, was placed before all these sciences, the phenomena of number, form, and magnitude being universal, and capable of generalization without reference to other phenomena. The "hierarchy of the positive sciences" thus came out in the following order: (1) mathematics; (2) astronomy; (3) physics; (4) chemistry; (5) biology; (6) sociology. According to Comte, this arrangement represented not only the logical order in which the sciences depend one upon another, but also the historical order in which they have been successively developed and in which they have aided each other's advance. Thus astronomy, according to Comte, was truly a science in the days of Hipparchus, while physics became a science, in

the true sense of the word, only when Galileo discovered the increment of velocity in falling bodies; chemistry was not scientific until the time of Lavoisier; biology was first organized into a coherent body of doctrine by Bichat; and sociology had to wait until all these lines of inquiry were gathered together in the hands of the founder of positivism. This Comtist classification of the sciences has fascinated many minds, but it is not at present accepted by scientific thinkers. For a full examination of this subject the reader may be referred to Herbert Spencer's essays on the *Classification of the Sciences* and the *Genesis of Science*, and to John Fiske's *Outlines of Cosmic Philosophy*, part i., ch. viii.

Methods of Scientific Inquiry.—Comte's classification, however, was not a bad one for the practical ends which he had in view. He cared much less about organizing a coherent body of doctrine concerning the various provinces of nature than about co-ordinating the methods of research which the sciences severally best illustrate. His most important step consisted in assigning to each class of phenomena its appropriate method of investigation, and in clearly marking out the limits within which each method is applicable. It is this which makes it still interesting and profitable to read his great work, even in those chapters on physics, chemistry, and biology, which in nearly all other respects the revolutions in science have rendered thoroughly antiquated. According to Comte the resources at our disposal for the inductive investigation of phenomena may be classified as observation, experiment, and comparison. In simple observation we merely collate the phenomena as they are presented to us; in experiment, we artificially vary the circumstances; in comparison, we watch the circumstances as they are varied for us on a great scale by nature. The conditions of successful observation are best studied in astronomy, where experiment is out of the question, owing to the magnitude and inaccessibility of the phenomena, and where the comparative method is only beginning to be applied. Physics and chemistry, on the other hand, are, *par excellence*, the sciences of experiment, since we can vary the phenomena almost indefinitely. In biology, experiment is also indispensable, nearly all our knowledge of the more important organic functions having been gained through vivisection and other forms of experiment; but experiment is far more complicated and difficult to interpret in biology than in physics, partly owing to the subtlety of the causes in operation, partly because the experiment itself sets in motion a new series of phenomena which are liable to mask and obscure those which we wish to observe. Hence the practical study of experimentation should not begin in biology, but in physics or chemistry, where the conditions are simpler. On the other hand, it is in biology that we can best learn the use of the comparative method, since here we have a vast hierarchy of organisms, in which various organs and their corresponding functions appear in all stages of development. It was in biology that the method of comparison was first employed upon a great scale, and since the time of Cuvier its extension over all departments of sociological inquiry, including linguistics, mythology, and jurisprudence, is perhaps the most striking event in the history of science.

The Three Stages.—Perhaps no better illustration of the use of the comparative method could be found than is furnished by Comte's first wide generalization from the facts of history. When, after his preparatory discussion of scientific methods, Comte endeavored to sum up the most prominent aspects of social progress, both intellectual and material, his first achievement was his celebrated theory of the "three stages" through which men's conceptions must pass. This theory constitutes the most essential part of the structure of positivism. He who intelligently accepts the so-called "law of the three stages" may properly be regarded as a positivist; he who rejects the so-called "law," as an inadequate and misleading description of the phenomena which it seeks to generalize, must be ranked among the antagonists of the positive philosophy.

At the beginning of his great work Comte tells us that "the mind employs successively in each of its researches three methods of philosophizing, of which the character is essentially different and even radically opposed—first, the theological method, then the metaphysical, lastly the positive. The theological system arrives at the highest perfection of which it is susceptible when it has substituted the providential action of a single Being for the capricious play of the innumerable independent deities which were primitively imagined. Likewise the perfection of the metaphysical

system consists in conceiving, instead of many particular entities, one grand entity, Nature, as the source of all phenomena. Finally, the perfection of the positive system would be to represent all observable phenomena as particular cases of a single general fact." In accordance with this general view Comte maintains that in every department of inquiry human speculation has passed through or is passing through these three stages; and, by way of welding firmly together the different parts of his system, he affirms that the order in which the respective sciences have advanced toward the positive stage is truly represented by the order in which they are ranked in his linear classification. Obviously we have here a very important theorem; for if this view of intellectual progress could be demonstrated it would follow that the conceptions of mankind must eventually become "positive" with reference to all questions, and Comte's claim to be regarded as the philosophic lawgiver for the whole future of the human race might not seem extravagant.

When Herbert Spencer's system of philosophy was beginning to attract general attention (about 1860), and while it had as yet been but partially expounded, it was very frequently confounded with Positivism. In truth the Spencerian philosophy is the very antipodes of Positivism, and a statement of their fundamental difference serves most vividly to illustrate the real character of the latter.

With regard to the doctrine of the "three stages," Spencer and his school hold a position diametrically opposed to that held by the Positivists. Between the three terminal conceptions—of God, of Nature, and of Law—as above described by Comte, Spencer denies that there is any incongruity, or that the latter supersedes the former; he maintains, on the contrary, that science, when properly understood, remains quite at one with metaphysics and theology in the assertion of Unconditional Existence as the source of Conditioned Existence. While in Comte's system, therefore, the assumed conflict between science and religion is emphasized and perpetuated, in Spencer's system it disappears entirely. The system of Spencer has by many persons been supposed to be akin to positivism, because, like the latter, it rejects as illegitimate sundry *a priori* methods of arriving at truth which have hitherto been more customarily associated with the processes of metaphysics and theology than with those of science; but this surface resemblance only shows that all modern philosophy, following out a tendency which has been apparent for two centuries, is becoming more and more thoroughly permeated by the scientific spirit of wariness in its method of reaching conclusions. The difference between positivism and evolutionism is the difference between a system that is radically revolutionary and quasi-atheistical, and a system that is conservatively progressive and in the deepest sense theistic.

Social Philosophy.—This difference is further elucidated by Comte's theory of sociology, and it serves in turn to elucidate that theory. The fifth volume of his great work is a brilliant survey of European history, in which the "law of the three stages" is applied and illustrated with admirable ingenuity. It should be read in connection with the *History of Civilization* by Guizot, which in some respects it resembles, though the latter writer, while inferior to Comte in depth of thought, yet far surpasses him in philosophic appreciation of the democratic and Protestant aspects of modern society. Along with the progress from theological to positive habits of thought, Comte joins the progress from military to industrial modes of life, and maintains—incorrectly, as evolutionists hold—that the latter change is determined by the former. This brings us to his fundamental point. He passes over the history of moral progress, and while admitting as a fact the growth of the sympathetic and social feelings at the expense of the selfish and unsocial, he yet fails to take this into the account as the pre-eminent factor in social changes, and always argues as if social amelioration were the product of a reformation of speculative beliefs. Instead of recognizing that the framework of society is based ultimately upon *character*, he regards it as based ultimately upon *opinion*. To this, as to nearly all the theorems of positivism, the Evolutionists of Spencer's school oppose a directly contrary theorem. They hold that, in order to improve society, it is not enough to effect a change of beliefs, but it is further necessary that there should be a gradual change in men's dispositions and prevalent motives. Now, improvement in character is a slow result of countless influences summed up in what has been called social discipline, and accordingly Evolutionists

do not suppose it possible to effect a radical reformation of society—to bring in the millennium, for example—by any such movement, taken separately, as can be carried out by one man or a single generation of men; least of all, do they believe it possible to reform society by means of philosophy. The whole structure of positivism, the whole lifework of Comte, is founded on the precisely contrary belief, that society can be reorganized by means of philosophy—that in order to insure a more harmonious co-operation of human interests it is sufficient to effect a unification of men's beliefs. The evil which Comte always regarded as the grand fundamental evil to be remedied, and which is always thus alluded to by his followers, is what they are fond of calling "the intellectual anarchy of the Western World." The belief that individuality, as involving variety in opinion and behavior, is equivalent to "anarchy," and that "order" means uniformity, is profoundly in accordance with the general temper of Comte's mind. It was to put an end to this "anarchy," and to inaugurate an era of uniformity in belief and conduct, that Comte entered upon his long series of philosophical labors; and from first to last he kept this end steadily in view. All his profound studies in the philosophy of method, and all his elaborate historical generalizations, were merely as incidents in the accomplishment of this great central task.

The Positive Polity and Religion of Humanity.—In 1845 Comte's old project, of inaugurating a new philosophy which should renovate human society, assumed the form of an attempt to institute a new religion, which Prof. Huxley has happily and tersely described as "Catholicism minus Christianity," and in which Comte, instead of the pope, was to be sovereign pontiff. In one of his works, published some seven years after this time, he alludes to it as the era in his life when to the career of Aristotle, which he had hitherto followed, he added the career of St. Paul! Yet the philosophic germs of this later career, as above hinted, are apparent enough in his earlier work. There was no such break between his earlier and his later speculations as one would infer from reading Mill's *Auguste Comte and Positivism*. The early philosophic project for reorganizing society came to be transfigured into a quasi-religious project, but its general outlines underwent no further change than was necessarily implied in such a transfiguration of external aspect. The end in view still was to insure a fixed and uniform standard of social action by establishing a fixed and uniform standard of belief; but the attainment of such a standard by means of scientific methods was no longer deemed sufficient; in addition to this there must be a uniform religious impulse and a uniform cultus; but as the assumed outgrowing of the theological stage of thought involved the ignoring of Deity, and as even Comte was not able to imagine a religion without some sort of a god, it became necessary to furnish some new kind of deity as the source of this new religious impulse and the object of this new cultus. This new kind of deity, according to Comte, is Humanity, and the religious impulse of the future is to be the impulse to serve Humanity and to deserve well of it. It must be admitted that the ethical side of this conception of religion is lofty enough, but the speculative side of it may well seem too grotesque to be seriously entertained by any one endowed with the slightest modicum of that sense of humor which, next to religious faith, is the most desirable possession of a human being. Comte spent the later years of his life in rearing upon this basis a system of practical philosophy astonishingly minute in detail, which in complicated absurdity has probably never been matched by the productions of any other human mind. The ideal of society, as described by Comte, is a state in which everything—even to the minutest details of life—is to be prescribed by unquestioned authority, in which the New Pope or "high priest of Humanity" is to decide upon the age at which each man shall be married, what profession he shall choose, upon what scientific researches he shall enter, and when he shall become *emeritus* as to the general work of life. No caliph, in his wildest dreams of absolutism, ever imagined such a state of things as Comte sought to work out for his ideal society. The main features of this scheme were shaped in curious accordance with the Roman Catholic ideal as conceived by the mediæval popes. There was to be a class of philosophers corresponding to the class of priests under the old régime, with unlimited control over opinions. The arch-philosopher, or "high priest of Humanity," was to supersede the pope; and Paris was to be the holy city of the Positivist as Rome had been the holy city of the Roman Catholic.

A new calendar was to be instituted, beginning with the French Revolution of 1789, and like the old one was to be made up of saints' days, save that philosophers, poets, legislators, inventors, and pre-eminently deserving men of all sorts, and of all ages and countries, were to be substituted for the saints of the old calendar; and for the Virgin Mother an antitype was to be found in the ideal of Humanity, symbolized as "a woman of thirty with a child in her arms." And so on throughout a host of arbitrary details.

Subjective Synthesis.—In the very last years of Comte's life symptoms of mental aberration became unmistakable. After finishing the *Positive Polity* he began a new work, called *Subjective Synthesis*, in which it is recommended that decimal numeration should be abandoned in favor of a septimal system, because seven is a sacred number, and, moreover, being a prime number, is better fitted to inspire the human intellect with a sense of its necessary limitations! Every volume, moreover, constituting a distinct treatise, should consist of "seven chapters, besides the introduction and the conclusion; and each of these should be composed of three parts. Each third part of a chapter should be divided into seven sections, each composed of seven groups of sentences, separated by the usual break of line," etc. The author did not live to complete this work, but died soon after his first volume was published.

Comte's Followers.—At his death Comte left one great disciple, Émile Littré, one of the most consummate scholars that France has produced; but Littré was regarded as half a heretic by the thoroughgoing disciples of Comte, as he refused to follow the teacher through his later vagaries. Robinet, the eminent physiologist, became a follower of Comte; and besides this a small number of Positivists, under the leadership of Lafitte, continued for some years in Paris to profess the "religion of humanity." In Germany, positivism has never gained any footing at all; in England, only a precarious one. Among the declared followers of Comte in England are Congreve, Prof. E. S. Beesly, Frederic Harrison, and Dr. Bridges; and John Morley has been considerably influenced by him. As a rule, the positivist school is characterized by a sympathy with communists and boycotting strikers, a partiality for the short and sharp despotic method of settling social questions, a tendency to regard politics from the sentimentalist point of view, a dislike to individuality of thought, an obtuseness to the requirements of scientific method, and (in the speculative region) hostility to the theory of evolution, the doctrine of the correlation of forces, and other theories which have assumed prominence since the time when their master Comte stigmatized as such kinds of theorizing as "metaphysical" and "chimerical."

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Pos'se Comitatus: a law Latin phrase, meaning literally "the power of the county." By the common law the sheriff while engaged in executing process, especially when it was criminal, or in pursuing and arresting felons, or in exercising his functions generally as the chief administrative officer charged with the duty of enforcing the keeping of the peace, was authorized to summon to his aid, if necessary, all the men above the age of fifteen years within the county, with the exception of the sick or infirm, ecclesiastics, and peers, and they constituted, in the ancient technical nomenclature, the *posse comitatus*. The same authority is given to the sheriff in the U. S., although its exercise is often regulated by statute. The ordinary cases in which such a resort is had to the active assistance of private citizens are the quelling of riots, the overcoming of forcible seizures or detainers of land, the subduing of forcible rescues made or attempted of persons arrested pursuant to the command of a proper writ, and the resistance to any forcible measures in opposition to the execution of public justice; in short, wherever a breach of the peace has attained, or threatens to attain, such magnitude that the officials themselves are unable to suppress it. Since the sheriff may call out the entire power of the county, he may likewise, under the circumstances above described, summon one or more individuals, or any number less than the whole. In Great Britain the calling out of the *posse comitatus* is expressly authorized by the Sheriffs Act, 1887, sec. 8, subsec. 2, for the purpose of resisting the execution of a writ.

Revised by F. STURGES ALLEN.

Postal Service: that branch of the public service which is concerned particularly with the conveyance and delivery of letters and other documents, newspapers, book-packets, etc., the issue of money-orders, and in some instances with the management of the telegraphs, savings-banks, etc., as in Great Britain.

Origin and Early History.—The beginnings of the present highly organized postal systems of the world are doubtless to be found in the lines of couriers which rulers early established for the prompt transmission of decrees and other dispatches connected with governmental affairs. The earliest known system was that established in 559 B. C. by Cyrus the Elder, King of Persia, who maintained relays of mounted men at fixed stations, ready at a moment's notice to forward the king's messages from post to post. China has maintained such a system from a very early date, and Marco Polo tells us that in his day (the latter part of the thirteenth century) the "Great Khan" maintained 10,000 post-stations, and more than 300,000 horses for the use of his messengers and couriers, who traveled "a good 200 or 250 miles in the day and as much in the night," a fresh horse and rider being supplied without delay every 25 or 30 miles. Establishments of this kind existed among the Romans in the time of Augustus, B. C. 31, and in France under Charlemagne, but the first actual letter-post for commercial purposes appears to have originated in the Hanse towns early in the twelfth century. A century later the University of Paris established an efficient postal system, which continued till the beginning of the eighteenth century. One of the earliest posts in Europe for general accommodation was that established in 1516 by Franz of Thurn and Taxis, for Maximilian, the Emperor of Germany. The office of postmaster-general became hereditary in the Counts of Thurn and Taxis, and was held by them until the dissolution of the German empire in 1806.

England. As early as 1252 royal messengers, or nunci, were employed in England for the conveyance of letters, and in 1470, when Edward IV. was waging war on Scotland, he established post-stations 20 miles apart, between that country and England; but it appears that until the time of Henry VIII. no regular system of posts existed in England.

Though these establishments were primarily for the transmission of the royal letters, and the conveyance of persons traveling on the king's business, the post-riders and postmasters soon found it both convenient and profitable to undertake the conveyance of private letters and private travelers, and so extensive had this practice become that Elizabeth commanded that all packets on the queen's business or the affairs of state should have precedence of private correspondence. In 1603 James I. issued a proclamation giving to post-agents the exclusive right of letting horses to travelers, and a later proclamation (1609) forbade all persons not duly authorized by the master of the posts from collecting, carrying, and delivering letters. This was the beginning of the state monopoly of letter-carrying in England.

At this time there were only four official post-routes in the kingdom, one through Kent to Dover and the continent of Europe, one to Plymouth, where the royal dockyard was situated, one to Ireland by way of Beaumaris, and one to Scotland via Berwick. In 1619 the Du Questres, father and son, were placed in charge of the first of these routes. Their successor, Thomas Witherings, introduced many postal reforms, and in 1635 was ordered by Charles to establish a running post between London and Edinburgh (410 miles), to go day and night, and return in six days. Witherings was succeeded by Prideaux, who not only established weekly posts all over England, but seems to have made the service self-supporting. In 1650 he undertook to pay a fixed rent of £5,000 a year for the exclusive right to run the post-office, and thus began the system of farming the postal service, which continued well into the eighteenth century.

While letters could be sent from London to many places in the country, it was not until 1680 that citizens in one part of London could communicate by letter with persons in other parts or in the suburbs. Such a system was introduced by a London merchant named William Dockwra, who divided London and its suburbs into seven districts, each with its own sorting-office, and opened between 400 and 500 receiving-offices at which messengers called every hour for letters or parcels. The amount charged for each package was 1*d.*, provided it did not exceed 1 lb. in weight or £10 in value. Deliveries were made in the business parts of the city ten or twelve times a day, and elsewhere from four to eight times. The success of the undertaking excited the greed of the Duke of York, on whom the revenue of the post-office had been settled, and in less than five years from its introduction this penny post was incorporated with the General Post-office, and Dockwra was later appointed comptroller. In 1701 this rate was advanced to 2*d.*, an increase legalized by Parliament in 1730. Similar posts were established in Edinburgh, Manchester, Bristol, and Birmingham in 1793; and in Dublin in 1773.

In 1780 the monopoly of letting post-horses was abolished, and four years later mail-coaches were introduced with success by John Palmer, manager of the Bath theater, and did good service for sixty years. Steamships were first used for the conveyance of mails in 1821, and railways in 1830.

United States.—The post-office existed in America from its earliest settlement. Originally it was merely a receptacle in the coffee-house, where letters arriving from abroad were deposited, to be taken by those to whom they were addressed or carried to them by their neighbors. The first legislation on the subject is found in the records of the general court of Massachusetts for 1639, and the next in the colonial law of Virginia in 1657. The former provides "that notice be given that Richard Fairbanks his house in Boston is the place appointed for all letters which are brought beyond the seas or are to be sent thither, to be left with him; and he is to take care that they are to be delivered or sent according to the directions; and he is allowed for every letter a penny, and must answer all miscarriages through his own neglect in this kind." The colonial law of Virginia required "every planter to provide a messenger to convey the dispatches, as they arrived, to the next plantation, and so on, on pain of forfeiting a hogshead of tobacco for default." Gradually a postal service was established between the several colonies along the coast, and in 1672 there was "a post to goe monthly from New York to Boston." In the year 1692 Thomas Neale received letters patent, good for twenty-one years, authorizing him to set up posts in North America, and under this grant the postal affairs of the colonies of North America were conducted by Neale's representative and his successors until 1710, when the postal service of the British empire was consolidated into one es-

tablishment, with chief offices at London, Edinburgh, Dublin, and New York. One of the earliest acts of the Continental Congress was the establishment of a post-office and post-routes from Falmouth, Me., to Savannah, Ga., "for conveying intelligence and letters throughout this continent," and to spread knowledge of the acts of Congress and the progress of the Revolution among the different colonies. Benjamin Franklin was the first postmaster-general, and under his practical management the postal service was soon extended through all the colonies. Newspapers were generally published by the postmasters of the several cities, and their papers had not only been sent free through the mails, but all others excluded. Franklin was the first to give equal privilege to all publishers; subsequently a small sum was charged as postage, which seems to have been a perquisite of the postmaster, but no regular postage on newspapers was established by law until 1792.

Postage, or fixed charges for the conveyance of letters, was first introduced in England by Witherings about 1635, when the royal sanction was first given to a scale of 2*d.* for a single letter (that is, written on only one sheet of paper) for any distance under 80 miles, 4*d.* for over 80 and under 140, and 6*d.* for distances above 140; 8*d.* to Scotland, and 9*d.* to Ireland. From that date until 1840 the basis of rate continued to be distance and not weight, except in regard to the penny post already referred to. Parliamentary regulation of rates began in 1657, and these were increased and decreased from time to time according to the exigencies of Government or of the pension-list. In 1812 the rates were for a third time increased, 4*d.* being charged for 15 miles, 5*d.* for distances over 15 and under 20 miles, 6*d.* above 20 and under 30 miles, 7*d.* above 30 and under 50 miles, 8*d.* above 50 and under 80 miles, and so on, 17*d.* being charged for any distance above 700 miles. These rates were almost prohibitory, and many curious devices were employed for the purpose of avoiding payment. In 1837 Mr. (afterward Sir) Rowland Hill began an agitation for cheaper rates, and proposed an inland or domestic rate of 1*d.* for every letter weighing not more than half an ounce, the abolition of the *FRANKING PRIVILEGE* (*q. v.*), more frequent mails, and speedier delivery. Three years later his agitation was successful, and penny postage became the rule for the United Kingdom. Since 1871 the rates there have been 1*d.* for a letter not exceeding 1 oz.; exceeding 1 oz., but not exceeding 2 oz., 1½*d.*; 2 oz., but not exceeding 4 oz., 2*d.*; from 4 to 6 oz., 2½*d.*; 6 to 8 oz., 3*d.*; 8 to 10 oz., 3½*d.*; and so on at the rate of ½*d.* for every additional 2 oz. Double postage is charged when not prepaid, and deficient postage entails a charge of double the deficiency. The fee for registration is 2*d.*, with compensation (in case of loss) up to £5, 3*d.*, with compensation up to £10, and so on, with 1*d.* additional for each added £5 of compensation, up to £50. Newspapers registered at the General Post-office and published in the United Kingdom are carried for ½*d.* each. For books the charge is ½*d.* for every 2 oz. or fraction thereof. No package of newspapers must exceed 14 lb. in weight, 2 feet in length, or 1 foot in width or depth. Book-packets must not exceed 6 by 9 by 18 inches, or 5 lb. in weight.

In the U. S. for some years after 1776 postage was paid in currency, and was increased as the currency depreciated until finally the rate was reduced and made payable in specie. The rates fixed in 1792 were: For 30 miles and under, 6 cents; over 30 and not exceeding 60 miles, 8; between 60 and 100 miles, 10; between 100 and 150 miles, 12; between 150 and 200 miles, 15; between 200 and 250 miles, 17; between 250 and 350 miles, 20; between 350 and 450 miles, 22; over 450 miles, 25. Few letters were sent at such high rates, and from 1800 to 1830 the increase scarcely kept pace with the growth of the population. Many letters were sent privately, and after the express companies were started a great many were sent by them at less than the postage, in spite of the opposition of the post-office department. The first important changes in postage were made in 1845, when a scale based on both weight and distance was introduced. The rates were for letters not exceeding ½ oz. carried for any distance under 300 miles, 5 cents; over 300 miles 10 cents; and an additional rate for every additional half ounce or fraction thereof. Newspapers were carried free for 30 miles; for over 30 and under 100, or within the State, 1 cent; over 100 miles, or out of the State, 1½ cents. The next most important change was in 1851, when a single letter weighing not more than ½ oz. was charged 3 cents for distances under 3,000 miles (5 cents if not prepaid), and 6 cents over 3,000 miles (12 cents if not prepaid). In 1855 the rate was made

3 cents for all distances under 3,000 miles, and 10 cents for distances over 3,000 miles. In 1863 the element of distance dropped out of the scale, and a uniform rate of 3 cents was charged on all domestic letters not exceeding $\frac{1}{2}$ oz. or fraction thereof. In Oct., 1883, ordinary letter-postage was reduced 33 $\frac{1}{3}$ per cent., and the rates are now for letters 2 cents for each ounce or fraction thereof; for postal cards, 1 cent; for second-class matter or regular publications, 1 cent a pound; for third-class or transient newspapers, and all other kinds of printed matter, 1 cent for each 2 oz.; for fourth-class, or merchandise, 1 cent an ounce. The limit of weight of third or fourth class matter, books excepted, is 4 lb. This postage must be fully prepaid on all matter except letters; on these at least 2 cents must be prepaid. The fee for the registration of letters or other articles is 8 cents.

Stamps.—The stamps used by the Counts of Thurn and Taxis are to be found in many collections, but the modern postage stamp dates back no further than 1840, when it was introduced into general use in Great Britain by Rowland Hill. Zurich and Brazil adopted the idea in 1843, the U. S. in 1847, Russia in 1848, France, Bavaria, Tuscany, Belgium, and New South Wales in 1849, and Austria-Hungary in 1850. Since then its use has become universal. See STAMPS.

Organization.—In the United Kingdom the management of the postal service is under the direction of the Postmaster-General, who is a member of the Government, frequently a cabinet minister, and goes out of office with the administration. The permanent officials are a chief secretary, a financial secretary, four other secretaries, each of whom takes charge of some separate branch, a secretary for Ireland, a surveyor-general for Scotland, and an accountant-general. During the year 1893 the postal service of Great Britain and Ireland employed a permanent force of 71,956 persons, of whom 10,465 were women, besides about 59,000 other persons employed by local postmasters, of whom 16,000 were women and girls. In the U. S. the head of the postal service is the Postmaster-General, who has been a cabinet minister since 1826. Under him are four assistant postmasters-general (appointed by the President), of whom the first is the general executive, in charge also of the dead-letter office, the free-delivery service, and the money-order system; the second has charge of the transportation of all mail matter; the third is the bookkeeper of the department and attends to the issuing of stamps and the classification of the mail matter; and the fourth manages post-office inspections, receives the bonds of postmasters, appoints fourth-class postmasters, etc. The sixth auditor is the officer of the U. S. Treasury who has charge of post-office accounts. Over 500 clerks are employed in his department, which annually audits about 450,000,000 accounts. Over 200,000 persons are employed in the U. S. postal service.

Postal Union.—At the invitation of Germany, a postal congress of all the states of Europe, the U. S., and Egypt, was held at Berne in Oct., 1874, for the purpose of considering how greater uniformity in the treatment of correspondence could be secured, how accounts could be simplified, and rates reduced, etc. A postal convention was agreed upon, which was signed by the delegates from the countries of Europe and from the U. S., was ratified by the several governments, and went into effect July 1, 1875. A postal union was organized, with a central office at Berne, under the supervision of the post-office department of Switzerland, for the purpose of considering and working out all questions in the interests of the union. These conventions are now held every three years. Instead of the varying rates theretofore prevalent, the following uniform postage was adopted for mail matter from any country of the union to any other: 5 cents on prepaid and 10 cents on unprepaid letters weighing not over $\frac{1}{2}$ oz.; newspapers not over 2 oz. in weight, 1 cent; books and other printed matter and patterns of merchandise not exceeding 8 $\frac{1}{2}$ oz., 1 cent for each 2 oz.; postal cards, 2 cents. Prepayment is invariably required except on letters. The union now embraces nearly every country in the world except China, which has no modern postal system.

Canada.—Down to the time of the confederation in 1868 each province controlled its own postal system, but since that date the rate of domestic letter-postage is 3 cents per oz. (in the U. S. it is 2 cents). By an agreement made between Canada and the U. S. in 1875 each country receives and delivers the letters of the other at their respective inland rates without keeping account of the same, as each country retains the full amount of postage collected by it. In 1879 Canada entered the Postal Union.

The statistics for the year ending June 30, 1893, are as follows: Letters, 106,290,000 (of which 3,254,000 were registered); postal cards, 22,790,000; newspapers and periodicals sent by individuals, 24,220,000; newspapers sent from office of publication, 66,150,916; books, circulars, samples, etc., 2,626,200; and parcels, 343,000. Number of offices, 8,475, of which 1,168 issued 967,866 money-orders aggregating \$12,902,976, of which \$10,404,857 were payable in Canada and \$2,269,635 were payable abroad.

Australasia.—The first Australasian post-office was established at Sydney in 1810, and the postmaster was allowed to charge 8d. for every English or foreign letter of whatever weight and 1s. 6d. for every parcel not exceeding 20 lb. Colonial letters were charged 4d. irrespective of weight, and soldiers' letters were free.

The first postal act was passed in 1825, but its provisions were not put into full force until 1828, when the lowest rate for a letter weighing $\frac{1}{2}$ oz. was 3d. In 1831 a twopenny post was established in Sydney; in 1837 a post-office was established in Melbourne, then a part of New South Wales. In Oct., 1891, the seven colonies entered the Universal Postal Union.

The following table shows the postal business of each of the colonies during 1890:

COUNTRY	POST OFFICES	Letters and postal cards	Books, journals, etc., per post	Newspapers
New South Wales	1,438	58,385,300	8,939,600	40,297,200
Victoria	1,671	62,730,148	7,084,915	22,720,005
Queensland	802	14,709,504	2,047,446	11,466,726
South Australia	609	16,794,679	1,251,416	7,499,075
Western Australia	82	2,629,698	329,871	2,137,956
Tasmania	345	152,824	963,167	1,667,371
New Zealand	1,958	22,877,320	4,403,181	11,137,846
Australasia	5,965	183,095,773	27,669,186	102,465,924

Registered Letters.—It would seem that in the English post-office all correspondence was registered from a very early period. An order in council dated July, 1556, and another in 1603 provide that "every post shall keepe a large and faire leger paper booke to entre our packets in as they shal be brought unto him with the day of the moneth, houre of the day or night, that they came to his handes, together with the name of him or them by whom or unto whom they were transcribed and directed." This practice was confirmed in 1792, but no receipts were given the sender until 1814. During the year ending Mar. 31, 1893, 12,132,144 letters and parcels were registered in the United Kingdom, and under the new system of registration and insurance introduced on Dec. 1, 1892, compensation amounting to £550 was paid on 507 registered packages that had been lost or damaged. Registration was introduced into the U. S. in 1854. The number of pieces of mail matter registered during 1892-93 was 15,561,410 (2,759,016 free of charge).

Free Delivery.—Until 1774 there was no free delivery in England except in a few of the larger cities and towns, and it was not until many cases had been decided by the courts against the postal authorities that letter-carriers were appointed, and the customary delivery fee of 1d. or more was omitted. Free delivery is now universal throughout the United Kingdom. In the U. S. the free-delivery system in cities was begun in 1863, and only in large cities. This was extended in 1887 to all cities with a population of over 10,000 or a postal revenue of \$10,000.

Special delivery was introduced into the U. S. in 1885. By this a fee of 10 cents secures immediate delivery by special messenger. In 1892-93 3,375,693 pieces were mailed for special delivery, 1,500 messengers were employed, and the average time of delivering a packet was nineteen minutes. In Great Britain an "express delivery" corresponds somewhat to the special delivery of the U. S.

Parcels-post.—There is no inland parcels-post, strictly so called, in the U. S., the classification of fourth-class matter, by which books and many kinds of merchandise may be transmitted through the mails, taking its place. There is a parcels-post, however, with Mexico, Hawaii, the Windward and Leeward islands, and several of the countries of South America, and to them 48,966 parcels were dispatched in 1892-93, an increase of 8,716 over the preceding fiscal year. A parcels-post between the United Kingdom and India had long existed, but it was not until Aug. 1, 1883, that an inland parcels-post was established. The limit of weight is 11 lbs.; the rate is 3d. for 1 lb. or less, and 1 $\frac{1}{2}$ d. for every additional lb. During the year ending Mar. 31, 1893, 52,370,326 parcels were carried for £1,151,051.

Money-order System.—This had its origin in 1792 in a private venture of three English post-office clerks who, under the name of Stow & Co., used the postal facilities at their command for the transmission of small sums of money to different parts of the country. The fee in these early days was 8d. per £1, of which 3d. went to the postmaster issuing an order, 3d. to the postmaster who paid it, and 2d. to the company. In 1838 this business was incorporated with the post-office department. In the three months ending Oct. 10, 1800, 697 orders for £8,863 were issued. For the year ending Mar. 31, 1893, 10,442,918 orders were issued in the United Kingdom, amounting to £28,683,951. The system was introduced into the U. S. in 1864. During the year 1892-93 13,309,735 domestic orders, aggregating \$127,576,433.65, were issued by 18,434 U. S. money-order offices, and 1,055,999 international orders, aggregating \$16,341,837.86, were issued by 2,407 offices. Postal notes or orders were introduced in Great Britain in 1881, and in the U. S. in 1883. At first these were payable to bearer, but as many abuses in the way of fraudulent negotiation had crept in, the British authorities have insisted since 1892 on the insertion of the name of the payee. In the U. S. the postal-note system was abolished in 1894 and incorporated with the regular money-order system. In Great Britain in 1891 56,590,668 postal orders were issued. During 1892-93 7,753,210 postal notes, to the value of \$12,903,076.73, were issued in the U. S.

Post-office savings-banks were established in the United Kingdom in 1861, and flourished in the British colonies as well as in several of the countries of Europe. In Great Britain the interest allowed is $2\frac{1}{2}$ per cent.; the lowest deposit is one shilling, and one person's deposits may not exceed £30 in any one year, nor £150 in all. On Dec. 31, 1892, 10,519 post-offices were open for the transaction of a savings-bank business, and in that year the number of accounts opened was 1,036,622, the amount deposited amounting to £21,334,903, and the total amount standing at the credit of depositors was £75,853,079. Postal savings-banks were introduced into France in 1881. On Dec. 31, 1893, the accounts numbered 2,095,632, with aggregate deposits of 607,871,925 francs. See the article SAVINGS-BANKS.

Telegraphs.—In 1870 the British Government acquired possession of all the telegraph lines then existing, and placed them under the management of the post-office. The rates charged have consequently been cheapened and the number of messages sent greatly increased; in 1893 this was 69,907,848 for Great Britain and Ireland.

Statistics.—The growth of the postal systems of the world since the introduction of cheap postage has been phenomenal. In Great Britain the total number of letters mailed in 1839 was 76,000,000. In 1840, the year in which penny postage was introduced, the number was 169,000,000. In 1882-83 it had increased to 1,280,000,000, while in 1892-93 the total deliveries amounted to 2,785,270,000; of these 1,790,500,000 were letters, an average of 46.6 to each person. In India in 1856 there were only 753 post-offices; in 1892 there were 21,465, and through these passed 308,403,108 letters, post-cards and money-orders, 25,910,336 newspapers, 2,108,685 parcels, and 10,711,051 book and other packets, making a total of 347,133,230 pieces. In the U. S. the growth has been still more remarkable. In 1790 there were only 75 post-offices and 1,875 miles of post-road open, while the number of letters and transient papers delivered did not exceed 2,000,000. On June 30, 1893, the number of post-offices was 68,403 (of which 610 were free-delivery offices); the number of mail routes was 30,831, including 1,116 railway lines and 36 steamboat lines, and aggregating 453,832.83 miles in length; and for the year 1892-93 the total number of pieces of mail matter handled was 10,236,314,985, of which 7,131,627 were sent to the dead-letter office in Washington. This increase is in part due to the remarkable growth of the efficiency of the service. The railway post-office system, in which each mail car is converted into a distributing post-office, lessens very greatly the average time of transmission. In the year 1892-93 the pieces of mail matter distributed in transit on railway and steamship lines numbered 9,772,075,810.

Revenue.—The British post-office has always been a paying concern. In 1893 its income (£10,344,353) exceeded its expenditures by £2,826,756. In the U. S., on the other hand, there has long been an annual deficiency, caused chiefly by the cheap rates (1 cent per lb.) at which second-class matter is carried. During the year ending June 30, 1893, the gross revenue was \$75,896,933, and the expenditures \$81,074,104, leaving a deficit of \$5,177,171. See FINANCE.

Offenses against Postal Laws.—A brief notice of the provisions of the postal laws of the U. S. is all that can be given here, but these provisions may be taken as giving a general idea of those in force in most countries.

It is unlawful to deposit in the mail any article intended or adapted for any indecent or immoral use, or any printed or written matter giving information where such things can be secured; also to send by mail any letter or circular concerning any kind of lotteries, or concerning any scheme or device intended to defraud and deceive the public, or to aid in obtaining money under false pretenses. The act of sending through the mail any matter having on the outside any language of a threatening, inflammatory, or libelous character, or which is obviously intended to reflect injuriously upon the character or conduct of another, is also unlawful; thus dunning-notes should not be sent on postal-cards. The use of the mail in order to defraud by, or to sell, dispose of, or furnish, any counterfeit or spurious coin, bank-notes, or other security is a crime punishable by fine or imprisonment, or both.

Opening the letters of other persons, even though not sealed, is forbidden by law. This may be done only under a warrant particularly describing the thing to be seized. It is an offense punishable by a fine of not more than \$100 to knowingly and willfully obstruct or retard the passage of the mail. Statutes also exist imposing imprisonment at hard labor for embezzlement or destruction of mail matter by postal employees, for stealing from the mail by other persons, and for robbing any mail from a mail-carrier or agent.

See Lewins, *Her Majesty's Mails* (London, 1864); *History of Penny Postage* in Hill's *Life of Sir Rowland Hill* (1880); Hyde's *The Royal Mail: its Curiosities and Romance* (London and New York, 1885); *A Hundred Years by Post*, and *The Post in Grant and Farm* (London, 1894); Joyce, *History of the Post-office* (London, 1893); Marshall Cushing, *The Story of Our Post-office* (Boston, 1893); and the *United States Official Postal Guide*. R. LILLEY.

Postlim'iny [from Lat. *postliminium*, liter., condition after having crossed the threshold; *post*, after + *limen*, *li'minis*, threshold]: in Roman law, return from a state of capture and its consequences, or restoration to former political and other rights. Capture of a Roman in war, as well as of any one else, was held to make him a slave; and as a slave could make no will nor have any civil rights, the captured Roman's rights of property, citizenship, even of family, would be by this calamity not merely suspended, but brought to an end. The right of testament was saved from the effect of capture by the fiction of the Cornelian law, according to which the soldier was conceived of as having been killed in battle while yet a free Roman. The rights of citizenship, family, and property were saved by the *jus postliminii*, also a legal fiction, by which, if he had freed himself during war or had been restored by treaty, it was assumed that he had never been away. This doctrine of postliminy has been imported from the Roman into the international law, unnecessarily perhaps, to explain the revival of the title of an original owner to his property upon its recapture. Thus a ship if retaken (but by U. S. usage not after condemnation by a prize-court) reverts to the original owner, subject to salvage. (See RECAPTURE.) In like manner is restored the sovereignty of a territory which has temporarily passed into the power of an invader, but later drives him out or is abandoned by him. Nevertheless, many non-political acts of the temporary sovereign which are in the line of lawful government are binding after the restoration. Revised by T. S. WOOLSEY.

Post-mortem Examination [*post mortem* is Lat. for after death]: the examination of the body to determine the cause and manner of death. In cases of poisoning the nature of the poison and possibly the manner of its administration may be determined; in death from violence the examination will often reveal the nature of the weapon used in the infliction of the wounds and the relative positions of the victim and assailant at the time. Such examinations are also made in order to study the lesions which are produced in various organs as the result of disease. The brain is removed and examined by making an incision across the top of the head between the ears, dissecting back the scalp, and sawing through the skull. All of the thoracic and abdominal viscera are examined by making a single long incision which passes from the root of the neck to the symphysis. After a thorough examination and description all the organs are replaced, and the body carefully cleaned and

sewed up. The incisions are made in such a manner that no trace of them is visible when the body is again dressed.

W. T. COUCHMAN.

Post-office: an office where letters, etc., are received for transmission to various destinations, and from which letters that have been received are delivered. The name is also applied to that department of the public service which is charged with the reception, conveyance, and delivery of letters, etc. See POSTAL SERVICE.

Post-tertiary Period: See PLEISTOCENE PERIOD.

Potash: See POTASSIUM.

Potassæ Bitartras: See CREAM OF TARTAR.

Potassium [Mod. Lat., from Eng. *potash*: *pot* + *ash*]: a metallic element discovered by Davy in 1807 while experimenting on the action of a powerful electric current on molten caustic potash (potassium hydroxide, potassic hydrate). *Potash* is potassium carbonate, a constituent of wood-ashes, from which caustic potash (KOH) is obtained. Lavoisier first suggested that the caustic alkalies were compounds of oxygen, but the evidence was furnished by Davy's experiments. It was later shown by Brunner that the metal can be made by distilling at a white heat an intimate mixture of potassium carbonate and charcoal, and this method is now used for the purpose of preparing the metal on a large scale. Potassium occurs in many minerals, principally in feldspar, which is very widely distributed in nature. It occurs in combination with chlorine as carnallite and sylvite in the great deposits at Stassfurt, Germany; in combination with sulphuric acid and aluminium as alum; with nitric acid as saltpeter or potassium nitrate. Potassium is found, further, in combination in all soils in consequence of the natural decomposition of the minerals containing it. It is taken up by the plants, and when vegetable matter is burned it remains behind, principally as the carbonate. When the ash is treated with water the carbonate dissolves, and by evaporating the solution thus obtained the carbonate remains behind in impure condition. Potassium occurs further in the form of a salt of tartaric acid in grape-juice, and is deposited from this. The deposit is called crude tartar. An intimate mixture of potassium carbonate and charcoal, which is used in the manufacture of potassium, is made by heating this crude tartar in a closed vessel. To make potassium, the intimate mixture thus obtained is placed in a wrought-iron retort connected with a closed flat receiver of sheet iron. The retort being heated to a high temperature, the metal distills over into the receiver, which, at the end of the operation, is placed under petroleum.

Potassium has a bright metallic luster on its freshly cut surfaces, but this quickly tarnishes on account of the ease with which moisture acts upon it. The metal is soft, and lighter than water. When thrown upon water the latter is decomposed, the products of the action being potassium hydroxide, KOH, and hydrogen. The heat evolved is sufficient to set the hydrogen on fire, and at the same time a little of the potassium is burned, so that the flame has the characteristic violet color of potassium flames. The symbol of potassium is K; its atomic weight 39.

Compounds of Potassium.—**Potassium chloride**, KCl, as already stated, is found in the deposits at Stassfurt as sylvite, and in combination with magnesium chloride, $MgCl_2 \cdot KCl + 6H_2O$, as carnallite. **Potassium bromide**, KBr, is largely used in medicine. It is prepared by artificial methods. The **iodide**, KI, is also extensively used in medicine and in photography. The **hydroxide** or **hydrate**, KOH, commonly called caustic potash, is made by treating the carbonate in solution with lime. The solution thus obtained is drawn off and evaporated in iron or silver vessels. Solid caustic potash is a white, brittle substance. In contact with air it absorbs water and carbonic acid. It decomposes FATS (*q. v.*), forming GLYCERIN (*q. v.*) and soaps. (See SOAP.) It is an extremely energetic base *q. v.* The **unsulphated** potassium compounds are formed by melting together potassium carbonate and sulphur. **Acid potassium tartrate** (see CREAM OF TARTAR). **Potassium nitrate** (see SALTPETER). **Potassium carbonate**, K_2CO_3 , is the principal soluble ingredient of wood-ashes and is extracted by treating the ashes with water. Formerly all the potassium carbonate made was obtained from wood-ashes, but at present not more than half of the supply comes from this source. The other sources are the residues from the manufacture of beet-sugar, potassium sulphate and chloride, and wool-fat. **Potassium silicate** is prepared in solution by dissolving sand in potassium carbonate

or hydroxide. It is prepared on a large scale by melting together quartz-powder and purified potash. It is known as *water-glass*, or, to distinguish it from that made with sodium carbonate or hydroxide, *potash water-glass*. **Potassium ferrocyanide** or **yellow prussiate of potash**, $K_4Fe(CN)_6$, is a beautiful yellow compound obtained by heating refuse animal matter, such as horn, hoofs, blood, etc., with impure potassium carbonate and scrap iron. The salt is of great value, as it is the starting-point in the preparation of all the cyanides, and is used in the manufacture of Prussian blue.

Regarding the relations of potassium salts to the growth of plants, see AGRICULTURAL CHEMISTRY. IRA R. JONES.

MEDICINAL USES OF POTASSIUM COMPOUNDS.—**Potassium hydroxide** (caustic potash), from its strong chemical affinities, is powerfully caustic to living tissues. It unites with water and with albuminous substances, and from its deliquescent and high diffusive power rapidly penetrates the tissues, and thus carries its destructive effects very deeply. The slough is black, slimy, and pultaceous. Taken internally, alone or in strong solution, it is a violent corrosive poison. The antidote is some organic acid, such as acetic (vinegar), citric, or tartaric. In weaker solution caustic potash swells and softens epithelium, producing a slippery feel to the fingers. It is used in surgery as a caustic, being fused and run into cylindrical moulds about the size of a goosequill, so as to form conveniently shaped sticks. A solution of specific gravity 1.065 is official in the *United States Pharmacopœia*, and may be used for the general purposes of alkaline medication; but alkaline salts of the same base are preferable, and this solution is therefore employed more in pharmacy than in medicine. **Potassium carbonate** and **bicarbonate** are strongly alkaline, and have essentially the physiological properties of solution of caustic potash. They are used externally in weak solution as lotions in skin diseases to remove dried epithelial crusts and scabs and control the excessive secretion of such diseases as eczema. They are not much given internally. They are sufficiently alkaline to be poisonous in large doses. **Potassium acetate** and **citrate**, though of neutral reaction, become converted into carbonates in the blood through decomposition of the organic acids. They thus tend to increase the alkalinity of the blood, to alkalize the urine, and especially to diminish the quantity of uric acid present in the system. They are used medicinally in rheumatism, gout, and uric-acid gravel to diminish the excess of acidity characteristic of those diseases, and in dropsy and deficient secretion of urine to produce diuresis. Solution of the citrate, freshly made by saturating lemon-juice with potassium carbonate and drunk during effervescence, is a favorite mode of giving the salt for the above purposes, and is also a very refreshing fever-draught, for allaying nausea, and for reducing over-action of the heart in acute febrile states. **Potassium and sodium tartrate** (Rochelle or Seignette salt) is of low diffusion power, and in large dose is purgative simply, producing, like other cathartic salts, watery stools. In smaller quantities, as a drachm, given considerably diluted, it is absorbed and its acid decomposed, and then under the form of carbonate it produces the effects and may be used for the purpose stated for potassium acetate and citrate. It is also employed as a purgative, and is most commonly given in the form of the *seidlitz powder* (*pulvis effervescentis compositus* of the *United States Pharmacopœia*). A seidlitz powder consists of 2 drachms of the Rochelle salt and 40 grains of sodium bicarbonate, put up in a blue paper, and 35 grains of tartaric acid, put up in a white paper. The contents of the two papers are to be separately dissolved in about 2 fluid-ounces of water, and the solutions mixed and drunk during their effervescence. **Acid potassium tartrate**, or cream of tartar, is a powerful diuretic, and in full dose is purgative. It ought not to be used, therefore, for alkaline internal medication, like the acetate or citrate. **Neutral potassium tartrate** is also purgative, but, from its disagreeable taste, the acid tartrate is medicinally preferable. **Potassium sulphate** is purgative, but is harsh and may be poisonous, and is therefore little used. **Potassium nitrate** (niter or saltpeter) is irritant, and in large dose poisonous, inflaming the stomach, causing vomiting and purging, and also having an effect, common to many of the stronger potassium compounds, of affecting the heart, enfeebling its power, and even causing death by syncope. Niter is used in medicines as an ingredient of cooling saline draughts in fever, to reduce over-action of the heart, and was at one time largely employed in acute rheumatism. Niter has nothing to do with the so-called *sweet spirit of niter*, which is a peculiar

ethereal compound containing nitrous ether and alcohol. *Potassium chlorate*, though of high diffusion power like niter, is less freely soluble, and is hence not so strongly irritant, yet it is the most poisonous salt of potassium, except the cyanide, producing, in addition to local changes, a rapid breaking down of the blood and intense inflammation of the kidneys. This salt is peculiar in being largely excreted by the salivary glands and increasing their secretion. Medicinally, its use is almost confined to inflammatory and ulcerative diseases of the mouth and throat, over which it often has a remarkable power. A saturated solution may be gargled, or a few of the crystals may be held in the mouth and allowed slowly to dissolve. It should not be swallowed, except in very small quantities.

The other potassium salts used in medicine derive peculiar powers from their several acidifying principles. *Potassium cyanide* is intensely poisonous, and has essentially the properties of HYDROCYANIC ACID (*q. v.*). *Potassium ferrocyanide* has but feeble physiological action, and is practically used only in pharmacy and the arts. The properties of *potassium iodide* will be found described under IODINE (*Medicinal Uses of*). *Potassium bromide* has peculiar powers over the nervous system, in addition to possessing the properties of potassium salts in general, of enfeebling the heart and tending to cause diuresis. The nervous influence is first a mere blunting of reflex excitability, cerebral and spinal, passing to complete paralysis if the drug be administered too long in inordinate quantities. The production of an eruption on the face like acne, and moderate salivation with a fetid breath, are minor effects following the continued use of the drug. This salt is largely used in medicine to allay morbid nervous irritability, and is of special curative power in epilepsy, for the treatment of which it is the best remedy yet found. *Potassium sulphide* is used in medicine for the sulphur it contains. (See SULPHUR, *Medicinal Uses of*.) *Potassium bichromate* is irritant and caustic, and internally a corrosive poison. It is official in the *Pharmacopœia* for pharmaceutical use, being employed for the preparation of sodium valerianate. It is also used rarely in medicine. *Potassium permanganate* in concentrated solution is slowly caustic, but the medicinal use of the salt is as a disinfectant and emmenagogue. As a disinfectant it acts by oxidation through giving up some of its own oxygen, and in weak solution is an excellent disinfectant application to wounds, foul sores, and ulcers.

Revised by H. A. HARE.

Potato [from Span. *patata*, *batata*, from Haytian, *batata*, sweet potato]: the most widely cultivated and valuable of esculent tubers. It is the *Solanum tuberosum*, the typical species of a typical genus, of vast extent and widely differing characteristics (see NIGHTSHADE FAMILY), and is allied to several powerful narcotics, such as tobacco, henbane, and belladonna, as well as to other esculents, such as the tomato, egg-plant, and capsicum. The potato is a native of the elevated tropical valleys of Chili, Peru, and Mexico, and a form of it, scarcely distinct (var. *boreale*), occurs as far N. as Southern Colorado. It probably was carried to Spain from Peru early in the sixteenth century, and introduced into Virginia from Florida by the Spanish explorers, and into Great Britain from Virginia by Sir John Hawkins in 1565, though the credit is usually assigned to Sir Walter Raleigh, who was never in Virginia. It is found in several varieties in a wild state in Peru, Chili, and the island of Chiloe, the wild plant bearing still a close resemblance to the cultivated, except in the abnormal development of the tuber in the latter. The common potato was described in 1597 under the name of *Batata virginiana* by Gerard in his *Herball*, and in the following century it was cultivated on a small scale in the Netherlands, Burgundy, and Italy, and on account of its great yield was recommended by the Royal Society of London in 1663 for introduction into Ireland as a safeguard against famines; but it was not until near the middle of the eighteenth century that it acquired any real importance in Europe outside of Ireland. It was little regarded in Virginia, and seems to have been unknown in New England until the eighteenth century, when it was carried thither from Ireland. The potato is not mentioned in *The Complete Gardiner*, a work published in 1719, and as late as 1771 only two varieties, a white and a red, were mentioned in the most important English work on gardening, and they were considered chiefly as food for swine and cattle. The roots are distinct from the tuber, which is in reality an underground stem, naturally of considerable size, and

abnormally developed by cultivation, through the accumulation of starch for the use of the plants growing from the eyes or buds. Under proper trimming and management the branches above ground may be made to assume several of the characteristics of the tubers.

The potato is a perennial plant, with smooth herbaceous stems, from 1 to 3 feet in height, with pinnate leaves, flowers varying in breadth from an inch to 2 inches, and in color from bluish white to purple, and consisting of a wheel-shaped corolla, more or less veined, bearing a globular purplish fruit or seed-ball of the size of a gooseberry, and an herbage characterized by a narcotic smell, and practically useless, though it may be eaten by cattle, and, like spinach, by man. One of the leading qualities of the potato is an extraordinary productiveness, far exceeding that of any esculent with which it can be placed in competition, an equal amount of ground yielding, according to Humboldt, thirty times greater weight of potatoes than of wheat. Potatoes consist almost wholly of starch, and are accordingly deficient in nitrogen, and ill-adapted for an exclusive article of diet. They are hardy, and grow well throughout a vast extent of the earth's surface. In the U. S. they yield best in the extreme north, especially in New York and New England, and also in Canada; and in Europe are successfully cultivated up to 60° N. lat. in Sweden. Formerly planted exclusively by hand in hills 3 or 4 feet apart, they are now dropped extensively in drills. Where large quantities of potatoes are grown, various mechanical devices are in use for dividing the drills and throwing up the tubers, ready to be gathered by hand. There is a bitter principle subsisting in the potato which may be considered as somewhat poisonous, and which is aggravated by the action of light to such a degree as to turn green; this principle must be removed by cooking before the tuber is fit for food; hence the water in which such potatoes have been boiled should never be employed in the preparation of other food. The particular variety of potato can be secured only by planting the tubers. The seed of a single ball will often produce many varieties of potatoes, and can not be depended upon to propagate the parent stock. The varieties most esteemed in the U. S. in the first half of the nineteenth century seemed to receive a complete check by the potato-rot of 1845, and they afterward practically fell into disesteem, and were replaced by others. The best of the old favorites was probably the Mercer or Neshannock (so called from having originated on Neshannock Creek, Mercer co., Pa.); its place in point of popularity was thereafter filled by the Jackson, White Garnet, Chili, Peach-blow, and Early Goodrich, most of which were originated by Rev. Chauncey E. Goodrich, of Utica, N. Y., to whom the world is largely indebted for the improvement of this important plant. Later, Early Rose, Beauty of Hebron, Burbank, and other varieties, became popular and superseded the old ones; and these varieties are in turn giving place to others. Varieties of potatoes soon disappear or "run out." The early varieties of potatoes now seldom produce seed-balls, and the late sorts are less productive of seed than formerly. This is due to the excessive deflection of the vital energy to tuber production in the highly improved varieties, and the failure of the flowers is particularly marked in the early kinds, probably because the energy is deflected to the tubers before the flowers are formed.

There are several serious enemies to the potato-plant, of which the best known is the Colorado POTATO-BUG (*q. v.*). The blight or rot has been somewhat prevalent since its first destructive appearance about 1840, although it is not equally bad in all years. The true potato blight and rot is caused by a fungus known as *Phytophthora infestans*, and it is readily kept in check by frequent and thorough sprayings with Bordeaux mixture. (See FUNGICIDE.) It is thought, however, that some forms of blight and rot are due to a bacterium, the exact nature of which is not known.

The potato crop is less important in the national economy in the U. S. than in Europe. The crop of Europe aggregates more than the entire wheat crop of the world. The average annual production in the U. S. from 1881 to 1890 was 169,809,053 bush., while that of a like period in France was 396,746,138; in Austria, 306,984,697; in Germany, 891,732,040; in Russia, 300,315,070; in the United Kingdom, 228,093,397. In 1893 the U. S. exported \$708,757 worth of potatoes and imported \$1,998,708 worth. For further information, consult the experiment station bulletins, Carman's *New Potato Culture*, and Terry's *A B C of Potato Culture*. See also FOOD.

Revised by L. H. BAILEY.

Potato-bug: a name applied indiscriminately by farmers to a great many different insects that attack the potato. Among them are the following: *Boring in the stalk*—the stalk-borer (*Geortyna nitens*); the potato-stalk weevil (*Baryscapus triangulatus*); *Feeding upon the leaves*—the potato-worm (*Sphinx maculata*); the three-lined leaf-beetle (*Lema trilineata*); the cucumber flea-beetle (*Haltica cucumeris*); over half a dozen species of blister-beetles, belonging to the genera *Lytta* and *Epicauta*; and finally the Colorado potato-beetle (*Doryphora 10-lineata*), a hemispherical yellow beetle about one-third of an inch long, with ten black stripes on the elytra. This last alone is treated in this article. See ENTOMOLOGY.

Few insects have attracted greater attention than has this species since 1860. First described by Thomas Say, who found it common on the upper Missouri in 1824, it was afterward scarcely heard of till 1859. It fed originally on the sand-burr (*Solanum rostratum*), a wild plant belonging to the same genus as the potato. It was first found falling in large numbers on the cultivated potato about 100 miles W. of Omaha, Neb., in 1859. In 1861 it invaded Iowa; in 1862, Southwest Wisconsin; in 1864 and 1865 it crossed the Mississippi to the western part of Illinois; in 1866 it occupied most of the U. S. W. of a line drawn between Chicago and St. Louis; in 1867 it reached Southwest Michigan and Western Indiana; in 1868 many parts of Ohio, and from that time on kept spreading from year to year, until, in 1874, it touched the Atlantic seaboard at numerous places, and in 1875 was common from Virginia to Maine. It has traveled over 1,500 miles in a direct line within 16 years, and spread over an area of something like 1,500,000 sq. miles. Though most injurious during the first few years of its advent, it always remains where it has once obtained a foothold.

Natural History.—The insect hibernates in the perfect or beetle state. As vegetation starts in spring the insect issues from the ground, and long before potatoes are up, or even planted, it may be seen flying in search of food and company. It frequently works into a sprouting hill of potatoes as these are raising the soil, and feeds upon the tender sprouts and tubers; and as soon as the plant shows itself the female begins to lay her oval orange eggs in clusters of from ten to forty, each attached by one end to the under side of a leaf or to a stem. With favorable weather there hatches, in the course of a week, from each egg a small, dark red, hunchbacked larva, which becomes paler and acquires a double row of lateral black spots as it advances toward full growth. This period arrives in about three weeks from hatching, and the larva finally burrows into the ground, where it becomes a pupa, and finally a beetle in from seven to ten days, the whole cycle of its transformations from the egg to the beetle requiring rarely more than a month. In the latitude of St. Louis there are three broods annually, the last brood of beetles issuing from the ground early in the fall. The migratory habit is often very noticeable in this last brood of the beetles, and for weeks they may be seen flying in beives or traveling on foot in immense armies. The beetle feeds less than the larva, but is, nevertheless, very tenacious of life. The period of oviposition covers about a month for each female, and the number of eggs produced by each averages about 500. While the species feeds by preference on plants belonging to the genus *Solanum*, and it is doubtful whether it could thrive for any length of time on other plants than those of the family *Solanaceae* yet in its march across the U. S. it has adapted itself in an emergency to a number of other species. In the article ENTOMOLOGY (q. v.) there is an illustration of the insect in its various stages.

Natural Enemies.—With the insect's advance the number of its natural enemies has increased. The rose-breasted grosbeak often effectually clears a potato-patch of the pest, and the domestic chicken has in some sections acquired a taste for it. The crow, the quail, the skunk, the toad, and some species of the long-legged harvestmen or "grandfather graybeards" (*Phalangium*) feed upon it. The most efficient aids, however, are found in its own class. Over two dozen of these have been described. The only true parasite known to infest it is a tachina-fly (*Lydella doryphoræ*) belonging to the Diptera, and having the general appearance of a common house-fly. Certain asilus-flies—a family of the same order—pounce upon and suck out the juices of the beetle. In its own order a number of ground-beetles (*Carabidae*) devour it, and several species of lady-bird (*Coccinellidae*) feed greedily on its eggs. Among bugs (*Heteroptera*) several

species are also very efficient, piercing the beetle, and more particularly the larva, with their strong beaks, and sucking out the vitals. These are especially the spined soldier-bug (*Leptocoris spinosa*), the many-banded soldier-bug (*Thaumocoris lineatipes*), and the ring-banded soldier-bug (*Perillus circumcinctus*).

Methods of Combating it.—The first beetles and eggs to appear should be destroyed, but great care must be had to discriminate between the eggs of the ladybirds, which resemble those of *Doryphora* in color and mode of attachment, but are invariably somewhat smaller. Numerous mechanical means—machines used by hand, and even by horse-power—have been devised to knock the insects off the vines and collect them; and during very hot and dry summer weather in the more western parts of the U. S. the insects perish when merely knocked on to the ground. The only cheap and effective way of protecting the plants when once the insect has been allowed unduly to multiply is by the use of Paris green or London purple. This poison is now very generally employed, either as a powder with about twenty-five parts of some diluent, such as ashes, lime, bran, or flour—the last the best; or in suspension at the rate of a tablespoonful of the pure green to 3 gal. of water, and with a certain portion of molasses or other cheap sticky substance to facilitate adhesion.

This article would be incomplete without a reference to the bogus Colorado potato-beetle (*Doryphora juncta*), which so closely resembles the species under consideration that it was formerly often mistaken for it, even by good entomologists. In *juncta*, as compared with *10-lineata*, the eggs are paler; the larva is paler, with but one row of lateral



Bogus Colorado potato beetle: a, a, eggs; b, b, larva; c, c, beetle; d, d, enlarged elytron; e, e, enlarged leg. Colors, a, whitish yellow; b, cream yellow; brown and black; c, black; yellow and brown.

black dots, instead of two; the beetle has the second and third black stripes on the elytra (counting from the lower edge) joined at the ends, instead of the third and fourth; the punctures of elytra more regularly in rows, and the legs with pale instead of dark tarsi, and with a black spot on the thighs. It feeds on the nettle (*Solanum carolinense*), has always existed in the southern half of Missouri eastward, and never touches the cultivated potato.

Revised by J. S. KINGSLEY.

Potato-fly: See CANTHARIS.

Potato, Sweet: See SWEET POTATO.

Pote'khin. ALEKSEI ANTONOVICH: author; b. at Kineshma, government of Kostroma, Russia, July 1, 1829. After finishing his studies he settled in St. Petersburg. He has described with unsparing fidelity the darker side of the life of the lower classes. Among his novels are: *The Peasant Woman*, *For Money* (a description of factory life), and *Young Inclinations* (1879). Many of his peasant tales are excellent, for instance, *Til Sotnikov Karamuk*, *The Sick Woman* (1876), *Under the Spell of Money* (1876), *Before the Community* (1877), *Village Leeches* (1880). On account of the sharp criticism of Russian conditions which they provoke, his dramas have not been allowed by the censors to be put on the stage. Among the best known are *The Voice of the People and the Voice of God* (1853), *Plagiarism* (1854), *do not Prosper* (1854), *Tinsel*, *The Severed Limb*, *A Profitable Undertaking* (1870), *A Love Match*, and *The Guilty Woman*. A. C. COOLIDGE.

Potem'kin. GREGOR ALEXANDROVITCH: Russian minister of state; b. in 1739 of a family of Polish nobility on its estate in the government of Smolensk; entered the Russian army, and was ensign in the imperial body-guard when he attracted the attention of Catherine II., shortly after her accession to the throne, by his handsome person. He was appointed gentleman of the bedchamber by the empress, and superseded Orloff as her lover. This intimacy did not last long, and he was absent from court for some time, serv-

ing in the war against Turkey, but on his return enjoyed a greater influence than ever. By his entire freedom from jealousy and by his mastery of the art of making himself interesting and indispensable, he retained his influence over the empress to his death. Not only the empress herself, but foreign monarchs—Frederick the Great, Maria Theresa, and Joseph II.—loaded him with honors and riches and submitted to all his whims; and as an alliance with Russia at this time began to be of the utmost importance to the neighboring states—Sweden, Poland, Prussia, Austria, and Turkey—he, as the dispenser of this alliance, played an important part in the politics of Europe. That he had some ability is shown by the success of many of his undertakings, but in private life he was capricious, vain, and licentious, and his public career affords no proof that he possessed a high order of statesmanship. Among the acts of his ministry were the foundation of the cities of Kherson, Kertch, Nikolaiev, Sebastopol, etc., the creation of a Russian fleet in the Black Sea, the Turkish wars which resulted in the acquisition of the Crimea, Caucasus, etc. D. on the road between Jassy and Nikolaiev, Oct. 15, 1791. See Cérenville, *Vie de Prince Potemkin* (1807); *Memoirs of Potemkin* (London, 1814); and de Ligne, *Mémoire de la Cour de Russie* (1859).

Revised by F. M. COLBY.

Potential [from Lat. *potentia*, power, possibility, deriv. of *posse*, be able]: in mathematics, a scalar function, usually called V , of the co-ordinates of a point, first introduced by Laplace in the discussion of gravitation in his *Mécanique Céleste*. The name *potential* was given to it by George Green, in his now famous *Essay on the Application of Mathematical Analysis to the Theories of Electricity* (Nottingham, 1828). Green almost created the theory as we have it, but so completely buried was his essay for nearly twenty years that most of its important theorems had in the meantime been rediscovered by Gauss, Charles, Sturm, and Thomson.

The introduction of the term *potential* into practical and even elementary electricity is a remarkable example of the influence of pure mathematics on the development and rationalization of a science. It is entirely probable that the extensive use of the term *potential*, and the ideas which it directly or remotely represents, have been due in great degree to the predominant influence on scientific thought of the principle of the conservation of energy. See ENERGY.

The *mutual potential energy* of a system of two bodies in any given position, is the amount of *work* done by their mutual repulsion in separating them to an infinite distance. When the bodies mutually attract their potential energy is conventionally negative. Work, which is the measure of energy, is the product of the force acting and the component of the motion produced in the direction of the force.

The *potential* at any point, due to any attracting or repelling agent, is the mutual potential energy between it and a *unit quantity* of the agent placed at that point. Thus the gravitational potential at a point is the work required to remove unit mass of matter from the point to an infinite distance.

Potential is applied to central forces, and generally, though not necessarily, to those varying as the inverse square of the distance. Thus the force at P , due to the acting agent q , distant r from the point, is $\frac{q}{r^2}$ if the unit quantity is so chosen as to render the constant in the expression for the force equal to unity. The work done in moving the unit quantity at P a distance dr along a line of force is

$\frac{q}{r^2} dr$. A *line of force* is a line tangential at each point to the direction of the force.

If we integrate the above expression between the limits r and infinity, the work done will by definition be the potential at P , or

$$\int_r^\infty \frac{q}{r^2} dr = \frac{q}{r}.$$

If the potential at P is due to several acting masses, then the total potential at P is the value of $\frac{q}{r}$ for all the acting masses conjointly, or $V_P = \sum \frac{q}{r}$. Thus the electrical potential at the center of a sphere, charged with a quantity of electricity Q , is $\sum \frac{q}{R} = \frac{1}{R} \sum q = \frac{Q}{R}$, where R is the radius. See ELECTRICITY.

From the definition of the potential at a point it follows

that the excess of the potential at the point A over that at B is the work which must be expended against the acting forces in moving unit mass from B to A . The word *mass* here denotes the acting agent of any kind. The work done is independent of the path traversed; otherwise it is obvious that by moving unit mass back and forth along suitable paths between the two points an infinite amount of work might be done without any expenditure of energy.

An *equipotential surface*, in gravity a level surface, is one having the same value of the potential at all points. There is therefore no difference of potential on the surface, and no work is done in moving any mass of the acting agent from one point to any other on an equipotential surface. Hence there is no component of force along such a surface, or it is perpendicular to all the lines of force meeting it.

Let there be two equipotential surfaces with potentials V_1 and V_2 ; then the work done in displacing unit mass from any point on one surface to any point on the other is $V_1 - V_2$. It is independent of the position of the points on the two surfaces and the path traversed from one point to the other.

The work done in transferring a mass, m , from one surface to the other is $m(V_1 - V_2)$.

Force is a function of potential. Consider two equipotential surfaces indefinitely near each other, their distance along a normal being dn . Let F be the force along this line. Then $Fdn = V_1 - V_2 = -dV$, if V_1 and V_2 are the indefinitely near values of the potentials on the two surfaces.

Therefore $F = -\frac{dV}{dn}$, or the force at any point is equal to the negative derivative of the potential with respect to the normal to the equipotential surface passing through the point. The force along any line may be similarly expressed. Let α be the angle which the line makes with the normal to the equipotential surface, and let ds denote the portion of the line lying between the two indefinitely near surfaces. Also let F_s be the force along the line. Then $F_s = F \cos \alpha =$

$$-\frac{dV}{dn} \cos \alpha. \text{ But } \cos \alpha = \frac{dn}{ds}. \text{ Hence}$$

$$F_s = -\frac{dV}{dn} \frac{dn}{ds} = -\frac{dV}{ds}.$$

Thus the component of the force in any direction is the partial derivative of the potential in this direction. In other words the force along any line is the rate at which the potential decreases per unit length of the line.

Potential plays a paramount part in the study of electrical phenomena. Positive electricity tends to flow from places of higher to places of lower potential. Hence the surface of a charged conductor in *electrical equilibrium* is an equipotential surface. Moreover, all points of such a conductor have the same potential. The potential of a sphere is therefore the same as the potential at its center, or $\frac{Q}{R}$.

The *capacity* of a conductor is the quantity of electricity required to raise its potential from zero to unity; and since the potential increases directly as the charge, it follows that

the capacity equals $\frac{Q}{V}$ (quantity per unit potential). Since the potential of a sphere is $\frac{Q}{R}$, dividing Q by $\frac{Q}{R}$ we have R as the capacity, or the capacity of a sphere is numerically equal to its radius. A sphere of unit radius has unit capacity.

The *energy* of a charge may be expressed as a function of the potential. If a quantity of electricity, Q , is transferred from potential V_1 to V_2 , the work done during the flow, or the energy converted into other forms, is $Q(V_1 - V_2)$, V_1 being greater than V_2 . If, however, a conductor has its potential raised from zero to unity by a charge, Q , then the potential energy stored up is $\frac{1}{2}QV$; or, since $Q = CV$, the energy of the charge is $\frac{1}{2}CV^2$. This may be demonstrated as follows: Let dQ be an element of the charge; to transfer it from a place of zero potential to the conductor at potential V_0 requires that work be done upon it equal to dQV_0 . But since $Q = CV_0$, $dQ = CdV_0$. Hence

$$dQV_0 = CV_0dV_0, \text{ and } \int_0^V CV_0dV_0 = \frac{1}{2}CV^2.$$

Now the capacity C is a constant. Therefore the potential energy of the charge is proportional to the square of the potential to which the conductor is raised by the charge. If the capacity of a charged conductor could be doubled, both the potential and the stored energy would be reduced to one-half.

In current electricity the difference of potential between two points plays a most important rôle. It is numerically equal to the work done in carrying a unit of electricity in the positive direction from one point to the other. Thus the potential difference between the terminals of a battery when the circuit is closed is the energy represented by the passage of a unit of electricity from the positive pole around through the external circuit to the negative. The total energy transformed during the passage of Q units is Q times the potential difference. This remains true whether the energy expended in the transfer is converted into heat because of the ohmic resistance, or whether a portion does mechanical work by means of a proper motor device in the circuit, or whether the energy is in part stored up by electrolysis, or whether it is stored up by producing that strain in the ether called a magnetic field.

The potential difference between two points on a circuit is numerically equal to the electromotive force (written E. M. F.) producing the current flow from one point to the other, so long as the circuit joining the points contains no source of E. M. F. In such portion of a circuit the current flows from higher to lower potential, but within the region where the E. M. F. has its origin the current flows from lower to higher potential, being so impelled by the cause there acting to produce an electric flow.

In any part of a conducting circuit the loss of potential is jointly proportional to the electrical resistance and the current strength. This loss is a fall of potential so long as no source of E. M. F. is encountered. It may exactly counterbalance the gain due to the E. M. F.'s encountered. In this case there will be a current flow produced by an E. M. F. without any potential differences. Potential differences are therefore due to E. M. F.'s rather than the reverse.

Potential differences are established by contact of dissimilar substances, by chemical action, by heat, by pressure, in physiological processes, and by the relative movement of a conductor and the lines of force surrounding a magnet.

A potential difference produces in insulators or dielectrics a displacement stress by which electricity is displaced in the direction of the potential decrease. If the medium is of such a nature that it can oppose or resist this stress it is called a non-conductor; but if it yields to the electric stress the medium is a conductor, the potential energy of the state of strain is converted into heat, and a continuous current flows so long as the potential difference is maintained.

For fuller information the following authors should be consulted: Clausius, *Die Potentialfunction und das Potential*; Mascart and Joubert, *Leçons sur l'Électricité et le Magnétisme*; Thomson and Tait, *Treatise on Natural Philosophy*; Pierce, *Theory of the Neumann Potential Function*; Maxwell, *Electricity and Magnetism*; Cumming, *Theory of Electricity*; Mathieu, *Théorie du Potentiel et ses Applications à l'Électrostatique et au Magnétisme*.

HENRY S. CARHART.

Potentilla [dimin. of Lat. *potens*, powerful, from its supposed virtues]: a genus of herbs and shrubs of the family *Rosaceæ*. There are many species, mostly herbs, about forty of which are natives of the U. S. The plants known as cinquefoil, five-finger, and tormentil belong to this genus. They have a highly astringent property, which is useful in medicine, and in the Orkneys and Lapland their roots have been employed in domestic tanning and dyeing.

Poten'za: chief town of the province of Potenza, Italy; on a hill near the river Basento (anc. *Casuentus*); 103 miles E. by S. of Naples (see map of Italy, ref. 7-G). The chief buildings are the cathedral, the seminary, and the hospital of San Carlo. It takes its name from the ancient *Potentia*, which was founded by the Lucanians on a site lower down the hill. It was almost totally destroyed by an earthquake on Dec. 17, 1857. There is now little activity of any kind here, though the neighboring country is agriculturally rich, producing silk, honey, and cheese. Pop. (1892) 18,500.—The province formerly called Basilicata has an area of 3,845 sq. miles. Pop. (1892) 541,865.

Potgieter, EVERHARD JOHANNES: critic and poet; b. at Zwolle, Holland, June 27, 1808; d. at Amsterdam, Feb. 3, 1875. His earlier life was given to trade, first at Amsterdam, then at Antwerp, and finally at Amsterdam once more. His tastes, however, were always literary, and he speedily became acquainted with a circle of brilliant young writers. In 1837, in company with certain of these, he founded the best of the Dutch reviews, *De Gids*, of which he was editor for thirty years. The influence of this periodical on Dutch letters has

been very great; and Potgieter, with his friend and fellow contributor, Bakhuizen van den Brink, became the head of the new school that was trying to do away with the artificiality of style and triviality of matter all too prevalent in Dutch literature in the first half of the nineteenth century. Besides a number of short stories, he wrote a vast number of critical articles and a considerable body of poetry. In 1864 he issued a collection of the former, entitled *Proza* (2 vols.); and later two volumes of the latter, *Poëzy* (2 vols., 1868-69). After his death Joh. C. Zimmermann issued six volumes of his literary remains: *Verzamelde Aank. W. Ken: Proza, Poëzy, en Kritische Studien* (1875-85). Later still the same editor printed his entire *Werken* in 18 vols. (Haarlem, 1885). A. R. MARSH.

Pothier, pō-ti-ā, ROBERT JOSEPH: law-writer; b. at Orleans, France, Jan. 9, 1699; was educated in the College of the Jesuits, and afterward studied law in the University of Orleans, and in 1720 was made one of the counselors, or magistrates, of the presidial (a local court of last resort), which position his father had held before him; in 1749 became Professor of Law in the University of Orleans, and wrote many treatises on the law, among the best known of which are *Pandectæ Justinianæ* (3 vols., 1748-52), often reprinted; *Maritime Contracts*; *Contracts of Sale*; *The Law of Obligations of Contracts*, etc. Of all French legal writers he is the one oftenest and most confidently cited as an authority, and fully three-quarters of the Civil Code is taken almost verbatim from his works. Many posthumous works by him were published, which, however, are of much less value than his others. D. at Orleans, Mar. 2, 1772. F. S. ALLEN.

Pot-hole: an approximately vertical and cylindric cavity in rocks, produced by a whirling current of water. The cutting is done by sand-grains, and especially pebbles and boulders, which by their weight are kept at the bottom and whirled about by the water. While the whirling motion can not be directly seen, it is inferred from the circular character of the holes, and from the fact that some of them are channeled about the periphery of the bottom as though cut by a diamond drill. Pot-holes occur on the beds of streams whose steep grades give them high velocity, and they are often many feet in depth. It is believed that they are formed also beneath glaciers, where crevasses permit streams of water to plunge from the surface to the base. As the ice moves forward crevasses are successively formed at the same spot, and the plunging water is thus enabled to excavate deeply. There is a series of holes referred to this action near Cohoes Falls, N. Y., and one of these was determined to have a depth of over 60 feet.

The deep pool usually found beneath a cataract is closely allied to the pot-hole, in that it is excavated by stones driven violently by a plunging stream of water; but the motion in this case is not ordinarily gyratory, and the excavation is less symmetrical. G. K. COLEMAN.

Poti: Russian fortress; in the Trans-Caucasus, on the Black Sea, at the mouth of the Rioni (see map of Russia, ref. 12-F). It was captured from the Ottomans (1809), but restored at the treaty of Bucharest and finally ceded to Russia by the treaty of Adrianople (1829). This stronghold is exceedingly important as commanding the shore route between Persia and Russia. Pop. (1890) 4,813. E. A. G.

Poto'mac: a river of the U. S., forming through its whole course the boundary between Maryland and Virginia, and West Virginia. It is formed by the junction of two branches, of which the northern rises in the Alleghenies of West Virginia, and the southern in the Shenandoah range, Va. It resembles a bow in form, is nearly 400 miles in length, receives as tributaries from Virginia the Shenandoah, Savage, and Monocacy rivers, is an estuary from 6 to 8 miles wide for 100 miles of its lower course, and enters Chesapeake Bay 75 miles from the Atlantic. Washington, D. C., the national capital, is situated upon its left bank, 125 miles above its mouth, to which point the tide ascends, and it is navigable for large vessels. Above Washington are several falls. The scenery of the upper Potomac is remarkably picturesque, especially the junction of the Shenandoah at Harper's Ferry. On its lower course are the birthplace and the residence of Washington, and in its whole extent it formed an important strategic line during the civil war.

Potomac Formation: the lowest of the geological formations representing the Cretaceous period of North America. The rocks are variegated clays, friable

sandstones, gravel, and sand, with many alternations, forming a series from 5 to 500 feet thick; they rest unconformably on crystalline rocks and on upturned and eroded strata of the Newark system, and are overlaid by fossiliferous Eocene and Neocene strata. The group forms a belt about 10 miles wide in Maryland but narrowing southward, which has been traced from the Delaware along the west side of Chesapeake Bay, and to the E. of Washington and Richmond, to Weldon, N. C., a distance of 300 miles. The Raritan formation in New Jersey, which includes the Amboy and Woodbridge clays, is thought to belong to this terrane, as are also the Tuscaloosa formation of Alabama, and the Trinity beds of Texas and Arkansas. Great numbers of fossil leaves, principally of broad-leaved trees, have been found in these rocks in Virginia, Maryland, and New Jersey; a few freshwater shells and the bones of large reptiles, allied to Jurassic species, have also been discovered. Consult W. J. McGee, *Am. Jour. Sci.*, vol. xxxv. (1888); *Twelfth Annual Report*, U. S. Geol. Survey (1890-91), pp. 421-424; W. M. Fontaine, Monograph No. 15, U. S. Geol. Survey; O. C. Marsh, *Am. Jour. Sci.*, vol. xxxv. (1888). ISRAEL C. RUSSELL.

Potosí, pō-tō-see': a city of Bolivia; on the side of the Potosí Mountain, a peak of the Eastern Cordilleras; 47 miles S. W. of Sucre (see map of South America, ref. 6-D). It is one of the highest inhabited places in the world, being 13,324 feet above sea-level. The climate is cold and changeable, though not unhealthy to regular residents; owing to the rarefied atmosphere new-born children often die or become deaf. Silver lodes were discovered here in 1546, and were long the richest known deposits in the world; up to 1864 they had yielded the sum of \$2,919,899,400. The deposits are far from being exhausted, but, owing to the great depth to which shafts have been sunk and the difficulty of drainage, most of them have become unprofitable by the mining systems now in vogue; about 2,000 shafts have been abandoned. The yield in 1890 was 196,365 oz. During the eighteenth century Potosí, with its immediate vicinity, is said to have had a population of 170,000. The fine mint and the cathedral attest its former grandeur. Pop. about 12,000. It is the capital of the department of Potosí, which embraces that portion of the Bolivian mountain region adjacent to the Argentine Republic and Chili, with an area of 85,046 sq. miles (claimed), and a population (1888) of 237,755. It is noted principally for its silver mines, including, besides Potosí, those of Porco and Huanchaca, the latter now the most productive in Bolivia. Gold and tin are also mined. HERBERT H. SMITH.

Potosí, Mexico: See SAN LUIS POTOSÍ.

Potsdam: city; in the province of Brandenburg, Prussia; at the confluence of the Rube and the Havel, 17 miles S. W. of Berlin (see map of German Empire, ref. 3-G). It is well laid out and well built, having many fine streets, public squares, promenades, public edifices, gates, bridges, and monuments. It contains large barracks and other military establishments, educational and benevolent institutions, and a great number of royal palaces and summer houses, old and new, some of which are built on a grand scale and surrounded with extensive gardens and parks. Here is an astro-physical observatory, founded 1874, with two equatorial refractors, for spectroscopic, photographic, and other observations. Potsdam was founded by the elector Frederick William, who built a palace here in 1673, but its modern splendor is principally due to Frederick the Great, while each of his successors contributed to the embellishment and extension of the town. Its industries comprise market-gardening, manufactures of firearms, and the production of sugar, chocolate, tobacco, and cotton and woolen goods. Pop. (1890) 54,125.

Potsdam: village; St. Lawrence co., N. Y.; on the Racket river and the Rome, Watertown and Ogdensburg Railroad; 22 miles E. of Ogdensburg (for location, see map of New York, ref. 1-H). It is principally noted for its extensive quarries of sandstone of a geological formation to which the name of the village has been given. The region traversed by the Upper Racket river affords an immense supply of lumber which is floated in rafts down the stream. Potsdam has a Holly system of water-works, improved sewerage, electric lights, a State normal and training school, agricultural fair grounds, public library, a national bank with capital of \$200,000, a State bank with capital of \$50,000, several foundries, machine-shops, saw-mills, furniture-factories, agricultural implement works, and other manufacturing, and three weekly newspapers. Pop. (1880) 2,762; (1890) 3,961. EDITOR OF "COURIER AND FREEMAN."

Potsdam Sandstone: in geology, a formation of the Cambrian period occurring in New York and Canada N. of the Adirondack Mountains. It is the basal member of the New York SYSTEM (*q. v.*), and was long supposed to be the oldest American Palaeozoic formation. The name has been applied also to sandstones at the base of the Palaeozoic series in various other parts of North America, but it has now become known, from a comparison of fossils, that not all such sandstones are of the same age as the Potsdam. According to Walcott the Potsdam sandstone is the chronologic equivalent of certain limestones occurring S. of the Adirondacks and in Vermont, of the Knox shales of Tennessee and the Connasauga shales of Alabama, of the St. Croix sandstone in Minnesota, of the basal sandstone in Dakota, Montana, Wyoming, and Colorado, of the Gallatin limestones of Montana and the Hamburg limestone of Nevada, of the Tonto group of Arizona, and of the Katemey group of Texas. Other Cambrian formations of the U. S., so far as determined, are of earlier date. In the district N. of the Adirondacks the sandstone has a maximum thickness of 500 feet. It is rather thinly bedded, and is usually yellowish brown or reddish brown. It is extensively quarried for paving blocks and to less extent for flagging and building stones. See CAMBRIAN PERIOD, and consult Bulletin No. 81, U. S. Geological Survey. G. K. GILBERT.

Potstone: a variety of talc, sometimes wrought, like soapstone, into pots, stoves, and kettles. It abounds in Europe, and is coarser and more granular than the best soapstone.

Pott, AUGUST FRIEDRICH: comparative philologist; b. at Nettelrede, in Hanover, Nov. 14, 1802; studied philology at Göttingen; was appointed professor in Halle in 1833. The *Etymologische Forschungen*, his greatest work, was published in 1836 (2d ed. 5 vols. and index vol., 1859-76). He also wrote *Die Zigeuner in Europa und Asien* (2 vols., Halle, 1845); *Die quinaere und vigesima Zählmethode* (1847); *Die Personennamen und ihre Entstehungsarten* (1853; 2d ed. 1859); *Anti-Kaulen* (1863); *Die Sprachverschiedenheiten in Europa an den Zahlen nachgewiesen* (Halle, 1868); *Wurzelwörterbuch der indog. Sprachen* (1867-73, and in *Etymolog. Forschungen*, 2d ed. vol. ii., part 2); *Wilhelm von Humboldt und die Sprachwissenschaft* (2 vols., Berlin, 1876; 2d ed. 1880); and important articles in journals, collected in full by Horn in *Bezenbergers Beiträge*, xiii., 338 ff. D. at Halle, July 5, 1887. Revised by A. GUDEMAN.

Pott, PERCIVAL: surgeon; b. in London, England, 1713; was apprenticed in his sixteenth year to a surgeon of St. Bartholomew's Hospital, with whom he served six years; in 1745 was made assistant surgeon, and from 1749 to 1787 was surgeon to St. Bartholomew's Hospital. His investigations into the causes of certain forms of spinal disease are classic. Some of his publications are *A Treatise on Ruptures* (London, 1756); *Observations on the Nature and Consequences of Wounds and Contusions of the Head, etc.*, (1760); *Remarks on that Kind of Palsy of the Lower Limbs which is Frequently found to accompany a Curvature of the Spine* (1779). D. Dec. 22, 1788. S. T. ARMSTRONG.

Pottawatemi Indians: See ALGONQUIAN INDIANS.

Potter, ALONZO, D. D., LL. D.: bishop; b. at La Grange, N. Y., July 10, 1800; graduated in 1818 at Union College, and afterward married the only daughter of President Nott; became a college tutor 1819, and held a mathematical professorship in Union College 1821-26; took deacon's orders in the Protestant Episcopal Church 1821; was advanced to the priesthood 1824; was rector of St. Paul's, Boston, 1826-31; Professor of Moral Philosophy and vice-president of Union College 1831-45; became Bishop of Pennsylvania in 1845; was one of the founders of the Episcopal Hospital and the Divinity School, Philadelphia. Author of *Political Economy* (1841); *Handbook for Readers and Students* (1847); *Discourses, etc.* (1858); *Religious Philosophy* (1870), and other works. D. in San Francisco, Cal., July 4, 1865.

Revised by W. S. PERRY.

Potter, ELIPHALET NOTT, D. D., LL. D.: educator; son of Bishop Alonzo Potter; b. at Schenectady, N. Y., Sept. 20, 1836; graduated at Union College 1861; studied theology; took orders in the Episcopal Church; was pastor of churches at Bethlehem, Pa., and Troy, N. Y.; built at the former place three churches, and at the latter two chapels; became Professor of Christian Evidences at Lehigh University 1866, and president of Union University (formerly called Union College) 1871, adding the duties of chancellor of that

institution 1872. He resigned in 1884, and became president of Hobart College, Geneva, N. Y. He was elected Bishop of Nebraska, but declined the office. He is author of *Parochial Sermons*, and has also prepared a work on *Christian Evidences at the Close of the Nineteenth Century*. Revised by W. S. PERRY.

Potter, HENRY GODMAN, D. D., LL. D., D. C. L.: bishop; b. at Schemetady, N. Y., May 25, 1835, the son of Bishop Alonzo Potter; graduated at the Protestant Episcopal Theological Seminary, Virginia, 1857; became rector of Grace Church, New York, 1868; bishop of New York, 1887. He is the author of *Sisterhoods and Daughters at Home and Abroad* (New York, 1871); *Gates of the East: a Winter in Egypt and Syria* (1876); *Sermons of the City* (1881); *Waymarks 1870-1891: being Discourses with Some Account of Their Occasions* (1892).

Potter, HORATIO, D. D., LL. D., D. C. L. Oxon.: bishop; b. at La Grange, N. Y., Feb. 9, 1802; a brother of Bishop Alonzo Potter; graduated at Union College 1826; took deacon's orders in the Protestant Episcopal Church 1827; was advanced to the priesthood 1828; was Professor of Mathematics in Washington (now Trinity) College, Hartford, Conn., 1828-33; became in 1833 rector of St. Peter's, Albany; in 1854 became provisional bishop, and in 1861 Bishop, of New York. Bishop Potter's episcopate was wise, conservative, and in the main conciliatory. D. in New York, Jan. 2, 1887. Revised by W. S. PERRY.

Potter, JOHN, D. D.: archbishop; b. at Wakefield, Yorkshire, England, about 1674; educated at the Wakefield free school; entered University College, Oxford, in 1688; published a volume of *Variantes Lectiones* on one of the works of Plutarch (1693); became fellow of Lincoln College 1694; edited Lycophron's *Alexandra* 1697; was ordained in the Anglican Church 1697; published his principal work, *Archæologia Græca* (2 vols., 1697-98); became chaplain to Archbishop Tenison 1706; Regius Professor of Divinity at Oxford 1708; Bishop of Oxford 1715, having just finished his edition of *Clemens Alexandrinus*, and became Archbishop of Canterbury 1737. D. at Lambeth, Oct. 10, 1747. His *Theological Works* appeared in 3 vols., 1753.

Revised by W. S. PERRY.

Potter, PAUL or PAULUS: painter; baptized at Enkhuizen, Holland, Nov. 20, 1625. He studied art with his father at Amsterdam, and subsequently at Haarlem under Jacob de Weth. He painted at Delft two years, then went to The Hague, where he married in 1650; settled in Amsterdam in 1652; d. there, Jan. 17, 1654. Among his best-known works is that at The Hague called the *Young Bull*, painted in 1647; a finer but smaller picture of the same subject is at Buckingham Palace. His works are to be found in the principal collections at The Hague, Amsterdam, St. Petersburg, Copenhagen, Paris, Turin, and London. A portrait of Paul Potter by Van der Helst is in The Hague Museum. W. J. STILLMAN.

Potter, WILLIAM JAMES, A. B.: clergyman and author; b. at Dartmouth, Mass., Feb. 1, 1830; educated at Friends' Boarding School, Providence, R. I., Bridgewater, Mass., Normal School, Harvard College, Harvard Divinity School, and in Germany; taught in district schools one year; usher in Bristol Academy one year; instructor in Cambridge High School two years; was pastor of the Unitarian church, New Bedford, Mass., thirty-three years, including one year spent in military service (1863-64) with title of hospital chaplain; detailed for special service under the Secretary of War; aided in establishing the American Free Religious Association; was its secretary from its origin, 1867, to 1882, and its president 1882-93; editor of *The Index* 1880-87; author of *Twenty-five Sermons of Twenty-five Years* (1885), a highly representative expression of later Unitarian thought; *A History of the First Congregational Society in New Bedford* (1888); *Four Discourses Suggested by the Life and Tragical Death of Abraham Lincoln* (1865), and various sermons, essays, and addresses, many of which may be found in *The Radical*. J. W. CHADWICK.

Pottery and Porcelain [*pottery* is from Fr. *poterie*, deriv. of *pot*, *pot*; *porcelain* is from O. Fr. *porcelaine*, from Ital. *porcellana*, a sea-shell, sea-mussel, hence fine clay, porcelain, deriv. of Lat. *porcus*, in its obscene sense of pudentia muliebria, to which the shell of the sea-mussel was compared]; *pottery* denotes, first, objects made of material (generally clay) which is moulded while soft and then baked until it becomes hard; second, a place where such objects

are produced; and third, the art and process of their manufacture. In a narrower and more customary sense, the word *pottery* is applied only to the coarser varieties of such objects; porcelain comprising the finer, translucent, or semi-translucent kinds. Both are generally made of clay, and are ceramic ware (see *KERAMICS*), but the terms are stretched to cover some wares that are not clay wares.

Materials.—Clay is very widely dispersed over all the continents and the larger islands of the world, and everywhere has been used for making vessels since the most remote antiquity. It is easy to mould by hand or by tools, keeps its shape well if kept moist, and can be remoulded as often as desired. When baked, or fired, it hardens without serious shrinkage or deformation, and will then keep its shape permanently. Different kinds of clay give different colored baked wares; thus at Apt, in Provence, there are beds of pale-brown clay, which have been in use during the eighteenth and nineteenth centuries by potters in that town, and which furnish the *terrines*, or covered pots in which various delicacies for the table are put up, these *terrines* being almost exactly of the same color as the unbaked clay. While the clay described above, and that of which yellow bricks and cream-colored terra-cotta are made, is hardly changed in color by firing, on the other hand, all clays which contain much iron turn red in the oven; thus common red bricks are not red before firing, but generally of a pale mud-color. The clay which forms the chief ingredient of porcelain is called *KAOLIN* (*q. v.*). This is white and mealy, and consists of decomposed feldspar. Clay made very thin, to be applied to the surface of a piece of pottery and baked with it, is called *slip*. The piece may be dipped in the slip, or the slip may be poured on from the nose of a can, as when used to make stripes and bands for ornament. The glaze or enamel with which the clay body is covered in many kinds of pottery and porcelain is more diverse in composition. The extremely thin glaze of some fine kinds of ancient pottery has not been successfully analyzed. The equally thin glaze on the hard *stoneware* of which vinegar-jugs, Selters-water bottles, English beer bottles, etc., are made, is produced by throwing common salt into the oven, where it is decomposed, the soda of the salt combining with the alumina of the clay to form a thin, hard silicate. Other kinds of stoneware, and some kinds of soft earthenware, are covered with a lead glaze, made from white lead, flint, fragments of glass, and other materials in smaller quantities. These are ground together to a very fine powder, and mixed with water to form a thin paste, which is applied to the surface by dipping, or with the brush. The glaze of porcelain is made of a mixture of quartz and kaolin, or of feldspar and kaolin, with small quantities of other ingredients. In all glazes the requirements are that they shall combine readily with the surface of the body, and cling to it, that they shall fuse and become vitrified at a lower temperature than that needed for firing the body, and that the surface, when baked, shall be hard and insoluble in ordinary liquids. It is also generally a requisite that the glaze should not contract so much in the firing as to crack; but the *crackle*, which is so great an ornament to many Oriental wares, is produced by allowing the glaze to shrink and separate, and then, in some cases, filling the cracks with color before another firing.

When a glaze is opaque and put on rather thickly, it is called *enamel*. The most common enamel is stanniferous—that is, made in part of an oxide of tin. Such an enamel is perfectly opaque, pure white, lustrous, and with a soft surface which receives color well, so that good painting on the surface of such an enamel is often more beautiful than the painting on porcelain. It is sometimes impossible to tell in ancient pieces whether the thick white coating is enamel or slip. The pigments used for painting on pottery and porcelain are fusible or vitrifiable colors. These have often a very different appearance before firing to that which they are to give to the finished piece.

Processes of Manufacture.—The chief implement used by the maker of pottery or porcelain vessels is the *potter's wheel*, a horizontally revolving disk, upon which the lump of clay is held, and which the workman revolves at his wish. By the rotary motion a true roundness is given to the vessel, and the soft clay is shaped and reshaped very quickly by a skillful hand, the vase or jar being drawn out larger, or spread broader, or modified in its shape by a touch as it whirls. The simplest potter's wheel is turned by hand, but other arrangements are made to turn it more easily, or without the effort of the potter, and the best form seems to be one with a treadle for the foot, acting on the vertical axis,

to which are attached the flat disk for the clay, at the top, and a fly-wheel at the bottom. Handles and spouts are



FIG. 1.—The potter's wheel.

moulded separately, either by hand or in plaster moulds, and stuck on to the body while still soft. Elaborately modeled ornaments, figures of men and animals, and the like, whether attached to vessels or forming ornamental objects by themselves, are made with the sculptors' modeling tools.

When the shaping is done, the piece is allowed to dry somewhat before firing, but care must be taken not to let it dry so much as to crack. Common earthenware is fired only once. Glazed and enameled wares are fired once for the body and once for the covering. Painted wares are fired a third time for all colors which are applied upon the glaze, and a fourth time, always with decreasing temperatures, for gilding. The firing (see KILN) is sometimes repeated more frequently, because the degree of heat and the length of the exposure may greatly modify the color which a pigment will furnish, and because retouches and alterations need new baking. Moreover, different workmen employ different processes: thus much Japanese porcelain is fired before the under-glaze colors are applied, then fired for those colors, all before the first glaze has been put on. Some of the celebrated colors, or the cloudings and stainings of color, are the result of accidents occurring in spite of all care and skill, and some of these accidental colors it has been found impossible to reproduce at will.

Decorating is chiefly accomplished by painting with a brush, the pigments being earthy or metallic, usually metallic oxides. Borax and other materials are used as fluxes,

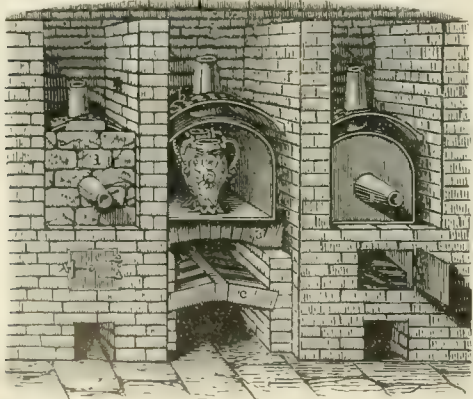


FIG. 2.—The muffle for fixing the colors on decorated porcelain.

and some kind of oil is used to facilitate the laying on. The color when fired becomes glass, either in a solid mass of some thickness or in a mere film. Some colors are applied upon the body under the glaze, but few can bear the great heat necessary for firing the body. Some painting is done upon the unbaked but dried surface of the stanniferous enamel when applied to the body; the color for this must also be very resistant. Other work is done upon the enamel after baking, and for this the low heat of the muffle is sufficient. Gold is applied with a brush, as powder, and is burnished after firing. Luster is generally metallic, the metal

being very finely divided, so as to give its effect when laid on as a paint and fired without burnishing.

Besides painting with the brush, some effects are produced by putting on the color in mass and letting it trickle down the surface until stopped and fixed by the heat of the kiln. Other similar effects are got by blowing color from a tube, or splashing or sprinkling it in drops. Sometimes an accidental form, as of a seeming cloud or mountain, produced by splashing or smearing, has given a suggestion for a design, which has then been carried out deliberately. Sometimes the decoration is in form as well as color, the one aiding the other, as when a vase is covered with a raised pattern, simulating basket-work, which is then heightened with color and gold.

Earthenware, Unglazed.—What is called *prehistoric* ware is that to which no approximate date can be given with any certainty, and which is not even associated with an epoch which can be fixed. Thus the burial-mounds of Europe and America have furnished enormous numbers of vases of different kinds which can not be dated at all. Under ordinary conditions, earthenware which is well baked will last indefinitely under ground, and a burial-vase found to-day in France or England may be of a time only just before the Roman occupation or centuries older than that. Vessels found in these depositories are sometimes filled with bones and ashes of the dead, sometimes they are vessels for drinking or for food, and sometimes they seem to be merely ornamental. All are made simply of clay, and this, while still soft, has been impressed with patterns of different sorts or even cut through, the openings being arranged for decorative effect. These impressions and cuttings are fixed by the baking of the clay, and endure as long as the vessel lasts. Circles have been made by the impression of a ring, perhaps the end of a round stick with the center cut away; groups of dots or punctures have been made by a stick with a notched end, or cut into teeth in its length; zigzags and bands have been drawn with a sharp point; in short, there are found all the devices which would suggest themselves to a savage having soft clay before him and desiring to ornament it. The forms of these vases are often rather graceful, though rude, and evidently modeled by hand alone, and the ornament well applied and effective.

The next step is to ornament the vessels with *slip*, or clay thinned with water and applied to the surface. This may be a finer and whiter clay, and in this way effective patterns are produced. Handles and purely ornamental strips and lumps of clay, whether of the same clay as the body of the piece or of the finer slip, are often applied. The slip may be used also to fill up patterns impressed deeply into the surface.

One of the most remarkable uses to which earthenware was put in ancient times is that of inscribed tablets. In Mesopotamia immense numbers of these square tiles have been found, impressed with characters which have been read by modern scholars. They are practically books, and whole libraries of these are known and are gradually yielding up their record of times which can be fixed approximately at from 4000 or 4500 to 2000 B. C. This land of the Euphrates and Tigris, Syria, Cyprus, parts of Asia Minor, and Greece have yielded a great amount of what is called *archaic* pottery—that is, ware which can be associated with other monuments, such as bronzes and gems, and in this way dated approximately, though belonging to a time little known by historical records. These pieces have been made on the potter's wheel, and are therefore fairly regular and smooth. Their forms are varied endlessly and are often very beautiful, and impressed ornaments, like those of the prehistoric pottery, but far more neatly worked, are freely used. Patterns are also made in white or yellow slip on a darker body, and these are very effective. Painting is used also, the colors being earths, such as ochre. The painting is very thin, and is rather a staining of the surface. It is applied upon the body and upon the slip alike.

In later times unglazed earthenware has been less used for ornamental vessels, because more decorative kinds of ware have been made, but statuettes and groups, architectural ornaments and the like, have been made by the Etruscans, by the ancient Greeks, and by all the peoples of Europe and Asia from antiquity to the present. Earthenware used in this way is generally called *terra-cotta*. Great numbers of such sculptures in unglazed terra-cotta exist in public museums, and among these is much fine art of a very refined type of various dates from the Egyptian and Etruscan burial-urns to the portrait-busts made by sculptors in Europe

and America at the close of the nineteenth century. There is constant use of unglazed earthenware for bricks, roof-tiles, drain-tiles, and other articles of utility.

Earthenware, Glazed and Enamelled.—The utility of glazing is that it makes porous-clay vessels water-tight, but it is employed equally for decorative effect and to protect surface-decoration in colors. Sometimes this glaze is a mere film; thus in fine Greek vases its thickness can hardly be seen in the fracture; it is a mere glassy film. Sometimes it is solid and opaque, as thick as very stout paper, and covers up the body of the ware so that this can not be seen at all, as in *MAIOLICA* (*q. v.*). Sometimes it is thick and yet translucent, as in some Chinese and Japanese wares of which the body is impressed with deeply sunk patterns, the glaze usually of what is called a celadon green, showing a deeper color where it fills the sunken lines.

This class is the largest, and includes the greatest number of sub-classes. Perhaps nine-tenths of the ceramic ware which students and collectors prize belongs to this class. The painted Greek vases are of this class, because the black coating which makes up so important a part of their system of decoration, though its exact composition is disputed, is clearly of the nature of an enamel; and because the glossy surface of the whole vase has been produced by the use of a very thin glaze. In the fine Greek vase (Fig. 4) the figures are of the color of the yellowish-red clay, the background black, made of the enamel mentioned above, put on with the brush, and worked around the figures. Many vases of the same epoch are known which are entirely covered with the black glaze, and depend upon their form and slight ornaments in relief for their effect. This example (Fig. 4) is one of the so-called red-figured vases which are considered as belonging to the finest class of Greek ceramic art, and of the fourth century B. C. Vases earlier than this, but still later and finer than the *archaic* ware described above, and fully glazed, had the figures in black on the red ground. No kind of earthenware known is more interesting than these Greek vases, thousands of which have been found in Southern Italy, in Greece, and in other Mediterranean lands. They give the only clear notion of what Greek painting must have been. In themselves, too, they are of great artistic value, as their forms are of incomparable grace, and the figure subjects, however formal and incomplete the pictures may seem, have very important artistic qualities. It seems certain that this great industry had ceased altogether long before the Christian era. No such vases were produced under the Roman empire, although sculpture and painting, glass and metal-work, and most of the fine arts of the Greeks were still flourishing.

Greek painted vases were called Etruscan in the eighteenth century, probably because those found in the tombs of ancient Etruria were the first to attract notice. It is known now that they were brought from Greece in large numbers. There was also a real Etruscan pottery. Most of the pieces known are unglazed black ware, but some vases exist which have a thin glaze nearly like that of the Greeks. Under the Roman dominion, glazed pottery was made in many parts of the empire. The type of it is the red ware, of fine texture and smooth surface, generally rather soft and easily broken, and covered with a very thin glaze. This is called Samian ware, from the Isle of Samos, but there is no certainty as to its place of manufacture. Early in the nineteenth century it was discovered that a ware very similar to this was made at Arezzo, in Tuscany, and the Samian ware was probably made in many places, varying slightly in color and character. It was often adorned with arabesque and figures in relief.

Ware with a thick and opaque enamel was not used by the Greeks, nor, apparently, under the Roman empire, but it had been used by the Egyptians at an early date, and the most splendid specimens of it known had been made

before the Parthenon was built. Persia, always a center of fine decorative art, had possessed from the time of Darius large friezes of life size, human figures, and animals in relief, decorated with enamels of the most brilliant coloring.



FIG. 4. Birth of Athena, on a Greek polychrome vase, from Vulci.

The Louvre now has a number of the figures, and their beauty and brilliancy almost exceed belief. Other specimens of this art, from the somewhat more recent palace of Artaxerxes Mnemon, are almost equal in merit. These colored reliefs, twenty-three centuries old, are the finest known instances of color applied to architecture, as well as unequalled pieces of enameled earthenware. In Persia this splendid art was not allowed to die out, and specimens of it of all ages are known. In the eleventh and following centuries of the Christian era the Persian vases, dishes, hanging lamps for mosques and the like, and the imitations of them made in Rhodes and other parts of the Levant, were the most beautiful ceramic wares made anywhere to the W. of China, and the influence of the designs and manufacture of these was felt throughout the south of Europe. In Spain, Sicily, and the Balearic islands a beautiful ware, decorated with a few simple colors and a free use of metallic lustrous glazes, was made; this is known as Hispano-Moresque ware. In Italy, in the fourteenth and following centuries, the splendid ware called *MAIOLICA* (*q. v.*) was made, perhaps surpassing Persian ware in beauty, especially as regards the metallic luster, which is the most vivid and striking of all ceramic decorations.

Earthenware with an opaque enamel was next to conquer the North. In France, after the great achievements of *PALissy* (*q. v.*), a number of less peculiar and abnormal kinds of faience were produced. What is known as Rouen ware reached its greatest development in the seventeenth century. The faience of Nevers, that of Moustiers-la-Reine, succeeded; then the potteries of Strassburg, those of Niederwiller in Lorraine, Marseilles, and Secaux. In the eighteenth century enormous quantities of these



FIG. 5. Faience, black and white, from the Louvre.

Ware with a thick and opaque enamel was not used by the Greeks, nor, apparently, under the Roman empire, but it had been used by the Egyptians at an early date, and the most splendid specimens of it known had been made

wares, decorated with bouquets and festoons and figures in color on a white ground, were made in France and Germany. Some attempts were made to imitate the rich and solid coloring of maiolica, and some Oriental designs were copied, but generally a delicate and light-colored style prevailed. Dutch ware, known generally as Delft, is of the same epoch. The Delft pieces most commonly met with are painted in blue on a white ground, in imitation of Chinese porcelain, but there is also a great deal of it decorated in several colors with gold. There are many, also, which are painted with scenes of



FIG. 6.—Proto-Samian cup, with an amazonomachia in relief, from Athens.

life, landscapes, and animals both domestic and wild. The forms of the pieces during the seventeenth century are generally very simple and refined, with some tendency toward imitation of the shapes of Chinese pieces of the best styles. There are also many *plaques*, or flat slabs, for hanging on a wall, and these are often painted with pictures of an elaborate sort.

In England but little artistic faience was made. The "ironstone china" and other varieties of what the French call *faience fine*, together with Wedgwood ware, are mentioned below under *Stoneware*. Inexpensive tableware is often decorated with transferred patterns. These are first printed upon paper and then transferred from the paper to the unbaked ware. Cheapness is secured in this way, but the process has nearly ruined English pottery as a decorative art, and has done great harm on the Continent.

In China and Japan the abundance of porcelain and (in Japan) of the hard and durable stonewares of yellow body has always kept down the supply of glazed earthenware; moreover, less of it is known in the West because of the attractiveness of those above-named ceramic vases. It may be said that for the common needs of life the Orientals use hard earthenware with only a very thin siliceous glaze, and that this kind of pottery approaches common stoneware so closely that it is impossible to draw the line between them. These peoples of the extreme East are such skilled potters that they use all processes freely, very often to the confusion of the Western student of ceramics. Thus a very ornamental kind of ware is made with a dark-brown and very hard body, the surface of which is very smooth and fine but not glossy; upon this a white or buff porcelaneous glaze is applied in places, so that the two colors contrast with one another. A statuette, for instance, will have the flesh of the brown earthenware and the dress of the whitish glaze, and this glaze may then be painted in many colors. Completely covered faience, where no part of the body shows, is also made. Decorative pieces are sometimes brought to the West. The great "porcelain tower" near Nanking, which was destroyed in the Tai-ping rebellion, was faced with faience, covered with thick enamel, and richly painted, some of the white bricks being a true porcelain.

Stoneware.—Much the most famous variety of this hard and thoroughly baked pottery is that known as Cologne ware, or as *Grès-de-Flandres*. During the seventeenth century splendid vessels were made of this, the forms most varied and fantastic, the ornamentation applied in relief by means of a great number of stamps, and the color-effect limited to the combination of a cold blue in places with the soft gray of the ware itself. This is the more interesting that the pieces differ so slightly from the commonest vessels of daily use. The finest Cologne ware tankard is only a common vinegar jug or beer mug somewhat adorned, and it is the more valuable to the student of design on that account. **Wedgwood ware** should be considered in connection with stoneware because of the non-porous character of the paste. The chief kinds are cream-ware or queen's-ware, of a light buff, colored throughout the body, used for fine dishes and other table utensils; jasper, which was generally either blue or white, very uniform and fine grained, and capable of taking the sharpest edges and neatest impressions, and therefore used for bas-reliefs small and large; basalt, a black paste, also very fine, and used for ornamental vases, but also for tea-sets and the like; crystalline, in which are included imitations of natural agates, porphyries, and marbles, the colored veins going through the body. From 1780

to 1810 Wedgwood's pieces were exported largely to the Continent, and were used freely in England. Bas-reliefs in white on a blue ground were used for buttons and brooches, and larger ones were set into mantels and the paneling of rooms, or hung up like the plaques of Delft and Moustiers. Vases, sometimes mounted in gilt metal, and often set upon high pedestals, were sent as ceremonial gifts, and used for the decoration of the most stately apartments. John Flaxman (see FLAXMAN, JOHN) was employed upon the bas-reliefs, and some of his portrait medallions and groups in white "jasper" are of real interest as sculpture. The most important single piece made by Wedgwood is an imitation of the famous Portland vase, of which a number of copies were made. Other English wares, distinguished by the French writers as *faience fine*, and known in England by various special names adopted by the makers, are half way between stoneware and artificial porcelain, their composition partaking of both. The paste is light-colored and solidly baked, and the glaze is thin and transparent. It is rare that they have much artistic merit, but they are excellent as tableware. Some of them approach closely to Wedgwood's queen's-ware in appearance.

The yellow ware of Japan, known to the West chiefly as Kioto and Satsuma pottery, is very hard and not porous in the body, and has a very thin and transparent glaze not changing the color of the piece. It is therefore more nearly stoneware than earthenware. Vases and dishes, statuettes, and groups of this beautiful ware are very well known. The artistic merit of the decoration is of many degrees; there are some pieces in which the delicacy and softness of effect entitles the ornament to be considered as beautiful and as truly appropriate to ceramic ware as any that is known, but most of the pieces are somewhat more harsh in color, and the painting often tends toward extreme minuteness and the display of technical skill.

PORCELAIN.—This appears to be the discovery of the Chinese, and all its highest attainments are due to that people. Few persons are aware of the endless variety of decoration to be found in Chinese porcelain, for no collection in any public museum contains nearly all the varieties that exist. Japanese porcelain is hard and fine, and exquisitely made and finished, but there are only three or four styles of painting used in its decoration, while the Chinese styles can be counted by hundreds. There are many vases and plates in Western collections which are painted most artistically and delicately with flowers, groups of men and women in rich costumes, and other subjects, all vivid colors treated in the most judicious manner. Blue painting on white, when carried to its highest pitch of excellence, is extraordinarily decorative. The fault of too great sharpness of outline and of too sudden contrast between pattern and background is not to be found with the best pieces. Of Japanese porcelains the best known is also the finest—viz., the "Old Japan" or Hizen porcelain, painted in blue under the glaze and then enameled colors and gold upon the glaze. The general effect is a combination of dull blue and dusky red with pale gold, on a brilliant white ground.

Porcelain was first made in Europe by Böttger in the employ of the Elector of Saxony about 1710. Previous to that time a factory kept up by the Medici at Florence had made a few pieces of a ware very like a real porcelain, and long thought to be so, but now known to be not a clay ware. The sight of the Saxony porcelain excited afresh the makers of fine pottery in France and England, and many attempts to imitate this and the Oriental porcelains were made. These attempts resulted in soft porcelain (*pâte tendre*), and in English artificial porcelain, both very complicated in their make, with many ingredients in the body and the paste, but hardly clay wares. About 1770 the secret of the kaolin or true porcelain clay became known in France, and from that time real porcelain was made at Sèvres; but the artistic qualities of Saxony and Sèvres porcelain are by no means equal to the skill shown in the manufacture or to the enormous prices paid for fine pieces. The Saxony porcelain—generally called Dresden, or, more properly, Meissen, from the town where the factory is situated—that of Vienna beginning about 1745, and that of Berlin from about 1750 may all be considered rivals of Sèvres porcelain in the favor of collectors. The German pieces are generally still less artistic and appropriate in design than those of France, but these, as well as the Sèvres, command admiration for their delicate finish and the wonderful skill of the makers and decorators of the finer pieces. Each of these factories has always been a Government enterprise,

and the most important productions are generally to be seen in palaces, having been sent as gifts from one court to another.

EXCEPTIONAL WARES.

Egyptian Green Ware.—This curious ware, commonly called "porcelain," is almost wholly composed of sand, half melted, held together by a little plastic material, and glazed with silex; in other words, it is a half-made glass, and is very easily broken. It is of a beautiful green or blue tinge, and decorated with simple patterns, generally in a darker blue.

Henri Deux Ware.—This extraordinary pottery was a mystery to students until Benjamin Fillon located its manufacture in the east of France, calling it Faïence d'Oiron, from a village in the department of Deux-Sèvres. It is now called Faïence de St.-Porchaire, from a village in the Charente-Inférieure. There are only fifty-three pieces of it known, of which about a dozen are in one glass case in the Louvre; all of the same general style of make and design; all are without doubt the product of one and the same private workshop. The great peculiarity of the decoration is the inlaying of clay of one color in a clay body of another color. Little metal stamps, like bookbinders' stamps, were used for this, the clay being removed from the parts cut out by the stamps, and the clay of a different color put in, after which the whole was fired, and then glazed and fired again.

Soft Porcelain.—The early Sèvres ware brings enormous prices, mainly because of its rarity, but it is really somewhat more refined in effect because of the slight absorption of the colors by the paste. As was said above of Chinese porcelain, so European real or hard porcelain seems to many persons harsh in its sharp-edged and strongly contrasting colors, while *pâte tendre* is softer in its gradations.

English Porcelain.—This, in its different varieties—Derby, Chelsea, Bow, "Spode," Worcester, Lowestoft—is generally made of an artificial mixture, and is rather glass than ceramic ware. It is rarely fine in design, the more expensive pieces being very clumsy in form, and painted and gilded in execrable taste, and the cheaper pieces ruined by having the colored patterns transferred to their surface from prints on paper. This is a way of getting an appearance of decoration cheaply, but no process is more devoid of true ornamental effect. Some fine Derby ware statuettes and groups have been sold in the biscuit, unglazed and uncolored, and these are very attractive, the example of Wedgwood ware and Flaxman's designs carried out in this material having influenced English work more as to sculptured form than in other ways.

Modern Wares.—At the close of the nineteenth century there are so many different wares and so many different processes of manufacture, many of these latter being also kept secret, that classification is extremely difficult. Generally the forms are ugly, partly because the art of modeling simple and suitable teapots and cups has been lost by the workmen, and only a trained artist can satisfy himself without inartistic additions and attempts at novelty, partly because the demand for extreme neatness and uniformity makes all natural grace impossible. The decoration in color and gold is usually disagreeable from its hard monotony. In France, however, some simple faïence is decorated with flower patterns, of which the outline is printed or transferred, but the filling in with natural-seeming colors is done by hand. At a higher price are made some tea-sets and the like, which are painted entirely by hand, a spray of roses or other flower being laid across each plate, very well drawn and colored, though not very well arranged as decoration. One exceptional style of decoration is that called *à pâtes rapportées* or *pâte sur pâte*, in which pure white semi-translucent reliefs are raised on a colored ground, the color showing through the thin edges, and the relief growing more purely white as the *pâte* grows thicker. This has been in use since 1852; it is often called by the name of Solon, who produces it for a London dealer, but it is also made at Sèvres. In the U. S. some private persons have painted clever designs of wild plants variously grouped. The Rookwood pottery, of Cincinnati, turns out large and small decorative pieces of great variety of forms. These, and the tableware, are decorated with very able painting of natural-looking sprigs and bouquets in white, buff, gray, etc., on a ground of dark brown, dark green, and similar colors passing into one another by gradations. Gallé, of Nancy, in France, makes ornamental vessels of the most extraordinary and unexpected designs, always interesting but often more novel

than beautiful. Delaherche, of Paris, makes noble vases decorated with strong dark-colored glazes with fine gradation, somewhat like Chinese single-colored porcelains. Massier, of the Gulf Juan, near Toulon, makes the most exquisite pieces, decorated with mere zigzags and cloudings, and half-seen bouquets, but this ware is unfortunately extremely soft, and its paste is scratched by a touch. The royal factory of Copenhagen turns out dishes and vases painted with landscape effects, birds, etc., in pale grays and white, some of which are very decorative in a subdued way. The Japanese makers of the close of the century are also vying with one another in the production of extremely delicate and highly ornamented pieces, as well as tableware, and the cheapness of even their very beautiful productions is remarkable. Tiles for wall decoration are made in endless variety in Europe and the U. S., the best in color being French, but some of those with figure subjects and heads in low relief made in the U. S. are extremely effective.

Pottery and porcelain are made at many places in the U. S. At East Liverpool, O., are about thirty different establishments, some of which produce decorative wares. At Trenton, N. J., are perhaps as many separate establishments. At Cincinnati, O., are two or three commercial manufacturing establishments, besides the private associations, in which much very novel and sometimes successful artistic work has been produced. Besides these there are works in New Hampshire, at Keene; in Massachusetts, at Cambridge, Chelsea, and East Boston; in Connecticut, at Hartford; in New York, at Utica, Greenpoint (Long Island), Syracuse, and the city of New York; in New Jersey, at Perth Amboy and Menlo Park; in Pennsylvania, at Beaver Falls, Morrisville, Pittsburgh, Phoenixville, Spring Mills, and Philadelphia; in Maryland, at Baltimore; in West Virginia, at Wheeling; in Georgia, at Atlanta; in Kentucky, at Covington; in Ohio, at Akron, Steubenville, and Zanesville; in Indiana, at Indianapolis and Anderson; in Illinois, at Peoria; in Wisconsin, at Edgerton. According to the U. S. census of 1890 the value of the clay and pottery products of the 707 establishments which reported was \$22,057,090, excluding bricks and tiles.

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1875), uncritical, but finely illustrated; du Sartel, *La Porcelaine de Chine*; Stanislas Julien, *Histoire de la Porcelaine de Chine*. A recent and thorough work on pottery and porcelain in the U. S. is by E. A. Barber, and has many illustrations. For general works on pottery and porcelain, besides the books named under KERAMICS, see Brongniart, *Traité des Arts céramiques* (Paris, 1844); W. Chaffers, *Marks and Monograms on Pottery* (London, 1863); Treadwell, *Manual of Pottery and Porcelain* (New York, 1872); Eliza Meteyard, *Wedgwood and his Works* (London, 1873); Champion, *Two Centuries of Ceramic Art in Bristol* (London, 1873); Beckwith, *On Pottery* (New York).

RUSSELL STURGIS.

Pottinger, pot'in-jer, Sir HENRY; diplomat; b. in County Down, Ireland, in 1789; went in 1804 as a cadet to India, where he rose through all the grades of the service; was political resident in Cutch and Scinde 1824-39; was made a baronet Dec., 1839; went to China as ambassador and superintendent of British trade 1841; co-operated with Admiral Parker in effecting the capture of Amoy and other places; concluded the treaty of peace of Aug. 29, 1842, which opened five Chinese ports to the commerce of all nations; was appointed governor of Hongkong Apr., 1843; became privy counselor on his return to England May, 1844; was governor of Cape Colony 1846-47, and governor and commander-in-chief of Madras presidency 1847-54. Author of *Travels in Beloochistan and Sind* (1816). D. at Valetta, Malta, Mar. 18, 1854.

Pot'to: a name applied to the KINKAJOU (*q. v.*).

Pott's Disease of the Spine: See SPINAL CARIES.

Pottstown: borough; Montgomery co., Pa.; on the Schuylkill river, the Schuylkill Canal, and the Phila. and Reading and the Penn. railways; 18 miles E. S. E. of Reading, 40 miles W. N. W. of Philadelphia (for location, see map of Pennsylvania, ref. 6-D). It is in an agricultural and mineral region, and is widely known for its manufactures, particularly of iron and steel. Besides the plant of the Pottstown Iron Company, which includes furnaces, rolling-mill, steel-works, and machine-shops, and that of the Philadelphia Bridge Company, there are 3 rolling-mills, a steel-mill, 2 nail-factories, a furnace for pig-iron, boiler-works, agricultural-implement works, 5 cigar-factories, 3 carriage-factories, 2 planing-mills, and other industrial works, including in the borough and its vicinity more than 20 creameries. The borough contains 22 churches, public-school property valued at over \$115,000, Normal Institute, Hill School, 2 school libraries (High and Hill) containing over 5,000 volumes, 3 national banks (combined capital of \$600,000), 2 daily and 2 weekly newspapers. Pop. (1880) 5,305; (1890) 13,285; (1894) estimated, 17,160. EDITOR OF "DAILY NEWS."

Pottsville: borough; capital of Schuylkill co., Pa.; on the Schuylkill river, and the Lehigh Valley, the Penn., the People's, and the Phila. and Reading railways; 35 miles N. W. of Reading, 93 miles N. W. of Philadelphia (for location, see map of Pennsylvania, ref. 5-H). It is in the extreme southern part of the great Schuylkill anthracite coal-field, where shafts have been sunk in the valleys to a depth of 1,600 feet to reach the underlying coal-beds, while on the mountain-sides the coal-beds crop out, and it is the chief shipping-point of this coal region. It was here that anthracite coal was first successfully used for smelting purposes in 1839, and the prize of \$5,000 offered by wealthy Philadelphians to the individual who would succeed in smelting iron ore with anthracite coal was awarded to the Pottsville furnace. There are 3 national banks with combined capital of \$800,000, a State bank with capital of \$200,000, a trust company with capital of \$250,000, and a private bank. The public-school property is valued at over \$300,000. There are excellent public schools, comprising besides the lower grades 2 grammar schools and a high school, and a commercial business college, 2 private schools, and 2 parochial schools. There are 3 libraries (Athenæum, Public School, and the Schuylkill County Law) containing over 10,000 volumes, and 3 daily and 7 weekly newspapers. The churches and chapels number 23. The borough has gas and water works, electric lights, electric railways connecting the adjoining towns, and a steam-heating plant. The industrial works include furnaces, rolling-mills, stove and other foundries, several boiler, engine, and machine shops, pottery, bolt and nut factories, planing-mills, spike-mills, shirt and stocking factories, large breweries, an extensive silk-mill, and bridge-works. Pop. (1880) 13,253; (1890) 14,117; (1894) estimated, 16,000.

BAIRD HALBERSTADT.

Pouched Rat: See GOPHER.

Poughkeepsie: city; capital of Dutchess co., N. Y.; on the eastern bank of the Hudson river; 75 miles N. of New York and 69 miles S. of Albany (see map of New York, ref. 7-J). It is the eastern terminus of the Poughkeepsie and Eastern Railway, and is on the lines of the N. Y. C. and H. R. Railroad and the Philadelphia, Reading and New England Railroad, which last here crosses the Hudson river on a cantilever bridge at an elevation of 212 feet. (See BRIDGES.) Connection also is here made with the West Shore Railroad by ferry. Poughkeepsie was settled by the Dutch at the close of the seventeenth century. The first substantial building was erected not far from 1705. The Legislature of New York met in Poughkeepsie in 1778 to accept the articles of confederation adopted by delegates from the thirteen States. Here also on July 26, 1788, a State convention, through the eloquent and patriotic endeavors of Alexander Hamilton, ratified the national Constitution. The city is partly upon a hillside sloping to the river, but largely upon table-land extending eastward to Vassar College, 2 miles away. At the N. is College Hill, whose summit is 500 feet above the town. The whole of this hill, excepting the reservoir-grounds, has been given to the city by one of its citizens as a public park; its area is nearly 100 acres. The city is lighted by electricity, and its streets are traversed by electric cars, by which communication is held with Vassar College and Wappinger's Falls, a manufacturing village 8 miles below. Poughkeepsie is distinguished for its seminaries of learning, of which VASSAR COLLEGE (*q. v.*), Riverview Military Academy, Eastman's Business College, and Lyndon Hall are prominent. It has 23 churches, 6 national banks, a savings-bank, a public library, Orphan Asylum, Old Ladies' Home, Old Men's Home, hospital, and many other charitable institutions, while to the N., just outside the city limits, is the Hudson River Hospital for the Insane. There are many important and flourishing manufacturing interests, and 4 daily, a semi-weekly, 3 weekly, and 2 monthly periodicals. The city is supplied with water from the Hudson. Pop. (1880) 20,207; (1890) 22,206. FRANCIS B. WHEELER.

Poulnp [from Fr. *poulpe*]: a common name for any species of eight-armed Cephalopod. See MOLLUSCA.

Poultice: a soft composition of bread, flaxseed, meal, slippery-elm bark, or herbs, applied warm or at as high a temperature as the part to which it is applied will bear, in order to hasten inflammation and produce suppuration. Cold poultices or other cataplasms—for instance, of cotton-wool steeped in water—are applied to prevent inflammation or mitigate pain.

Poultney: town; Rutland co., Vt.; on the Poultney river, and the Del. and Hudson Railroad; 7 miles S. by W. of Castleton, 18 miles S. W. of Rutland, the county-seat (for location, see map of Vermont, ref. 7-B). It is in an agricultural region, and has several slate-quarries, slate-manufactories, foundry, machine-shops, the Troy Conference Academy (Methodist Episcopal, chartered in 1834), a national bank with capital of \$50,000, and a weekly newspaper. Pop. (1880) 2,717; (1890) 3,031.

Poultry [from O. Fr. *pouleterie*, deriv. of *poulet*, chicken]: domestic fowls, either gallinaceous or aquatic. Of the former there are sixty-eight breeds, each bred to a standard of points and possessing certain characteristics of color, form, and habits. The standard breeds are classified as American, Asiatic, Mediterranean, Polish, Hamburg, French, English, Game, Game Bantam, Bantam, and Miscellaneous.

American.—The American class comprises the Plymouth Rocks, Wyandottes, Javas, Dominiques, and Jersey Blues. The Plymouth Rocks are subdivided into White, Buff, and Barred varieties, the Javas into Black, White, and Mottled, and the Wyandottes into White, Golden, Silver, Buff, and Black. They are of medium size, and vary in color. With the exception of the Dominiques, which have rose-combs, they possess single straight combs which are serrated. The fowls of the American class are good layers. The color of the eggs is usually light brown, sometimes nearly white. The hens are persistent sitters.

Asiatic.—In this class are included the Light Brahmas, Dark Brahmas, Partridge Cochins, Black Cochins, White Cochins, Buff Cochins, and Langshans. They are the largest of the gallinaceous fowls, the Light Brahmas leading in weight. All fowls of this class have feathered legs, and all have single combs, with the exception of the Light Brahmas and Dark Brahmas, which possess pea-combs. They are

hardy, large, and adapted to confinement. The hens are excellent layers and mothers.

Mediterranean.—To the Mediterranean class belong the Leghorns, Minorcas, Andalusians, and Black Spanish. The Leghorns are subdivided, according to the color of the plumage, into black, white, brown, dun, and buff. There are also two varieties known as rose-comb brown and rose-comb white. The Minorcas are separated into two varieties—white and black. The fowls of the Mediterranean class are small, of active habits, unfitted for confinement, and are excellent foragers on a range. They are not sitters. They rank first as layers, but are deficient in size and attractiveness as market-fowls. Like all non-sitters, they lay eggs entirely white in color.

Polish.—The fowls of the Polish class are non-sitters, and are excellent layers during spring and summer, but are not very hardy. They are valued chiefly for their beautiful plumage. They possess large crests, and some varieties have beards. The Polish breeds are subdivided into the white-crested black, golden, silver, white, bearded golden, bearded silver, bearded white, and buff faced.

Hamburgs.—This class includes the Hamburgs and Red Caps. They have rose-combs, are small, lay white eggs, and are non-sitters. They are not adapted to confinement, but are excellent foragers on a range. As table and market fowls they are not in favor, and also lack in hardiness. They are beautiful in plumage, and are second to the Polish as ornamental fowls. The Hamburgs are separated into golden-spangled, silver-spangled, golden-penciled, silver-penciled, white, and black.

French.—The French class comprises the Houdans, Crève-cœurs, and La Flèches. They are non-sitters and excellent table-fowls, but are unable to endure severe winters and damp weather. The fowls of the Houdan breed, however, are raised successfully in some sections of North America. The Houdans and Crève-cœurs possess crests and beards, while the La Flèche is without either. The Houdan possesses a fifth toe on each foot.

English.—The Dorkings compose the English class, being separated into white, gray, and colored. For the table they are unrivaled. The chicks are difficult to raise, and the adults are not well adapted to the climate of the U. S. The Dorking has five toes on each foot, is very compact in body, and the eggs are white in color. The females are excellent sitters and mothers.

Game.—To this class belong the Malays, Sumatras, Black-breasted reds, the various Duckwings—brown, white, pyle, and Indian. Games intended for combats in the pit differ from the standard varieties in being bred without regard to color or form, as courage is more essential. The Game fowls are excellent for the table and have an abundance of "breast meat." The females are superior sitters and mothers, but are not above the average as layers.

Bantam.—The Game Bantams do not differ from the standard Game fowls except in size. They are esteemed as pets. Cocks should not exceed 22 oz. in weight nor hens 20 oz. The Black-breasted reds are the favorites. Of Bantams other than Game are the Pekin (or Cochin), Booted, Japanese, white-crested White Polish, Rose-comb Black, Rose-comb White, Golden Sebright, and Silver Sebright.

Miscellaneous.—The miscellaneous class includes the Sultans, Silkies, Frizzles, Russians, and breeds that are considered oddities. They possess no merit of importance, with the exception of the Russian, which is a desirable breed for the market, the hens also being excellent layers and mothers.

Characteristics of Breeds.—As cattle have been classified into breeds, as milk, butter, and beef producers, so do the breeds of fowls differ in points of merit. The same breed can not be superior as egg-producers and in furnishing choice meat for the table, as egg-production is antagonistic to the production of meat of the best quality. The Asiatic class is composed of fowls that have been reared in confinement for many years until their wings have been so reduced in size as to render flying impossible, while the size of the body has been increased. These fowls fatten very readily, and if judiciously managed produce eggs during all seasons. As the motive power of the wings is in the muscles of the breast, the amount of "breast meat" has been lessened and the quality of the flesh is inferior, although their large size is an advantage in making an attractive display in market.

Fowls of the active breeds, such as the Leghorns, Hamburgs, and Minorcas, convert a large proportion of their

carbonaceous food into force, and consequently they do not fatten as readily as the large breeds. They are non-sitters, although experiments demonstrate that hens of all breeds become broody when they have too much food and become fat. Fowls of American breeds are hardy, and while not equaling those of the Mediterranean class as layers nor rivaling the Dorkings in quality of flesh, they are above the average in both respects, but are liable to become overfat unless fed carefully during the winter. They are partially adapted to confinement, but, like fowls of all breeds, thrive best on a range. The best breeds for egg-production, considering hardiness and adaptability to climate, are the Leghorns, Minorcas, Wyandottes, Plymouth Rocks, Brahmas, and Langshans, in the order named. If the object is to produce poultry for market the breeds should be selected without regard to their laying qualities. Considering hardiness as a factor, the best breeds for market are the Plymouth Rocks, Light Brahmas, Cochins, Wyandottes, and Langshans, the last-named breed, however, not possessing the desired yellow skin and legs. For the table the Dorkings and Games are unexcelled, but they are too difficult to raise for market, owing to rapid feathering when very young.

Turkeys and Guinea-fowls.—There are six breeds of turkeys—the buff, bronze, slate, white, black, and Narragansett. The leading breeds are the bronze and white, the others being rare and possessing no especial merit. The bronze is the heaviest, the required weight of the adult male being 32 lb. and that of the female 22 lb. There are three varieties of guinea-fowls—the pearl, white, and bronze. They are not recognized in the list of domestic breeds and find no sale in market. On farms, however, they are regarded as excellent layers and their flesh is considered delicate. The period of incubation is the same as that of the turkey, and their habits are nearly the same in the domesticated state.

Aquatic Fowls.—Geese are separated into the Toulouse, Embden, African, Canada, Egyptian, White China, and Brown China breeds, all rare except the first two. Of ducks there are the Pekin, Aylesbury, Rouen, White Muscovy, Colored Muscovy, and Cayuga, all well-known breeds. The Call and East Indian are very small and are seldom kept on farms. The crested duck is bred more as a novelty than for practical purposes. The Muscovy ducks differ from the others in requiring a longer period for incubation and in producing sterile progeny when crossed with other breeds; the cross-bred female lays eggs which will not hatch. It is therefore doubtful if the Muscovy is really a duck: its period of incubation and habits approach more nearly those of the goose. See Goose and Duck.

Feeding.—Laying hens require food of a character entirely different from that suitable for non-producers. An egg is composed of 12½ per cent. of albumen, 21 per cent. of oil and fat, and 10 per cent. of mineral matter, the greater proportion of the egg being water. As grain is deficient in lime and is largely starch, it has a tendency to fatten rather than to supply the elements composing the egg. Digestion and assimilation are promoted when the food is varied, and egg-production is increased when the ration is well balanced. The individual characteristics of the hens must be considered, as no two hens are alike even when of the same breed, one requiring more food than another and preferring kinds that may not be acceptable to her companions. Bulky food—such as chopped grass, clover, vegetable tops, cooked potatoes, and turnips—is essential because grain is too concentrated. Pounded bones, meat, and milk should always be included in the ration, as they are highly nitrogenous and seldom fail to promote laying.

It is difficult to prescribe a routine course of feeding. During the winter season the first essential is warmth, which is promoted by shelter and a liberal supply of grain. Ground food, scalded, is excellent as a morning meal, or the ground grain may be mixed with clover hay which has been cut very fine and scalded. The allowance of food should be light, and to induce the hens to exercise a small quantity of millet seed should be scattered in cut straw, leaves, or litter of any kind. No food should be given at noon. Late in the afternoon about 1 lb. of chopped lean meat or ground bone may be allowed twenty hens, after which wheat or corn, or both, should be scattered over the ground in order that the hens may exercise in securing it. Troughs should not be used except when feeding moistened ground grain. During the summer months the hens can secure all food required on a range, as grass, seeds, and insects will be abundant. Water should be at all times where it can be procured easily by

the fowls. No fixed allowance of food for a flock can be determined upon, especially when the food is varied. It will require about 5 pecks of corn, or its equivalent, to support a hen for a year.

Turkeys and guinea-fowls thrive best on a range, and are capable of securing the whole of their food during the greater portion of the year. A meal, composed of corn or wheat, given at night, will induce them to come up regularly to roost near the dwelling-house. In winter they should have grain twice a day. Geese and ducks are partial to green foods, and if grass is abundant they will have no difficulty in securing food in summer. A meal of cooked turnips, thickened with bran, given twice a day in winter, with a supply of chopped clover hay, scalded, will keep them in good condition.

Care of the Young.—Chicks are hatched at a temperature of 103°. Hens seldom become broody during the winter season, and many poultrymen resort to incubators and brooders during that period. No food is required for thirty-six hours after hatching. The chicks should be given dry food in preference to dough of any kind. Oatmeal, or rolled oats, should be kept in a little trough before them, and three times a day they should be fed on a mixture of equal parts, by weight, of corn meal, middlings, sifted ground oats, and ground meat, moistened and cooked as bread. When ten days old they should receive cracked corn, wheat, finely cut clover (scalded), cooked potatoes or turnips, or anything that will be acceptable. They should be kept warm and dry; water should be given in vessels that permit them to wet their beaks only. Young turkeys require food that is highly nitrogenous, as they grow feathers so rapidly as to become debilitated, while the least dampness is injurious. They may be fed in the same manner as chicks, but, in addition, should be given chopped eggs that have been boiled, finely chopped onion-tops, milk curds, and cooked lean meat. Goslings and ducklings require soft food, such as cooked turnips or potatoes, with ground grain of any kind, given in troughs. Water must be supplied freely for drinking purposes, but they should not be allowed on ponds until well feathered, as they may become chilled and perish.

Management.—Lice and disease are the chief drawbacks. If the poultry-houses are kept clear of lice the fowls can then rid themselves of vermin by the use of the dust-bath. Drenching the poultry-house with an emulsion of kerosene is the most effective remedy. Large gray lice destroy many young chicks and turkeys; anointing the heads with a few drops of sweet oil is the remedy. Roup is the most prevalent disease among gallinaceous birds, and exists in many forms, the symptoms being hoarse breathing, swelled eyes and heads, discharge from the nostrils, and in the malignant or contagious form it is accompanied with a very foul odor, the birds gradually drooping. There is no remedy for the disease, the most economical method being to destroy the sick birds and thoroughly to clean and disinfect the premises. Cholera is a rare disease, the supposed cases being mostly indigestion resulting from overfeeding. There is no sure remedy for cholera, but good results have been obtained by adding a teaspoonful of liquid carbolic acid to each quart of drinking-water. The symptoms are greenish droppings, intense thirst, prostration, and death or relief within forty-eight hours. Chicks should not be kept with adults until well advanced in growth, and pullets intended for laying the next season will thrive best when not with the young cockerels. The poultry-house should be cleaned daily, and if the flock is confined in yards it will be an advantage to have two yards for each flock, so as to change from one yard into the other. The unoccupied yard should be used for growing green food, the top soil being turned under; in this way the yards can be kept clean. Poultry will always give the best results on a range, and an orchard serves the purpose well. Although prices of eggs are higher in winter than in summer, the small cost of the food and the larger number of eggs secured afford a greater profit on poultry and eggs in summer than in winter. Poultry-houses should be well lighted with windows, as fowls will not remain in a dark poultry-house during the day even if the weather is stormy. The decimal system will serve to guide in making many estimates. Only ten hens should be allowed with one male, ten chicks in one brood are a sufficient number, and ten hens should have a house 10 feet square. Ten weeks is enough for a chick to make sufficient growth to reach the market, and the pullets of the large breeds should begin to lay when ten months old.

Although aquatic birds prefer to have access to a body of

water, yet they are very susceptible to dampness, and will thrive best when kept in houses having board floors, upon which straw should be placed. Turkeys always seek high roosts, and should be given an open shed with the roosts near the roof as a protection against storms. When compelled to roost in the open air they become liable to roup, a disease which destroys a large number of them.

PATRICK H. JACOBS.

Pound: See AVOIRDUPOIS and WEIGHTS and MEASURES.

Pound-nets: See FISHERIES.

Pound Sterling: a denomination of English money, equal in value to 20 shillings, or 240 pence, into which a pound of silver was anciently divided, thus giving origin to the term "pound." The word "sterling" is of obscure origin, but probably is derived from *Easterling*, the popular name of the Baltic and German traders who visited London in the Middle Ages. The silver penny was first called *Easterling*. See COINAGE.

Poussin, GASPARD: See DUGHET.

Poussin, poo'sān', NICOLAS: painter; b. at Villers, in Normandy, June, 1594. Quintin Varin, of Les Andelys, taught him painting. He went to Paris at the age of eighteen and studied there for a time. He was not able to get to Rome till the age of thirty. There he lived with Du Quesnoy, afterward called *Il Fiammingo*; this artist was of much service to him in the development of his style. Poussin studied anatomy in Rome and attended the academy of Domenichino. He endured great poverty until Cardinal Barberini, who had been ambassador in France and Spain, took him under his protection on his return to Rome, and commissioned him to paint two pictures—*The Death of Germanicus* and *The Capture of Jerusalem*. The patronage of the cardinal brought him good fortune and when, after an absence of sixteen years, he returned to Paris he was introduced to Louis XIII. by Cardinal Richelieu. The king gave him the appointment of court painter with rooms in the Tuileries and a salary of 120 francs a year. He returned to Rome to fetch his wife, but as Louis XIII. died about this time Poussin spent his remaining years in Rome. He died Nov. 19, 1665, and was buried in San Lorenzo in Lucina. More than 200 prints have been engraved after his pictures. Poussin had an immense influence in landscape-painting. Gaspard Dughet was his brother-in-law and pupil. W. J. STILLMAN.

Pout: See BIB.

Pouter: a breed of pigeons characterized by the great dilatation of the gullet, which can be distended with air until the neck assumes a globular shape. This is simply the swelling of the neck seen during the act of cooing, carried to a greatly exaggerated condition by selection. The legs are long and feathered, tail and wings long, the latter pointed and weak. The pouter has one more pair of ribs and two more presacral vertebrae than ordinary pigeons. F. A. L.

Powder: See EXPLOSIVES and GUNPOWDER.

Powderly, TERENCE VINCENT: labor leader; b. at Carbondale, Pa., Jan. 22, 1849; attended a district school; was switch-tender on the Delaware and Hudson Railroad 1862-64; car-repairer 1864-66; served apprenticeship at machinist's trade 1866-69; removed to Scranton, Pa., 1869; worked as a machinist until 1877; elected mayor of Scranton 1878; re-elected 1880, 1882; elected general master workman, Knights of Labor, 1879, and held office until 1894; admitted to the bar 1894. He has lectured on industrial questions in the principal cities of the U. S. and Canada; has published *Thirty Years of Labor*, and is a contributor to *The Journal of the Knights of Labor*, *The North American Review*, and other periodicals.

Powell, BADEN, F. R. S.: mathematician and theologian; b. at Stamford Hill, near London, Aug. 22, 1796; educated at Oriel College, Oxford, and graduated 1817; took orders in the Church of England; became vicar of Plumstead 1821; was Savilian Professor of Geometry at Oxford from 1827 till his death in London, June 11, 1860. Author of many contributions to scientific periodicals, of several mathematical treatises, and published, among other works, *The Connection of Natural and Divine Truth* (1838); *The Order of Nature considered in Reference to the Claims of Revelation* (1859); and an essay *On the Study of the Evidences of Christianity*, in the celebrated volume entitled *Essays and Reviews* (1860).

Powell, JOHN WESLEY, Ph. D., LL. D.: geologist and anthropologist; b. at Mt. Morris, N. Y., Mar. 24, 1834. The

son of a Methodist minister, his youth, in Ohio, Wisconsin, and Illinois, was attended with hard work, exposure, and privation. He studied as he had opportunity at Illinois, Wheaton, and Oberlin Colleges, teaching meantime and making scientific collections. During the civil war he rose from the ranks to a lieutenant-colonelcy in the Second Illinois artillery, and lost his right arm at Shiloh. In 1865 and 1866 he served as professor in the Wesleyan College and the Illinois Normal University successively, and during the next year he led an exploring party through the hitherto unvisited canyon of the Colorado river. The success of this expedition caused Congress to authorize a survey of this mysterious river and the Rocky Mountain region and to place Maj. Powell at its head. In 1879 the four separate surveys operating in the Territories were consolidated, named the U. S. Geological Survey, and made a bureau of the Department of the Interior, and the same year the Bureau of Ethnology was organized with Maj. Powell as its chief, as a part of the Smithsonian Institution. The next year, on the retirement of Clarence King, Maj. Powell became director of the survey also. The reports and monographs issued under his direction have been the handsomest and most valuable publications of the Government, and in 1891 the French Academy awarded to him and his scientific corps the famous Cuvier prize. He has received degrees from Harvard and Heidelberg, is a member of the chief scientific societies of the U. S., of some of which he has held the presidency, and has been made honorary or corresponding member of the important scientific societies in all countries. In the summer of 1894 he resigned his position as director of the Geological Survey, but retained that of the Bureau of Ethnology. Among his best known books are *Exploration of the Colorado River* (1875); *Report on the Geology of the Uinta Mountains* (1876); *Report on the Arid Region of the United States* (1879); *Introduction to the Study of Indian Languages* (1880); *Studies in Sociology* (1887); *Canyons of the Colorado* (1893). He is an associate editor of *Johnson's Universal Cyclopedia*.

Power, HENRY, M. B. Lond., F. R. C. S.: ophthalmologist; b. at Nantes, France, Sept. 3, 1829; studied medicine at St. Bartholomew's Hospital, London, becoming in 1851 a member, and in 1854 a fellow, of the Royal College of Surgeons; subsequently became a member of the council and vice-president of that body; was appointed ophthalmic surgeon and lecturer on diseases of the eye at St. Bartholomew's Hospital; was lecturer on physiology at the Westminster Hospital, and edited the 6th, 7th, 8th, and 9th editions of *Carpenter's Principles of Human Physiology*; was examiner in natural sciences for the Universities of Oxford and Cambridge; was co-editor of *A Biennial Retrospect of Medicine and Surgery* from 1865-74. While he has practiced his specialty, ophthalmology, he is equally well known as a physiologist. His important works are *Illustrations of some of the Principal Diseases of the Eye* (London, 1868) and *Elements of Human Physiology* (1884).

S. T. ARMSTRONG.

Power, TYRONE: actor; b. in County Waterford, Ireland, Nov. 2, 1797; removed to Wales in early life; made his debut at the Cardiff theater; retired from the stage for several years; played in the principal cities of England, including London; excelled in the delineation of Irish characters. During his last engagement at the Haymarket theater Power's salary was advanced to £150 per week. He made successful tours in the U. S. 1833-35 and 1840-41, and embarked for Europe Mar. 11, 1841, in the steamship President, which was never heard of afterward. He wrote two novels and *Impressions of America* (2 vols., London, 1835).

Revised by B. B. VALLENTINE.

Power-loom: See LOOM.

Power of Attorney: a written instrument conferring upon one person the power to act for another. It is a deed, or sealed instrument, at common law; but modern statutes frequently dispense with the seal. It ordinarily contains the name of the principal, the name of the agent, a precise statement of the authority conferred, with a declaration that the principal ratifies and confirms all authorized acts of the agent, and the seal and signature of the principal. Often it gives to the agent the power to substitute a third person in his stead. A power of attorney may be revoked, unless the power is coupled with an interest. See AGENT.

FRANCIS M. BURDECK.

Powers: in the real property law of England and the U. S. an authority vested in one person to dispose of an es-

tate which is vested in another. It may be created by the deed or will by which the estate itself is conveyed, and the power to make a further disposition of the estate may be reserved by the person making the conveyance, or may be conferred by him on the grantee of the estate or on a stranger. A usual mode of creating a power at common law is for the grantor or donor of the estate to convey it by deed or will to A for life, at the same time giving A the power to appoint, by deed or will, the person who should have the estate after A's death. Here the grantor of the estate is called the *donor of the power*. A is known as the *donee or appointer*, and the person designated by A to take the estate after the termination of his own life-estate is called the *appointee* under the power.

The effect of the execution of the power by A is to vest the estate at once in the appointee, and the latter is considered to have derived his estate, not from A (who was never seised of it himself), but from the original donor, and through and by virtue of the will or deed by which the power of appointment was created.

The institution of powers was one of the devices of the great land-owners for tying up estates for the benefit of their families and for restricting, to some extent, the alienation of the estates by their immediate descendants. They owed their origin to that highly artificial but flexible system of conveyancing which resulted from the operation of the Statute of Uses. (See USES.) They have greatly diminished in importance but are still in use in England and in the U. S., though in many of the States their use is much restricted by statute. The principal employment of powers at the present time is to confer on executors or trustees the authority to sell lands under a will, for the payment of debts, legacies, or for other purposes. Where such a power is given, without any estate in the land, it operates by way of executory devise in favor of the person to whom the land is sold under the power, and the purchaser takes as devisee under the will and not by way of conveyance from the trustee or executor. The fee in the meantime goes to the heir until the power is executed; but where the land itself is devised to the trustee or executor for the purpose of the sale, the purchaser derives his title from him and not from the will.

The leading treatise on this intricate branch of the law is Sugden on *Powers*. See also *American and English Encyclopedia of Law*, article *Powers*. GEORGE W. KIRCHWEY.

Powers, HIRAM: sculptor; b. at Woodstock, Vt., July 29, 1805. In 1817 his parents removed to Cincinnati, O., where he lived until 1835, and where he began his life work by learning to take casts from models and by making wax figures for a museum. In 1835 he went to Washington, D. C., where he constructed a revolving *jet d'eau* for the Capitol grounds, and modeled the heads of several distinguished men, including J. Q. Adams, Jackson, Van Buren, Webster, Calhoun, and Preston. After spending two winters in Washington, Powers, with the assistance of friends, removed to Florence, Italy, in 1837. His busts acquired a reputation for fidelity to nature and the highest possible finish, and the insufficiency of his pecuniary resources obliged him to confine himself to this branch of his art to the extent of his orders; but he devoted every spare moment to ideal work, and the *Greek Slave*—finished in 1843, and purchased by Alexander T. Stewart—secured for its author a certain position among modern sculptors. Many repetitions of this statue were made, most of them for England. In the winter of 1872-73 his already declining health became so impaired that he was obliged to discontinue work, and on June 27, 1873, the sudden rupture of a blood-vessel closed his life. Besides the above-named works, Powers executed a large number of ideal busts of great merit, as well as many statues; among the latter, those of Washington, *The Fisher Boy*, *America*, *Eve Disconsolate*, and *The Last of the Tribes*.

Revised by RUSSELL STURGIS.

Powers, Mechanical: See MECHANICAL POWERS.

Powhatan': the principal chief of several confederate clans or tribes of Eastern Virginia at the time of the settlement of Jamestown in 1607, usually called "emperor" by the early writers, though the number of his subjects was estimated at only 8,000. He was hostile to the English, with whom he repeatedly came into collision. Powhatan's principal residence was at Werowocomoco on York river, within the present limits of Gloucester County, where he maintained considerable pomp, being always attended by a body-guard of four warriors. D. in Apr., 1618.

Pownall, THOMAS, LL. D.: statesman; b. at Lincoln, England, in 1722; graduated at Cambridge 1743; became secretary to the commissioners for trade and plantations 1745; went to New Jersey as secretary of that province 1753; became lieutenant-governor 1755; was a member of the colonial congress which met at Albany in 1754 to devise measures of defense against the French; was Governor of Massachusetts 1757-60, of South Carolina 1760-61, after which he became director-general of the office of control; sat in Parliament, where he opposed in many well-considered speeches the rash policy of the crown toward the American colonies; published *The Administration of the Colonies* (1766); *A Topographical Description of the Middle British Colonies* (1775); and many other works on archaeology and politics. D. at Bath, England, Feb. 25, 1805.

Poynter, EDWARD JOHN: historical painter; b. in Paris, of English parents, Mar. 20, 1836; studied at the Royal Academy, London, and under Gleyre in Paris; Royal Academician 1876; Slade Professor of Fine Arts at University College, London, 1870-75; director of the art schools at South Kensington Museum 1875. One of his most celebrated works is *Atalanta's Race* (1876), and he has executed noteworthy frescoes in St. Stephen's church, Dulwich, and mosaics in the Houses of Parliament. Studio in London.

W. A. C.

Pozzi, pô't'sê, SAMUEL JEAN, M. D.: gynæcologist; b. at Bergerac, Dordogne, France, Oct. 3, 1846; studied medicine in Paris, graduating M. D. in 1873; in 1875 became associate professor in the faculty, and in 1877 surgeon to the hospitals; paid special attention to gynæcology, and is one of the most prominent of European specialists. His most important work is *Traité de gynécologie clinique et opératoire* (Paris, 1890).

S. T. ARMSTRONG.

Pozzo di Borgo, pot'sô-dê-dê-bôr'gô, CARLO ANDREA: diplomat; b. at Alata, in Corsica, Mar. 8, 1764; studied law at the University of Pisa, and settled as an advocate at Ajaccio, where he lived in great intimacy with Joseph and Napoleon Bonaparte. This friendship soon cooled, however, and the relation between the former friends assumed a very bitter character when Pozzo di Borgo espoused the cause of Paoli, who showed great confidence in him. In 1791 he represented Ajaccio in the National Assembly, and sided with the Girondists, but returned to Corsica in 1792; held a high position in the government of the island during its occupation by the British, and fled, after their expulsion, to London. Here he became the agent of the French *émigrés*, and began his flying missions from one court to another to form plots and coalitions against France. In 1803 he entered the Russian diplomatic service, and the interest which Alexander I. took in him gave an opportunity of gratifying his hatred of the Bonapartes. The intimacy which sprang up between Napoleon and Alexander after the Peace of Tilsit brought him for a moment into great danger, and he went first to Austria and then to England, never ceasing to work for the downfall of Napoleon. In 1812 the Czar recalled him to St. Petersburg. He induced Alexander to continue the war in 1813, and he persuaded the allies to reject Napoleon's offers of peace. He wrote the famous proclamation which preceded the entrance of the allies into France—that they waged war against Napoleon, not against the French people—and he had at last the triumph of signing the Treaty of Paris in 1815 as Russian ambassador. After the fall of Napoleon he remained in the Russian service, and enjoyed great esteem from the Russian court, though perhaps not always full confidence. In 1825 the Emperor Nicholas made him a count. He was for several years ambassador in Paris, where he was the oracle of the doctrinaires and detested by the radicals. In 1834 he was appointed ambassador in London, but retired from public life in 1835. D. in Paris, Feb. 15, 1842. See Vuhner, *Notice biographique sur le Comte Pozzo di Borgo* (Paris, 1842).

Pozzuolana, pô't-soo-ô-laa'na: a rock possessing the properties of hydraulic lime or cement, so called from the village of Pozzuola, near the base of Mt. Vesuvius, where it was first discovered. The word is applied to the pozzuolanas proper, tras or terras, the arènes, some of the ocherous earths, and the sands of certain graywackes, granites, basalts, etc. Their principal ingredients are silica and alumina, the former largely preponderating, and most of them contain small quantities of soda and potash, and the oxides of iron and manganese. When finely pulverized, even without previous roasting, and combined with a paste of common lime, a hydraulic mixture is produced which will

compare favorably with the mortars of hydraulic lime and sand. Pozzuolana itself was known to both Vitruvius and Pliny, and it was extensively used by the Romans before their day. Vitruvius gives a formula which, with slight variations, has been followed in Italy ever since: 12 parts of pozzuolana, well pulverized; 6 parts of quartzose sand, well washed; and 9 parts of rich lime, recently slaked. This constitutes the mortar. To this is added 6 parts of broken stone, porous and angular, when it is intended for concrete or monolithic masonry.

Tras closely resembles pozzuolana, and is employed substantially in the same way. It is found on the Rhine between Mayence and Cologne, and in various localities in Holland. The arènes are a species of ocherous sand, containing so large a proportion of clay that they can be mixed into a paste with water without the addition of lime, and used in that state for pisé work, as well as for common mortar. Mixed with rich lime, they yield hydraulic mortars of considerable energy. Many of the natural pozzuolanas are improved by a slight roasting, and an artificial pozzuolana may be produced by subjecting clay to a slight calcination. Brick-dust mixed with common lime gives a feebly hydraulic mortar. Forge scales from the smith's anvil, the slags from iron-foundries, and the ashes from lime-kilns, containing cinders, coal, and lime, are artificial pozzuolanas. Revised by MANSFIELD MERRIMAN.

Pozzuoli, pô't-soo-ô-lêe (Gr. *Δικαιαρχία*; Lat. *Puteoli*): town in the province of Naples, Italy: on the northern shore of the Bay of Pozzuoli, about 6 miles W. of the city of Naples (see map of Italy, ref. 7-F). The streets are narrow and irregular, and many of them very steep. Among the buildings there is little of interest except the cathedral of St. Proculus, which occupies the site of a temple erected to Augustus by L. Calpurnius. The neighborhood of Pozzuoli, however, abounds in interest for the archaeologist. The famous temple of Serapis consisted of a rectangular court inclosed by forty-eight massive columns, and having in the center a round temple with sixteen Corinthian pillars of African marble. The statue of Serapis is now in the National Museum of Naples. The amphitheater erected in the time of the Flavian dynasty accommodated 30,000 spectators. There are besides minor ruins, among which are a temple of Neptune and a temple in honor of Hadrian, which was built on the site of Cicero's villa. In 194 B. C. Puteoli was colonized from Rome, and afterward became the most important commercial port in Italy. Later it was sacked by Alaric (410), Genseric (455), Totila (545), and the Turks (1550), and ruined by earthquakes in 1198 and 1538. In 1888-90 military engineering works, a branch of the Armstrong works at Newcastle, were established here. Agriculture, fishing, soap-making, etc., are carried on. Pop. 11,967.

Practice: in law, the form and manner of conducting suits or prosecutions (whether legal or equitable, civil or criminal) through the necessary steps according to the principles and rules governing in the several courts. The scope of the meaning of the term is not definitely settled, but it is generally used as excluding the principles and rules of both pleading and evidence, and referring rather to the formal method and course of bringing matters pleaded to trial and proof, and of enforcing judgment. The jurisprudence of every civilized country, ancient or modern, has established certain formal modes in which proceedings before public tribunals must be conducted, as being in general promotive of public justice, and contributing to private convenience. The rules of practice are to a large extent fixed by custom or statute, but the judges of the different courts are very generally intrusted with a large discretionary power of changing them. See the general treatises of Chitty and Daniell (Chitty, common practice law; Daniell, chancery, or equity, practice) and the numerous special treatises on the practice of the various courts.

F. STURGES ALLEN.

Pradier, JAMES: sculptor; b. at Geneva, Switzerland, May 23, 1792. In 1809 he entered the studio of Baron Lemot, and by special favor was exempted from the conscription even in the height of Napoleon's demands upon his empire. In 1813 he won the Grand Prix de Rome by his bas-relief of *Philoctetes and Ulysses in Lemnos*. He then spent the usual time of five years in Rome, and on his return exhibited a *Nymph*, now in the Museum of Rouen, and other works. During another stay in Italy, before 1823, he produced three statues, which were bought by the Government for the Luxembourg Museum—a *Venus*, a *Psyche*, and a *Son of Niobe*. Then came a number of important works

for the churches of Paris and Versailles, a *Venus* now in the Museum of Orleans, a group of the *Three Graces* which stands in the Museum of Versailles, the colossal allegorical statues of *Strassburg* and *Lille* on the Place de la Concorde in Paris, several statues for the fountain of Molière near the great National Library, the *Tudor Victories* of the tomb of Napoleon in the Church of Les Invalides, statues for the funeral chapel of the royal family at Dreux, four bas-reliefs, *Flame* for the Arc de Triomphe, and a great number of smaller works in public and private collections. He was always as classical as he knew how to be, but his work has a feminine grace which he did not find in his Græco-Roman models. D. at Bougival, near Paris, June 14, 1852.

RUSSELL STURGES.

Pradier-Fodéré, PAUL LOUIS ERNEST: publicist; b. at Strassburg, July 11, 1827; studied law in Strassburg, and was admitted to the bar of Paris in 1857, and made Professor of Public Law in the Armenian College of Moorat; appointed in 1874 by the Peruvian Government to organize the instruction in the studies of political and administrative sciences in the University of Lima. At the end of the war with Chili he returned to France and was made *conseiller* (judge) of the court of appeal of Lyons June 3, 1882; Chevalier of the Legion of Honor. He has published, besides other works, *La Question de l'Alabama et le Droit des Gens*; *Commentaire sur le Code de Justice Militaire*; *Traité de Droit International Public, Européen et Américain*; *Droit de la Guerre et de la Paix* (translation of the work by Grotius); *Précis de Droit Administratif*; *Traité de Droit Commercial*. F. STURGES ALLEN.

Pradon, प्रादोन्, NICOLAS: dramatic poet; b. at Rouen, France, 1632; went early to Paris and devoted himself to literature. Of very mediocre poetic gifts, he was yet able to enjoy a great temporary reputation as a tragic poet, profiting by the jealousies excited by the popularity of Racine. His *Phèdre* et *Hippolyte* (1677), played a few days after the *Phèdre* of Racine, appeared, by an intrigue of Racine's enemies, to have a striking triumph over it, which led Racine to renounce the drama. D. in Jan., 1698. A. G. C.

Præd, प्राद, WINTHROP MACKWORTH: poet; b. in London, July 26, 1802; educated at Eton; was the associate of John Moultrie and H. N. Coleridge in editing *The Etonian*; entered Trinity College, Cambridge, and graduated 1825; contributed to Knight's *Quarterly Magazine*; was called to the bar 1829; sat in Parliament as a Conservative for St. Germain, and subsequently for Great Yarmouth and Aylesbury; became secretary of the board of control 1834, and afterward recorder of Barnstaple and deputy high steward for the University of Cambridge. He wrote essays and graceful *vers de société* for the magazines. D. in London, July 15, 1839. His *Poems* were edited in New York by R. W. Griswold (1844), and, with a *Memoir*, by W. H. Whitmore (2 vols., 1859), and a complete edition, with a memoir by Rev. Derwent Coleridge, was issued by his sister, Lady Young (2 vols., 1864). His prose essays were published in 1887 and an edition of his political poems in 1888.

Præneste: See PALESTRINA.

Præraphaelites: See PRÆRAPHAELITES.

Prætor [= Lat., for **prætor*, one who goes before, deriv. of *præire*, go before; *præ*, before + *ire*, go]: in ancient Rome, a magistrate created by the Licinian law of 367 B. C. as "lesser colleague" of the two consuls. In practice, however, the functions of the prætor were quite exclusively judicial. He was obliged to remain in the city, and from this fact was called the *prætor urbanus*. About the middle of the third century B. C., with the increase of the city's population, an additional prætor was named and given jurisdiction over the foreigners resident at Rome, and hence called the *prætor peregrinus*. With the expansion of Roman territory new prætors were added until in the reign of Claudius (41-54 A. D.) there were eighteen, though not all of them exercised judicial functions. In the early part of the first century B. C. the custom was inaugurated of practically extending a prætor's term of office by sending him out as governor of a province on the expiration of his year of service in the city. By their decisions as judges, and especially by their edicts or official announcements of the principles on which jurisdiction would be based, the prætors became most important agents in the development of the Roman law. G. L. HENDRICKSON.

Prætorians [from Lat. *prætorium*, or *cohors prætoria*, prætorium, prætorian cohort, orig. the body-guard of a gen-

eral (Lat. *prætor*, prætor, general), later of the emperor]: the personal guard of the Roman emperors. During the time of the republic the general in command had a guard, a *cohors prætoria*, which consisted of picked soldiers from the legions, whose only mark of distinction from the common soldiers was the bravery or devotion which had commended their selection. At the end of a campaign this guard was always dissolved and its members returned to the legions. Augustus, however, transformed (in 27 B. C.) his *cohors prætoria* into a standing body of troops, consisting of ten cohorts, each numbering 1,000 men (horse and foot), of which he kept three in Rome for service in the palace, while the rest were stationed in the neighborhood of the metropolis. Tiberius gathered all the cohorts to Rome for the sake of maintaining a better discipline, and built them a fortified camp in the northeastern corner of the city, and Vitellius increased their number to sixteen cohorts. Originally, only Italians were employed in this guard, but later others were admitted from regions which had become thoroughly Romanized. The term of service was sixteen years; the pay double that of the legions; the rank of a private of the guard equal to that of a centurion in the legions; and when the time of service expired each soldier received 20,000 sesterces. In the hands of ambitious and unscrupulous prefects their political influence was often superior to that of emperor or senate. They were the murderers of many of the emperors, none of whom could maintain themselves without their aid, and their voice was often the controlling one in determining the imperial succession. In the remodeling of the Roman military system by Constantine the prætorian guard was abolished.

Revised by G. L. HENDRICKSON.

Pragmatic Sanction: a diplomatic term which originated with the Byzantine court, and denoted the highest and most solemn state ordinances issued by the emperor. It was early introduced into France, and has become historical as applied to four important instruments—namely, (1) that by which Charles VII. and the States-General of France, assembled at Bourges in 1438, adopted those decrees of the Council of Basel which authorized the election of bishops by cathedral chapters, and which were condemned by the pope. (See GALLICAN CHURCH.) (2) That by which the same decrees were adopted by the German Diet, assembled at Mentz in 1439. (3) That by which Charles VI., Emperor of Germany, who had no male issue, settled the right of succession to his Austrian dominions on his daughter, Maria Theresa. It was accepted by the various peoples over which he ruled, consented to by the different members of his family, guaranteed by all the European states, but immediately after his death (Oct. 20, 1740) the war of the Austrian Succession (see SUCCESSION WARS) broke out. (4) That by which Charles III. of Spain in 1759 settled the right of succession to the kingdom of the Two Sicilies on his third son, Ferdinand.

Prague (Germ. *Prag*; Czech, *Praha*): the capital of Bohemia, Austria; in lat. 50° 5' N., lon. 14° 25' E.; on both sides of the Moldau, 217 miles by rail N. N. W. of Vienna (see map of Austria-Hungary, ref. 3-D). It presents a picturesque and imposing aspect on account of the diversity of the surface on which it stands and its numerous towers, spires, and domes. It was surrounded by a wall 12 miles in circumference, which, since 1866, has been to a great extent removed; outside this line extend the suburbs of Karolinenthal, Wyscherad, Weinberg, and Smichow. The city proper consists of five parts—the Altstadt, Neustadt, and Josephstadt on the right bank of the Moldau, and the Hradschin and Kleinseite on the left—connected with each other by several bridges, of which the most remarkable is the Karlsbrücke, built 1358-1503 of stone, 31½ feet broad, 1,572 feet long, resting on sixteen arches and adorned with statues. The Altstadt, consisting of narrow, crooked streets lined with tall, quaint old houses, the Neustadt, of a more modern and elegant appearance, and the Josephstadt, the Jewish city, form the business part of Prague; the Hradschin and Kleinseite consist almost exclusively of palaces and public buildings. Here is the imperial castle, one of the largest royal residences in Europe. The Hradschin Place, formed by the immense palaces of the prime, the ex-Emperor Ferdinand, and Prince Schwarzenberg, extends in front of the castle. On the terrace in the rear of the castle stands the cathedral of St. Vitus, a Gothic structure built 1343-85, and containing the tomb of St. Nepomuk, the patron saint of the country, with his monument of solid

silver weighing 30 cwt., and a mausoleum of Carrara marble erected by Rudolph II. over the Bohemian kings. Among the most prominent buildings of the Kleinseite are the so-called Sachsenhaus, built in the thirteenth century; the gorgeous Church of St. Nicolai, erected in 1628 by the Jesuits; the palaces of Waldstein with beautiful gardens, of Fürstenberg with a large library and a picture-gallery, of Nostitz with a collection of coins, a library, and an art gallery, etc. In the Altstadt is the church Am Teyn, the old Hussite church, founded in 1407, containing the monuments of the two Bohemian martyrs, Cyrillus and Methodius, and of the Danish astronomer Tycho Brahe. The university has a library containing 195,000 volumes and 3,800 MSS., a botanical garden, a laboratory, an observatory, and the faculties of theology, law, medicine, philosophy (which comprises also languages and history), and the exact sciences. It was founded in 1348 by Charles IV., and was frequented in the fifteenth century by about 10,000 students, but subsequently its importance decreased. It was reorganized in 1881 and now has two sides, one German and the other Czech. In 1892 the former had 152 teachers and 1,248 students, and the latter 152 teachers and 2,354 students. There is also a technical high school of engineering and chemistry with (1892) 117 teachers and 569 students. The suburb of Karolinenthal, which is of modern growth, has numerous fine buildings, public gardens, and manufacturing establishments; farther N. there are public walks on the Moldau and a great botanical garden. The commerce and industry of the city are considerable. Leather, glass, liqueurs, beer, spirits, chemicals, woollens, linens, metal ware, and machinery are manufactured. Prague was founded in the eighth century, and has ever since formed the leading center of the Czech community. After the connection with Austria, Bohemia was often dragged into wars entirely foreign to its interests, and Prague, as its capital and a strong fortress, has several times suffered severely from sieges and bombardments. In 1866 it was occupied by the Prussians without bloodshed, and a treaty was concluded here. About four-fifths of the inhabitants are Czech. Pop. (1890) of the town proper, 184,109; with the suburbs (1893) 327,953.

Revised by R. A. ROBERTS.

Prairie [= Fr. < Late Lat. *prateria*, an extensive meadow, deriv. of *prae*, meadow > Fr. *pré*, meadow]: a word applied by the early explorers of North America to the fertile, grassy plains of the Mississippi basin. Prairies are level or gently rolling, and free from trees. The origin of their even surface has been described under PLAIN (*q. v.*) as sheets of fine glacial drift, or beds of former lakes, or swamps, or deeply weathered plains of denudation. The absence of trees has been much discussed. It can not be ascribed to deficiency of rainfall, as is the case on the treeless Western plains, for over the prairies the rainfall is sufficient and well distributed through the year. It can not be ascribed to excess of heat or cold, for trees grow abundantly in forests farther S. and N., as well as along water-courses and on hilly interruptions of the prairies. Moreover, trees will flourish on prairies if they are artificially planted and cared for. The absence of trees is more plausibly ascribed to the prevailing fine and close texture of the prairie soil, this explanation being particularly applicable to those smaller prairies formed by the gradual filling of swampy lakes with peaty growth and fine silt, and to those broader prairies that represent the bottom of glacial lakes. There is reason to think that the former prevalence of prairie fires, while the country was occupied by Indians, may have had much to do with retarding the invasion of trees into districts where they would naturally spread; for trees are invading certain prairies, now that the settlement of the region prevents the frequent recurrence of fires.

The prairie region of the upper Mississippi valley is of extraordinary richness agriculturally, and has tempted rapid settlement by emigration from Europe and from the older Eastern States; it is in this respect strongly contrasted with the semi-arid, treeless plains farther W.

The prairies need no clearing of trees or rocks, and they yield abundant crops. Their disadvantages are insufficient local supply of timber for building and fuel, scarcity of building stone and road metal, and generally a want of sufficient slope for good drainage.

W. M. DAVIS.

Prairie-dog: any rodent of the genus *Cynomys*, which forms a part of the great squirrel family, whose members are closely related to the ground or prairie squirrels (*Spermophilus*). Why they were called *dogs* it is difficult to see, for

they neither look, act, nor bark like those animals. They are considerably larger than the squirrels, being generally about a foot in length, exclusive of the tail, which is short and from about 2 to nearly 5 inches in length, according to the species. They inhabit the prairies of Western North America, congregate in large numbers, and form communities designated as "villages." They burrow to a considerable distance in the ground, throwing up around the mouths of the burrows hillocks on which they are wont to mount and from thence survey the doings of the community. Horses are sometimes thrown by stumbling into such burrows. Four species of *Cynomys* are recognized, the best known being *C. ludovicianus*, abundant on the plains from Kansas to the Rocky Mountains, and from Western Texas to 49° N. The fable still clings to this species that it lives in harmony with the burrowing owl (*Speotyto*) and rattlesnake, but when any two of the above-named animals are found together it is either due to accident or bodes ill to the young "dogs" or owls. *Cynomys mexicanus* is a more southern species, while *C. gunnisoni* and *leucurus* inhabit uplands.

Revised by F. A. LUCAS.

Prairie du Chien, *prā-rēe-doo-sheen'*: city; capital of Crawford co., Wis.; on the Mississippi river, 3 miles from its junction with the Wisconsin, and the Burlington Route and the Chi., Mil. and St. P. railways; 70 miles N. by W. of Dubuque, Ia., 194 miles W. of Milwaukee (for location, see map of Wisconsin, ref. 7-C). It has a large river trade, numerous artesian mineral wells, several mills, machine-shops, and other manufactories, St. Mary's Institute, St. John's College, a State bank, and two weekly newspapers. Pop. (1880) 2,777; (1890) 3,131; (1895) 3,286.

Prairie-hen, or **Pinnated Grouse**: a peculiar form of the grouse family, the *Tympanuchus americanus*, restricted to the U. S. and found chiefly on comparatively open plains and prairies. The species is at once recognizable by the extension of feathers to the lower end of the tarsus, the air-bladders, and the long and lanceolate feathers of the sides of the neck, and the short, subtruncate tail; the former generic name (*Cupidonia*) alludes to the long neck-feathers, which have recalled to the imagination of some the wings of the fabled Cupid; beneath these feathers on each side is a bare and distensible air-sac developed in the male, and connected with the organs of voice. During the love season the male inflates the bladders, which then resemble small oranges, lowers his head to the ground, and opening his bill gives utterance to a single sound, produced partly by means of the air contained in these bladders, which are alternately filled and emptied as he makes his booming noise. If these sacs are punctured they are no longer resonant. The prairie-hen feeds chiefly upon berries of various plants, as well as upon the buds, and in some places encroaches considerably upon the domains of the farmer. This species ranges from Illinois westward to the foot-hills of the Rocky Mountains, and formerly abounded, but has been decimated by market gunners. It is replaced in the Southwest by *T. pallidicincta*. A very closely related species, *Tympanuchus cupido*, formerly inhabited portions of the eastern parts of the U. S., and in comparatively recent times was common on Long Island, but has now been almost exterminated, only a few individuals being left on Martha's Vineyard and Naushon. This bird was for a long time confounded with the Western species, and much confusion of names has arisen in consequence.

Revised by F. A. LUCAS.

Prairie-squirrel: any member of the genus *Spermophilus*, of the family *Sciuridae*, found in various parts of the U. S. These are simply squirrels frequenting the ground rather than the trees, and having a shorter tail than the tree-squirrels, and also provided with cheek-pouches. They live on the prairie-lands of the Western States and Territories, make burrows, and generally associate in considerable communities. Eleven species are now recognized as inhabitants of various parts of the U. S.; the best known are the *Spermophilus 13-lineatus* (striped gopher and prairie-squirrel of Illinois, Iowa, and adjacent States), and the *Spermophilus franklini* (great gopher of Illinois and corresponding latitudes upward to the Saskatchewan region). See also *SCIURIDÆ*.

Prairie-wolf: See *WOLF*.

Prâkrit Languages [*Prâkrit* is from Sanskr. *Prâkrta*, liter., natural, common, vulgar, vernacular, deriv. of *prakṛti*, origin]: in Hindu usage, all languages derived from San-

skrit as their common source (*prākṛti*); Sanskritists and linguists, however, restrict the connotation of this term to the languages immediately derived from Sanskrit, while they call those more remotely connected with it *bhāṣā*, vernaculars, or modern Prākṛits. This article refers to the Prākṛit dialects in the narrower signification of the word.

The source of the Prākṛit languages is not the literary Sanskrit which has been cultivated by the Brahmans as their sacred language, but popular idioms of perhaps equal antiquity, which may be regarded as constituting, together with literary Sanskrit, the Aryan dialects of ancient India. The Prākṛits are lineal descendants from them. There have been brought forward some very interesting speculations on the distribution of these old Indian dialects (see Hoernle's *Comparative Grammar of the Gaudian Languages*, London, 1880, p. xxxi. ff.), but no certainty is yet attainable.

Though the root of the Prākṛits is fixed in the ancient Indian dialects, they developed under the continued influence of the Sanskrit. Their constant dependence on it is more visible in the literary Prākṛits than it would have been in the popular language, but of the latter we know little or nothing. The development of the Prākṛits differs considerably from that of languages which were entirely left to themselves. Nearly all crude forms of Sanskrit words could at all times be borrowed by Prākṛit writers, provided that they were made to agree with the phonetic laws of the dialect; such words are called *tatsamas* when they are identical with their Sanskrit prototypes, and *tadbhavas* when their difference from them is caused by a phonetic change only. On their account all Prākṛits look more archaic than their long separation in time from their parent language would lead us to expect. This appearance, however, is deceptive, for many words of common use, as some verbs (called *thātva-deśas*), numerals, pronouns, etc., which could not be borrowed from the sacred language, present forms which can not be brought under the well-known phonetic laws of Prākṛit. The same remark applies to the so-called *deśis*—i.e. words used in the Prākṛits, which can not be derived from Sanskrit, or have a meaning different from their meaning in Sanskrit. The *Deśināmāmalā* of Hemachandra (ed. by Prof. Pischel in the Bombay Sanskrit Series, 1880) contains about 3,000 *deśi* words, most of which are, as would seem at present, without corresponding originals in Sanskrit. They are probably derived from such Sanskrit prototypes as belonged to the vocabulary of the common people, and were therefore beyond the remodeling influence of learned authors.

The oldest Prākṛits are the Pāli, the nearly cognate idioms of the inscriptions, ranging from about 250 B. C. to 200 A. D. The Prākṛits proper, which represent a more advanced phase in the development of the language, come next in time. Among them Paicācī seems to have preserved the most archaic character. In this language was composed the *Bṛhatkathā* by Guṇādhyā, probably in the first century A. D. It has not yet been recovered, and we have but scant materials to form an idea of its language. Younger than it from a linguistic point of view, but older from a literary one, is the Jaina Prākṛit, or the language in which the canonical books of the Jains were written; but as these works were brought into their present shape many centuries after their composition, their language may have undergone alterations. As it is, it resembles the Māhārāṣṭrī dialect in most points, but it has many forms which may be older or be derived from other sources. The writer believes that the Jaina Prākṛit represents faithfully, on the whole, an old literary Prākṛit, and that the Māhārāṣṭrī is but a more modern and refined variety of it, which assumed its present form in order to be suitable for songs. The oldest work extant, written in Māhārāṣṭrī, is the *Saptaśatakam*, or collection of 700 stanzas by various older poets, edited by Prof. A. Weber (Leipzig, 1881), and in the *Kāvya-mālā* (Bombay, 1889). Its reputed collector is King Sātavāhana or Hāla, who lived probably about the second century A. D. Māhārāṣṭrī is considered by the Prākṛit grammarians as the standard Prākṛit: in it are composed all Prākṛit poems such as the *Sētibandha*, *Gauḍavaha*, etc., and it has been used by Jaina writers in many non-canonical works in verse and prose. There is, indeed, a large literature extant in Māhārāṣṭrī. The other dialects are chiefly used in dramas in which nearly all women and some men, not of the highest rank, speak various Prākṛit dialects. The one most frequently employed is the Čaurasēnī, but its use is almost entirely restricted to prose, while the same persons use Māhārāṣṭrī in their songs or verses. The remaining dialects,

among which Māgadhī, Ardhamāgadhī, Paicācī, Āvantikī are the most conspicuous, are reserved for persons of the lowest social, moral, or intellectual status, or to denote their local extraction. Most of these dialects are named after countries, probably after those where they were spoken. A third group of Prākṛit dialects which has undergone the greatest changes is collectively called Apabhraṃṣa, and is said to have been the language of *abhīras* or cowherds. These idioms seem to have been the forerunners of the modern vernaculars of India, and to have gradually merged into them. Yet they are apparently as old as the other Prākṛits, since they are used in one of Kālidāsa's plays, and some Apabhraṃṣa peculiarities occur in metrical works of the Jaina canon.

All Prākṛits, Pāli included, differ from Sanskrit in the following points: (1) They have lost (*a*) the Sanskrit vowels *r*; *l*; *ai*; *au*, replacing them by *a*, *i*, *u*, *ri*; *li*; *ē* or *ai*; *ō* or *au*; (*b*) the Visarga. (2) They have but one sibilant (rarely two), usually *s*, instead of the three sibilants in Sanskrit. (3) They do not admit groups of more than two consonants, which, besides, must never be dissimilar. (4) They shorten long vowels before two consonants (few exceptions in Pāli), and occasionally lengthen a short vowel when an original group has been reduced to one consonant. (5) At the end of words they allow only vowels and the *anusvāra*. (6) They have lost the dual number. Besides these special changes, the inflection, especially that of the verb, has been gradually simplified till in the most modern Prākṛits only few original forms are left.

In Prākṛit proper single consonants between vowels, which are generally retained in Pāli, are variously modified. In Māhārāṣṭrī the following consonants are dropped between vowels: *k*, *g*, *c*, *j*, *t*, *d*, *y*; they either disappear entirely or with the Jains are replaced by a scarcely audible *y*. The aspirates *kh*, *gh*, *th*, *dh*, *ph*, *bh* become *h*. The cerebral surds become soft, *ḍ* becomes *l*; *ṣ* and *ś*, *s*; *p* and *b*, *v*; *n*, *ṇ*. The same changes occur in Čaurasēnī except that the soft consonants, which are dropped or replaced by *h* in Māhārāṣṭrī, remain unchanged, and the surds become soft. This also applies to Māgadhī which, besides, changes *r* to *l*, and the sibilants to *ç*. Paicācī as taught by the grammarians totally differs in this respect from Māhārāṣṭrī and the other dialects, as it retains all single consonants between vowels, and only changes *d* to *t*, *ṇ* to *n*. Except these two changes Paicācī scarcely differs from the Prākṛit of the inscriptions; its difference from Pāli consists in the grammatical structure of the language which is more like that of Prākṛit proper. In the subdialect Čūlikapaicācī every soft consonant is changed to the corresponding surd. Jaina Prākṛit has an intermediate position between Paicācī and the standard Prākṛit, at least as regards single consonants; for it optionally retains them. It may be mentioned that it admits the dental *n* when it is initial or doubled or joined with *h*.

Initial single consonants undergo no change except *y*, which in Māhārāṣṭrī and Čaurasēnī becomes *j*, while in Māgadhī it retains its sound and even *j* is changed to *y*.

Conjunct consonants are treated in very much the same way as in Pāli (see the article on PĀLI); even those conjunct consonants which are admitted in Pāli, as *ḥv*, *lv*, *vy*, *yh*, *vh*, *tr*, *br*, *tv*, *sv*, *kr*, *sm*, are assimilated in Prākṛit to *jj*, *ll*, *vv*, *jjh*, *bbh*, *tt*, *bb*, *tt*, *ss*, *kk*, *mh*. In some points the dialects differ from one another. Thus Čaurasēnī admits *yy* for *ry*, which in Māhārāṣṭrī is changed into *jj*, and Māgadhī always has *yy* for the *jj* of the common Prākṛit. Māgadhī retains *s* before other consonants and substitutes *ṣ* for *tt* and *sth*, *st* for *sth* and *rth*, *çh* for *chchh*, the *jihvāmūliya* and *k* for *ksh*; it shares with the Paicācī and the older Prākṛits the change of *ny*, *ṇy*, *jñ*, *ñj* to *ññ*, which corresponds to *nn* in the other dialects.

As regards the inflection of nouns and adjectives, stems ending in consonants generally drop the consonant or add a vowel, so that they practically become stems ending in vowels; but some stems in *n* and *r* have retained a few original inflected forms. Thus we have only three declensions: (1) stems in *a*; (2) stems in *i* or *u*; (3) the feminine stems in *ā*, *ī*, *ū*. Following are the paradigms of the masculine in *a* and the feminines in *ā*: Singular nom. *dēvō*; voc. *dēva*; acc. *dēvam*; instr. *dēvina(m)*; dat. *dēvāy* rare; abl. *dēvāo*, *dēvā*; gen. *dēvassā*; loc. *dēvāni*. Plural nom. voc. *dēvā*; acc. *dēvā*; instr. *dēvhi(m)*; gen. *dēvāṇam*; loc. *dēvāsu*; abl. *dēvhiṃ*, *dēvāsu* (not frequent). Sing. nom. *mahilā*; voc. *mahlīḥ*; acc. *mahlīm*; abl. *mahlīḥ*; instr. gen. loc. *mahlīḥ*. Plural nom. voc.

acc. *mahilāo*, etc. Nom. acc. plural of neuters *vanāim* or *vanāni*. In Čaurasēni the abl. is *divādō*; loc. only *dēvō*; acc. plur. *dēvā*. The pronouns differ only in the gen. plur., which may be *tēsīm*, *tāsin*, or *tānam*. The personal pronouns have developed many new forms, most of which can be accounted for by the principle of analogy.

Prākrit has suffered the greatest loss of forms in the conjugation of verbs. Of original tenses it possesses but the present with its modes (indicative, optative, and imperative) and the future. The present or, more usually, the past passive participle is substituted for the original past tenses—the imperfect, perfect, and aorist. The *Ātmanēpadam* is lost, except the third person singular and plural, which are occasionally met with. There is but one set of endings: *mī*, *sī*, *i*; *mo*, *ha*, *nti* (in Čaurasēni, *mī*, *sī*, *dī*; *mha*, *dha*, *nti*). The imperative has peculiar endings in the second person singular: *hi*, *su* (Čaurasēni, *ssa*); third sing. *u* (Čaurasēni, *du*); third plural *ntu*.

The original variety of stems has given way to great simplicity; all stems of the present end in *a* or *ē*, few in *ā* or *ō*. From this stem the modes and tenses are derived. Following are the *Māhārāshtri* forms of the third person singular of a verb in *a*: Present, *bhañai*; imperative, *bhañau*; optative, *bhañejjō*; future, *bhañissai* or *bhañikhi*. The participle of the present is *bhañanta*, *bhañamāna*; of the future, *bhañissanta*, *bhañissamāna*; the infinitive is *bhañium*; the gerund, *bhañium*, *bhañiya*, *bhañitā*; the future pass. part., *bhañiyava*, *bhañanija*; the perfect pass. part., *bhaniya*. There are, however, many irregular forms which in truth are generally the regular Sanskrit forms. Besides the active, Prākrit has a regular passive verb, *bhañijai*, or one directly derived from Sanskrit, *bhañnai*, and a causative verb, *bhañāveti*. Both active and causative may be conjugated in all tenses and modes.

For details of Prākrit grammar, the student is referred to the following works: Chr. Lassen, *Institutiones linguae Pracriticae* (Bonn, 1837); H. Jacobi, *Ausgewählte Erzählungen in Māhārāshtri* (Leipzig, 1886); E. Müller, *Beiträge zur Grammatik des Jaina Prākrit* (Leipzig, 1876); and to the native grammarians: Vararuchi, *Prākṛita Prakāśa*, ed. E. B. Cowell (London, 1868); Hemachandra, *Grammatik der Prākṛit Sprachen*, ed. R. Pischel (Halle, 1877-80); Chanda, *Prākṛita Lakṣhaṇa*, ed. R. Hoernle (Calcutta, 1880).

HERMANN JACOBI.

Pram, KRISTEN HENRIKSEN: Danish poet and critic; b. in Norway of Danish parents, 1756. He was the author of a vast number of poems and plays of slight value, the best of the former being *Emilies Kilde* (Emilia's Spring). As one of the founders and editors of the critical journal *Minerva*, he exerted great and beneficial influence on public taste in the north. D. at St. Thomas, 1821. His works were edited by K. L. Rahbek (6 vols., Copenhagen, 1824-29). D. K. D.

Prase: See QUARTZ.

Pratinas (Gr. Πρατίνας) of Phlius in the Peloponnesus: Greek poet; flourished toward the end of the sixth century B. C., and is said to have introduced the satyr drama into Athens. Interesting fragments of his lyrics are given in Bergk, *Poetae Lyrici Graeci*, vol. iii., 557 foll. (4th ed.).

Prato (sometimes called *Prato in Toscana*): town; in the province of Florence, Italy; on the right bank of the Bisenzio; 11 miles N. W. of Florence (see map of Italy, ref. 4-D). It is situated in a plain surrounded by hills; has a citadel and a cathedral with frescoes by Filippo Lippi, and manufactures of cloth, paper, and straw hats; the water of the Bisenzio is largely used to work machinery. The chief domestic industry is straw-plaiting. Pop. 15,510.

Pratt, CHARLES: See CAMDEN, CHARLES PRATT, EARL OF.

Pratt, ORSON: Mormon apostle and author; b. at Hartford, Washington co., N. Y., Sept. 19, 1811; was educated in common schools in Columbia County; became a member of the Mormon Church, in which he was one of the "twelve apostles"; traveled extensively as a preacher; was also Professor of Mathematics in Deseret University, and Church historian, and was for several sessions Speaker of the Utah House of Representatives: author of *Divine Authenticity of the Book of Mormon*; *Cubic and Bi-Quadratic Equations* (London, 1866); *The Great First Cause*; *The Absurdities of Immaterialism*; and many religious pamphlets; had in MS. *Lectures on Astronomy and Differential Calculus*, and was engaged in the preparation of a work to be entitled *A New System of the Universe*. D. at Salt Lake City, Oct. 3, 1881.

Pratt, PARLEY PARKER: Mormon apostle; b. at Burlington, N. Y., Apr. 12, 1807; joined the Mormon Church in 1830, and was a member in 1835 of the first quorum of the twelve apostles; traveled widely in the U. S. in his efforts to make converts; visited England in 1840, where he established and edited at Manchester *The Millennial Star*; revisited England in 1846; explored parts of what is now Utah in 1847 and 1849; made a proselyting tour to the Pacific coast in 1851 and 1854; on a similar tour eastward was assassinated near Van Buren, Ark., May 13, 1857. He was the author of numerous pamphlets, and of the works *Voice of Warning and Instruction to all People* (New York, 1837); *History of the Persecutions in Missouri* (Detroit, 1839); and *Key to the Science of Theology* (Liverpool, 1854).

Pratt, ZADOCK: manufacturer; b. at Stephentown, Rensselaer co., N. Y., Oct. 30, 1790; began business 1811 as a saddler and harness-maker; located a tannery in 1824 among the Catskill Mountains on Schoharie Kill, Greene County, which became the nucleus of the town of Prattsville; was elected to Congress 1836, and again 1842; became noted for his advocacy of cheap postage; procured the establishment of the National Bureau of Statistics, and prepared the plans for the new post-office building at Washington; became colonel of militia 1823, State Senator 1830, presidential elector 1836 and 1852; was an active Democratic politician, a delegate to the Baltimore convention of 1852 and president of many industrial and benevolent institutions. D. at Bergen, N. J., Apr. 6, 1871.

Pratt Institute: an educational institution in Brooklyn, N. Y.; founded in 1887, and endowed by Charles Pratt (1830-1891), and administered by his sons, who constitute a board of trustees. Its work is on four general lines: (1) Educational, pure and simple, aiming to develop the faculties harmoniously, as in the high-school department, where art and manual training play a large part in fitting youth for life; (2) normal—the preparation of teachers; (3) technical—special training for skill in handicraft, applied science, household science, domestic art, library economy, etc.; (4) philanthropic and social—designed to exert a pronounced influence on the community for industry, thrift, self-culture, good-citizenship, etc.; illustrated in free lecture courses on social science and on art, in a savings-bank, a free library, and a "neighborship association," for Pratt Institute extension.

The departments, each administered by a director, are high school, with classes in language, history, politics, mathematics, science, drawing and manual training, and music; department of fine art, including freehand drawing and drawing from life, painting, designing, modeling, normal training, wood-carving, art needlework; of domestic art, including sewing, dressmaking, study of textiles, millinery, physical culture; of domestic science, including household economy, cookery, laundry-work, hygiene, and home nursing; of science and technology, including mechanical drawing, machine design, mathematics, mechanism, strength of materials, theory of steam-engine, trade-school work; of commerce, including phonography, typewriting, bookkeeping, and commercial arithmetic; of kindergarten, including theory and practice; of libraries, including library economy and management, a circulating department of 45,000 volumes, large reading and reference rooms, with branches; the thrift, including investments, deposits, loans; of museums, including art and industrial collections. There are classes for morning, afternoon, and evening. The average number of students in 1894 was 4,000. C. M. PRATT.

Pratz, LE PAGE, du: colonizer and explorer; b. in Holland about 1690; entered the French army in early youth; was engaged in campaigns in Germany; became a member of a French Western Land Company, which obtained the grant of a tract of land near New Orleans, La.; conducted an expedition thither 1718; made fruitless efforts at colonization; ascended the Mississippi 1720, and settled among the Natchez; explored Missouri and Arkansas rivers; was for several years treasurer of the land company at New Orleans; returned to France 1734; published a valuable *History of Louisiana* (3 vols., 1758). D. in 1775.

Prawn [M. Eng. *prane*, probably from a deriv. of *Lat perna*, mussel]: a name applied to many of the smaller long-tailed decapod crustaceans, chiefly to those of the *Palaeomonidae* and *Peneidae*. In Europe and in the tropics they are used as food, but in the U. S., except in the Southern States, they are little used. Some of the species which inhabit the seas of warm climates reach a large size.

Praxit'eles: a Greek sculptor; head of the Attic school; b. it is thought, at Athens about 392 B. C. Of his life nothing is known; of his works we have an idea through tradition, descriptions, images on coins, copies, and fragments. His favorite material was marble, though he wrought also in bronze. The *Cnidian Venus*, celebrated in antiquity, which travelers went to Cnidus expressly to see, which King Nicomedes is said to have offered in vain to buy at the price of the whole debt of the island, we know by copies, one of the most famous being in the Vatican Museum, partly concealed by metal drapery. Another famous Venus was at Cos. The *Cupid* of the Vatican, the *Satyr* in the Capitol, the *Apollo Sauroktonos* in Florence and the Louvre, the *Narcissus* in Naples, familiar to visitors at the galleries and to lovers of art, are thought to be reproductions, replicas, or copies of works of his. One statue only is known which is certainly his own work, the famous *Hermes* at Olympia in Greece. Praxiteles has been called the sculptor of the beautiful, as Phidias was of the sublime.

Pray, ISAAC CLARK: journalist and actor; b. in Boston, Mass., May 15, 1813; graduated at Amherst College 1833; became a journalist at Boston and New York, and subsequently a successful theatrical manager and actor, and both in the U. S. and in England aided in the professional training of several theatrical celebrities, including Charlotte Cushman; published *Prose and Verse* (1835), *Poems* (1837), *Book of the Drama* (1851), *Memoirs of James G. Bennett* (1855); was author of several burlesques and other plays, including a tragedy, *Virginus*; edited several magazines and other periodicals, and conducted the *Philadelphia Inquirer* 1859-60. D. in New York, Nov. 28, 1869.

Revised by B. B. VALLENTINE.

Prayer [from O. Fr. *preiere* (> Fr. *prière*) < Lat. *precarius*, pertaining to prayer, deriv. of *precari*, entreat, pray > O. Fr. *preier*, whence Eng. *pray*]: the communion of the soul with God. It is the necessary result of the recognition of the dependent relation of the creature to the Creator. It may be exceedingly various in form, "uttered or unexpressed," but in its most perfect form it is the expression of thought, feeling, or purpose to God in language. Such prayer will consist in adoration, thanksgiving, confession, petition, and intercession. Adoration expresses a sense of the excellence, glory, majesty, and holiness of God, and delight in his works of providence and redemption. It is the natural utterance of every heart in which there is a true love for him, which must delight in his excellences. The prayers of the Bible, specially the Psalms, are full of it. Thanksgiving recognizes with gratitude the special goodness of God, as it has been manifested in particular benefits conferred. Confession recognizes sinfulness, general or explicit, with the expression of penitence, the promise of reformation, and the request for pardon and for grace. Its language is: "Forgive us our debts as we forgive our debtors." All approach to God partakes of that original repentance by which man gives himself to God in conversion, and all prayer is the repetition of the cry of the publican (Luke xviii. 13), especially when sins have long been persisted in, and when prayer is the resumption of long neglected duty (Ezra ix. 6-15, x. 11). Petition may properly embrace our daily physical wants, "our daily bread," the general course of our life, its great affairs, our work and career, success in our efforts to perform all the ordinary and extraordinary duties of our lot and station (Romans i. 10), our special necessities also, whether in times of crisis, in sickness, and want, or in more common times (Isaiah xxxviii. 3; Matt. xxvi. 36 ff.; Heb. v. 7; Psalms xxxv., xxxviii., xl., etc.); but particularly it should include spiritual gifts of every sort, which constitute the burden of the biblical prayers (Eph. i. 16, iii. 14-19; John xvii.), and prayer for which is never denied since it is "according to the will of God" (1 John v. 14; Luke xi. 13); and it reaches its culmination in the great petition, embodying substantially all others: "Thy kingdom come, thy will be done on earth as it is in heaven." Intercession is both recommended by the example of our Lord, who completes therein his sacerdotal office (Heb. vii. 25, ix. 23-28), and commanded by the apostle (1 Tim. ii. 1), and should embrace every person and every cause with which the suppliant has a natural connection, even his enemies (Matt. v. 44).

Prayer is founded upon the belief that it constitutes a real transaction between the soul and God, leading to real and definite consequences. Its effects may be subjective, preparing the soul to receive the gifts of God, exerting a

soothing, purifying, and elevating influence upon it; or objective, in the consequent communication to the soul of gifts of grace or the conferment of outward benefits. It has its *conditions*, however. The suppliant must come in the spirit of true submission and reconciliation to God, else there is no communion (Psalms lxxi. 18). Every prayer must contain implicitly or explicitly the petition "Thy will be done" (Matt. vi. 10, xxvi. 42). Hence it can not be dictation; nor the substitution in the intent of the petitioner of the will of man for that of God, which would make prayer, if it were thus answered, a calamity to the universe; nor the substitution of the wisdom of man for that of God; but it is the petition of a child, and must have the childlike spirit of a subject, and must have the loyal spirit of one who recognizes both limitations and shortcomings. Faith is also a condition (Heb. xi. 6). It lays hold of God with confidence in him, and it may at times rise into the realm of moral certainty, as was the case in the faith that wrought miracles (Matt. xxi. 22), or as when perfect obedience has brought perfect union with Christ (John xv. 7), when perfect sympathy with God brings the knowledge that petitions are in accord with his will (1 John v. 14, 15), and when the spirit inspireth the petition (Romans viii. 26). Prayer must also be offered in the name of Christ (John xiv. 13, 14, xvi. 23, 24, 26), that is, upon the ground of his person and work, and by a believer in him, pleading his intercession.

The *objections* to the possibility or the reality of prayer are mostly evacuated by the true understanding of its nature. If it be said that God is too great to answer prayer, the reply is that he may, and as it seems actually does, call man into a co-operation with him in his greatest works through prayer. The existence of general laws in the universe which, it is said, do not permit of exceptions in answer to prayers, may be so viewed as to imply that there is back of these laws no conscious Spirit, in which case the reply is the whole argument of theism. Or these laws may be viewed merely as an observed fact, so invariable as to leave no place for the supposition of their continual interruption. But if there is a personal God, the laws of the universe are modes of his operation, and not forces superior to him which he can not administer. Nor does the answer of prayer necessarily involve the suspension of laws, except in the sense that one suspends the law of gravitation when he lifts a stone. So far as man can say, every ordinary answer to prayer may be in the strictest accord with natural law. Certainly no law is violated when a widow prays for bread, and when the thought is suggested to the mind of some prosperous friend to send her just then an abundance of food. It is the "just then" which shows the hand of God; but law is not violated. Neither does the divine predetermination destroy the reality of prayer. Let all things be foreknown and foredetermined, including both my prayer and its answer; still I have a free will, and can pray or decline to pray, and hence my prayer is a real act; and the answer is just as real as if it never entered into the thought of God till I had already prayed. The whole difficulty about prayer being answered or not answered resolves itself into one of the manner in which the divine and human agencies co-operate. The objection that as a fact many prayers are not answered is met by the consideration that, if an answer is not given in the precise form in which it was put, it is because of the higher wisdom of the Giver, which was invoked in and with the petition, and by the affirmation that no true petitioner ever fails to find some form of answer to his request.

The *forms of prayer* have been quite various. The ancient Greeks offered prayers and vows together. The worshiper raised his eyes and hands toward heaven or toward the images of the gods. He stood, or if in deeper earnest he and at times all the assembly knelt. Suppliants wore garlands on their heads or necks, and carried boughs of olive or laurel twined with wool, with which they touched the knees or cheeks of the images. Libations of wine, water, or oil were poured out. The Romans covered their heads, bowed to the ground, moved completely round from right to left, as if to meet the god from whatever direction he might approach; then, with the right hand on the mouth, looked toward the east or toward the altars or images. In higher devotion they knelt or were prostrate, and laid hold on the altar. Public prayers were offered by the priest or magistrate. The Mosaic law took prayer for granted; the temple was "the house of prayer" where public prayer accompanied the sacrifices and where private prayer was offered. Those who were absent from the temple prayed toward it. The chief

hours for the duty were 9 A. M., 12 M., and 3 P. M. To these were added the beginning and end of night and the time of eating. According to the degree of his fervor, the Jew stood, bowed, knelt, or prostrated himself. Free prayers were constantly offered, though forms were used with tithe-offerings and certain blessings, but Solomon's prayer at the dedication of the temple seems to have been the beginning of a liturgy, which at the time of Christ had developed into a set service before, during, and after the sacrifice. A similar liturgy was used in the synagogue, from which the petitions of the Lord's Prayer were probably drawn. Prayer was accompanied by almsgiving and fasting, and was made in conspicuous places, with many vain repetitions, by formalists who loved display. Among the early Christians prayer was the chief service, and was counted the main bond of unity. In their methods they followed Jewish customs largely. The pastor led the congregation, using both free prayer and forms. A strong liturgical tendency appears early in both the East and the West. Worship was first simple, then intricate, then regulated, then liturgical. Liturgies were made first by the bishops, then by the metropolitans. Early Christians knelt in ordinary prayer, but stood on the Lord's Day and from Easter to Whitsunday, in honor of Christ's resurrection. Prayer at all times and in all places was commended, though the temple and other places of meeting, the Lord's Days, occasional appointed days, morning and night, times of eating, times of success or distress, and crises of every kind were deemed peculiarly appropriate.

FRANK HUGH POSTER.

Prayer-book: See LITURGICS and EPISCOPAL CHURCH, THE PROTESTANT.

Preaching Friars: See DOMINICANS.

Pre-Adamites: men living before the time of Adam. This term has been adopted by various writers to designate the tribes or nations which they believe existed on the earth before the date assigned by the usual scriptural chronology to the appearance of Adam and Eve. Before the investigations of geologists and archaeologists in the nineteenth century there was no positive reason for imputing a greater antiquity to the human race than that given in the book of Genesis. This itself was not definitely fixed, as the chronological data of the Pentateuch differ widely in the three authoritative ancient versions known as the Masoretic Hebrew text, the Septuagint (which is the early Greek translation), and the Samaritan Pentateuch. The usual date for the creation of Adam given in English works is that derived by Archbishop Usher (about 1660) from the Hebrew text, and places it 4,004 years before the birth of Christ. The calculations of William Hales (about 1810) founded upon the Septuagint assigned the creation of Adam to 5411 B. C. Still wider variations have been advanced by other competent orthodox scholars, so that it is stated in a publication by the University of Oxford (*Chronological Tables*, 1835) that "not less than 300 different dates have been assigned as the era of the creation, varying in the extremes no less than 3,000 years." The decided tendency among the ripest scholars of all Christian denominations is to regard the account of the Pentateuch, in respect to time, as symbolical, indicative of the relation of the primitive human race to their Creator, and not as an historical narration. The same is true in regard to the location of Adam's creation. It was long supposed to have been somewhere in the valley of the river Euphrates, and many attempts have been made to discover the precise spot once occupied there by the Garden of Eden; but a closer examination of the text shows that Eden lay eastward from the scene of Adam's first existence as described, and that the river Nile (Gihon) was its western boundary. From these exegetical considerations, the term "pre-Adamites" means simply those members of the human race who lived previous to the beginning of the chronological records in the book of Genesis. That there were such, and in considerable numbers, is distinctly implied by that book itself, for there would have been no necessity for placing a mark on Cain to prevent him being killed if there had been no one living but members of his own family; nor could he have built a city if there had been none to live in it. It is entirely consistent, therefore, with faith in the scriptural narrative to recognize an antiquity of the human race indefinitely greater than that attributed to it in the chronology of Archbishop Usher. The necessity of so doing became apparent when geologists and archaeologists discovered in undisturbed deposits of vast antiquity the fragments of human bones and

the relics of human industry. These have been exhumed in every continent, showing that at a very remote epoch man was not only living upon the earth, but had already wandered widely over its surface. The scene of his first home can only approximately be defined, and the term of his existence as a species can not from such data be established with accuracy; but in the opinion of most competent observers it must be estimated by tens of thousands of years. Furthermore, investigations on the sites of the oldest known cities of the valleys of the Nile and the Euphrates prove beyond question that several of them were founded and were the scenes of a developed civilization long antecedent to the remotest date above mentioned as that of the creation of Adam. Prof. Norman Lockyer has demonstrated from astronomic data that some of the temples of Philæ in Egypt were constructed not later than 6400 B. C.; and the explorations of Niffir in Babylonia show it to have been a city already old in age at Usher's alleged date of the creation of the world. Even in America, usually considered to have been the latest of the continents to have received its human population, relics have been found, both in the northern and southern continents, which indicate that its extensive area was at least sparsely inhabited by tribes of low culture when many animals were living which are now extinct, and when the climate and the distribution of land and water were widely different from those now prevailing. This means a lapse of many thousand years since the earliest men reached its shores.

It may be said in conclusion that the term "pre-Adamites" is no longer regarded as sufficiently accurate for the language of science. It is better to employ the phrase "pre-historic men," meaning those who lived before the recorded dates of any authentic historical narratives. This avoids the impossible effort to frame a correspondence between the scriptural account of creation, which was certainly not intended to be a treatise on geology, and the results of modern scientific research, which, upon this subject, have by no means reached harmonious conclusions among themselves.

D. G. BRINTON.

Preble, prebl', EDWARD: naval officer; b. at Falmouth (now Portland), Me., Aug. 15, 1761; in 1777 embarked in a privateer, and in 1779 entered as midshipman in the provincial navy; was taken prisoner in New York harbor, and upon his release served as first lieutenant on board the sloop of war Winthrop, with which he remained until 1782, greatly distinguishing himself by boarding with four men an armed British brig off Castine, Me., and capturing her under fire. In 1799 he was appointed to the command of the Essex, and in 1803 he commanded the squadron sent against Tripoli. Arriving at Tangier, he concluded peaceful negotiations with the Sultan of Morocco, after which he proceeded to blockade Tripoli, which he subjected to repeated vigorous bombardments, interrupted by several sharp engagements with the Tripolitan gunboats. In Sept., 1804, having been relieved by Com. Barron, he returned home, and received the thanks of Congress and a gold medal. D. at Portland, Aug. 21, 1807.

Preble, GEORGE HENRY: naval officer; b. at Portland, Me., Feb. 25, 1816; entered the navy as a midshipman Oct. 10, 1835. Served in Florida against the Seminoles, and in the Mexican war participated in the capture of Alvarado and Tampico; was in several actions with Chinese pirates in 1854-55; commanded the Katahdin at the taking of New Orleans in 1862, and the fleet brigade in the battles of Honey Hill and De Vaux's Neck in 1864. He was promoted to the rank of rear admiral Sept. 30, 1876; retired Feb. 25, 1878. D. in Boston, Mass., Mar. 1, 1885. He was the author of *History of the American Flag* (Albany, 1872); *History of Steam Navigation* (Philadelphia, 1883); and other historical works. Revised by C. BELKNAP.

Preble, WILLIAM PITT, LL. D.: jurist; b. at York, Me., Nov. 27, 1783; graduated at Harvard College 1806; was tutor in mathematics there 1809-11; became a lawyer and a leader of the Democratic party; was U. S. district attorney 1813; settled at Portland 1818; was a leading member of the convention which formed the State constitution of Maine 1819; on the inauguration of the new State government was appointed a judge of the State Supreme Court 1820; was minister to the Netherlands 1829; held many other public offices; was the first president of the Atlantic and St. Lawrence Railroad 1847. D. at Portland, Me., Oct. 11, 1857.

Precambrian Flora: See PLANTS, FOSSIL.

Precedents [from Lat. *præcedens*, pres. partic. of *præcedere*, go before, precede; *præ*, before + *cedere*, go]: (1) forms of procedure, of conveyancing, and the like, which have been approved by usage or judicial authority, and therefore may be followed safely; (2) decisions of the courts which declare a rule of law susceptible of application to other cases.

Legal precedents have a place in every system of jurisprudence, but English law is peculiar in the limits and the value which it puts upon them. It confines them to the judicial decisions of actually litigated cases. The opinions of distinguished lawyers and text-writers are not precedents, and British judges frequently condemn the practice of citing such opinions even upon the argument of a cause. (*Union Bank vs. Munster*, 37 Chancery Division 51.) In the U. S., however, such practice is not discouraged by the courts, but the opinion of a text-writer is never treated as a precedent.

The value of a judicial precedent varies with the questions involved and with the rank of the court from which it emanates. If the question is one of procedure, and especially if it is decided without serious contest, the court will not consider itself bound by its prior decision. (*Cross vs. Burke*, 146 U. S. 82.) The declaration of a rule of substantive law by a court of last resort is binding on all inferior tribunals within that jurisdiction, and will not be overruled by the same court unless it is convinced that the principle laid down is erroneous and works serious hardship. The strongest argument in favor of this practice is that of convenience. It has been stated in the following terms by Chancellor Kent: "It would therefore be extremely inconvenient to the public if precedents were not duly regarded and implicitly followed. It is by the notoriety and stability of such rules that professional men can give safe advice to those who consult them, and people in general can venture with confidence to buy and trust, and to deal with each other. If judicial decisions were to be lightly disregarded, we should disturb and unsettle the great landmarks of property." This "sort of consecration," to use Sir Henry Maine's expression, which English law gives to judicial precedents, exercises a most conservative influence in legal development. At times it has conserved error and barred legal progress. This is especially notable in international law, where the rules evolved by the courts based on early precedents are frequently less enlightened and benignant than those formulated by military commanders, who are not bound by the precedents of an earlier and less humane age.

After a decision of the court of last resort has been overruled it is treated not as having been bad law, but as not having been law at all. It still concludes the parties to the case in which it was rendered, but it does not affect the rights of other parties depending on the question erroneously decided.

In the U. S. the decisions of State courts are binding precedents upon the Federal tribunals when they decide questions dependent upon local statutes or local usages of a fixed and permanent operation, such as the rights and titles to immovables, but not when they decide questions of general commercial law. *Baltimore Railway vs. Baugh*, 149 U. S. 368. FRANCIS M. BURDICK.

Precession of the Equinoxes [*precession* is from Lat. *præcedere*, go before or ahead; *præ*, before + *cedere*, go]: a slow change in the position of the equinox among the stars, of such a nature that the pole of the equator moves around the pole of the ecliptic in a period of about 25,000 years. It was first discovered through a difference in the length of the year as determined by the passage of the sun through the equinox, and by its angular distance from a bright star. The distance of the sun from the star Spica or α Virginis was determined from time to time by Hipparchus and other ancient astronomers by measuring the distance between the sun and the moon shortly before sunset, and between the moon and star after sunset. This double measure was necessary, because the star and the sun could never be seen at the same time. At the end of a year, when the earth had made a revolution around the sun, the same distance could again be measured. By repeating the measures at an interval of one or two centuries the true time of the revolution of the earth, or the sidereal year, could thus be determined. In this way it was found by Hipparchus and Ptolemy that the length of the sidereal year was a few minutes more than 365 $\frac{1}{4}$ days; but the interval between

two passages of the sun over the equator was found to be a few minutes less than 365 $\frac{1}{4}$ days. This showed the point at which the sun crossed the equator. This point was called the equinox, and was subject to a continual motion from E. toward W. among the stars. According to the ancient astronomers the motion was a degree in a hundred years, so that a complete revolution would have required 36,000 years. Modern astronomy, however, shows it to be greater, about 50'25" in a year, and therefore a degree in about seventy-one years; but the amount varies with the obliquity of the ecliptic, and will increase for several centuries to come.

When the motion of the earth around the sun was understood, it was seen that precession meant simply a gradual change in the direction of the earth's axis. Newton showed that this change was due to the action of the sun and moon upon the slight protuberance of the earth around the equator. The effect of the moon is about twice that of the sun. Were the earth perfectly spherical, there never could be any change in the direction of its axis; but owing to the centrifugal force generated by its rotation on its axis, the equatorial parts are slightly expanded, and the figure is changed into that of a spheroid, flattened at the poles, and bulging at the equator. In consequence of this bulging, there is a certain excess of attraction upon those parts of the equator nearest the sun or moon, and a deficiency in those parts farthest from it. This slight effect causes the unceasing change which has been described. The action is somewhat analogous to that which makes a top in rapid rotation perform a slow motion round and round, so as to describe the surface of a cone. If the sun and moon were always in the plane of the earth's equator—that is, if there were no obliquity of the ecliptic—the attraction of these bodies upon the northern and southern hemispheres would be symmetrical, and there would be no such motion as has been described, and therefore no precession. The latter arises from and varies with the sun's declination. At the time of the equinoxes the sun is on the earth's equator, and farthest from it at the solstices. The result is that the force which produces precession is not a uniform one, but takes place in a series of small cycloids, two in each year. This inequality of motion is called *nutation*.

Nutation, as here described, is produced not only by the action of the sun, but also by that of the moon; but in the case of the latter action there is also another inequality due to the fact that, owing to the revolution of the moon's nodes in a period of eighteen and a half years, the action of the moon in producing precession is more powerful at some epochs than it is at others. Again the result is an inequality, having a period equal to that of the revolution of the moon's nodes. This is called *lunar nutation*. The semi-annual term produced by the sun is called *solar nutation*. In addition to these principal inequalities there are a number of minuter ones, depending on the eccentricity of the sun's orbit, and on the inclination of the lunar orbit to the ecliptic. The formulas for these terms are given in astronomical ephemerides, to which reference may be made. S. NEWCOMB.

Précieuses, pră'si-ôz': name given in France in the seventeenth century to a group of women who cultivated an extreme refinement in speech and manners. They carried to excess the concern for propriety and elegance of expression and of the forms of social intercourse which, centering in the Hôtel de Rambouillet, was doing much to refine French language and society. With the *précieuses* this elegance became affectation. Such common words as mirror or chair were held vulgar; they were to be replaced by "counselor of the graces" and "convenience of conversation." For a moment the *précieuses* were conspicuous in the salons that imitated the Hôtel de Rambouillet, and even invaded that salon itself, and threatened to impose their jargon on the French language; but good sense, aided materially by the pungent satire of Molière's *Précieuses ridicules*, turned them into ridicule. Cf. Livet, *Précieuses et Préieuses* (Paris, 1859); V. Cousin, *La Société française au XVII^e siècle* (2 vols., Paris, 1858). A. G. CANFIELD.

Precious Stones: mineral substances possessing such beauty and brilliancy of color, hardness, and rarity, as to fit them for use in jewelry or for ornamental purposes. Strictly speaking, the only precious stones are the diamond, ruby, sapphire, and emerald, though the term is often extended to the opal, notwithstanding its lack of hardness, and to the pearl, which is strictly an animal product.

There are other minerals hard enough to scratch quartz,

without metallic luster, but generally brilliant and beautiful, such as the chrysoberyl, alexandrite, tourmaline, spinel, zircon, andalusite, aquamarine, and topaz, which are known as semi-precious or "fancy" stones (called *pierres de fantaisie* by the French). Minerals of both these classes, especially when cut and polished, are popularly called gems, but mineralogically only the semi-precious stones are so called, while archæologically the term gem is restricted to engraved stones, such as intaglios and cameos. See GEM.

The diamond, although the hardest and the most brilliant of the precious stones, does not command the highest price unless it be of a fine red, blue, or green color, all of exceptional rarity. Fine rubies command from five to ten times the price of fine white diamonds. Emeralds rank next in value, and frequently sell for as much as or more than fine diamonds; sapphires for somewhat less; fine cat's-eyes and the alexandrite variety frequently sell for as much as sapphires. The finest Hungarian opals frequently command one-half the value of diamonds, but little increase in price with size. The New South Wales, Queensland, and Washington opals sell for less. Ruby spinels of deep ruby-like color frequently command a price nearly as great as that of the diamond. The diamond is 10 in hardness; sapphire, 8.9; chrysoberyl or cat's-eye, 8.5; spinel, 8; topaz and aquamarine, 8; emerald and zircon, 7.8; tourmaline, 7.5; garnet, agate-chalcedony, and bloodstone, 7.3; rock-crystal, smoky cairngorm, smoky quartz, amethyst, 7; turquoise and opal, 6. The beauty of the precious stones is brought out by cutting and polishing, or the correct form of cutting and the angle of the various facets. To produce the greatest brilliancy the brilliant form of cutting is the best. The most perfect brilliant cut has fifty-eight facets. To heighten the color in a stone the step, degree, or trap cutting is the best.

The terms "artificial" and "imitation" must not be confounded in speaking of gems or precious stones, the former being of the true material, but produced by art, while the latter are imitations in other materials. Nearly all gems, with the exception of the diamond, have been artificially produced, but, with the exception of the ruby, only in small examples. Rubies have been made, but the chamber of commerce of precious stones of Paris has decreed that all gems of this kind shall be sold as artificial and not as precious stones. Imitation gems comprise (1) what are known as doublets, in which the upper part of the gem is made of garnet, quartz, or other hard stone, below which is cemented glass the color of the stone to be imitated; for instance, an imitation emerald may have its top of garnet or quartz, and the back a green glass. Other kinds are (2) those which are made by heating rock-crystal and plunging it in a solution the color of the gem to be imitated; and (3) those made entirely of glass, for which purpose a brilliant glass is employed containing oxide of lead, and known as *paste* or *strass*. This is colored by small amounts of metallic oxides, according to the tint desired—e. g. oxide of cobalt for blue, oxide of manganese for violet, etc.

Pearls are imitated by lining tiny hollow glass beads with the scale of the bleakfish, called *essence d'orient*, and then filling them with wax. Another imitation is made by silvering beads made of mother-of-pearl. GEORGE F. KUNZ.

Precocity [from Lat. *præcox*, *præcociis*, cooked or ripened too soon; *præ*, before + *coquere*, cook]: a rapid and abnormally early development of the mental powers, sometimes associated with a correspondingly early ripening of the functions of the body. The popular belief that precocious infants are usually destined to early decay of mental and physical powers, resulting in speedy death, idiocy, or at the best in mediocrity, is well founded, as can be established by abundant proofs; but there are exceptions to the rule. No doubt precocity is often associated with diseases of the nervous system, with scrofulous symptoms, and with rickets, but not a few instances can be adduced of precocity associated with apparently good health. There is a double relationship between ill-health and precocity. The former by restraining a child leads to habits of reading and association with older people, and thus to precocity. The latter by causing a taste for reading and indoor life tends to engender ill-health or disease. Precocious children should be restrained from following their intellectual bent, and their physical culture encouraged. Revised by W. PEPPER.

Predestination [from Lat. *prædestināre*, predestine, foreordain; *præ*, before + *destināre*, establish, determine]: in theology, the doctrine according to which God has fore-

ordained from eternity and unchangeably whatever takes place. It was first defined and debated during the controversy between Pelagius (see PELAGIANISM) and ST. AUGUSTINE (q. v.). In the Roman Catholic Church the Jansenists (see JANSENISM) became the champions of predestination. It was generally adopted by the earliest Reformers, but while in the Reformed Church it received a very strict and explicit development by Calvin (see CALVINISM), to which the Arminians (see ARMINIUS and ARMINIANISM) opposed a milder explanation, it was for some time entirely given up by the Lutheran Church until Schleiermacher revived it in a mitigated and somewhat mystical form. The doctrine is distinct from various theories of the method by which events are governed; and it is in every form intended to be totally different from the idea of fate. All the chief points of the idea will be found expanded in Forbes's *Predestination* (Edinburgh, 1878). See also MOHAMMEDANISM.

Revised by F. H. FOSTER.

Predicate (in logic): the second term in a proposition; that which is asserted or predicated of the subject. See LOGIC.

Preece, WILLIAM HENRY: electrician; b. near Caernarvon, North Wales, Feb. 15, 1834; was educated at King's College, London; received practical training in the telegraph and cable service. In 1870 he entered the service of the Post-office as divisional engineer, was appointed electrician in 1877, and chief electrician in 1892. He is the author of many important papers in electro-technics, particularly in the fields of submarine telegraphy and telephony. He is also the author (with Sir James Sivewright) of a well-known *Text-book of Telegraphy*, and (in collaboration with Julius Maier) of a volume on the telephone. Mr. Preece is a fellow of the Royal Society and a member of numerous other learned scientific associations. E. L. NICHOLS.

Pre-emption [Lat. *præ*, before + *emere*, *emptum*, buy, obtain, (in compounds) take]: the act of one belligerent in seizing upon the sea, and taking at a price, certain kinds of neutral property not strictly contraband intended for importation within the territory of his foe; a forced purchase instead of confiscation. It was a relaxation of the harshness of the doctrine of *occasional contraband*. See CONTRABAND. T. S. W.

Prefect [from Lat. *præfectus*, prefect; *præ*, before + *factus*, made]: the title of many officers and magistrates of ancient Rome. The *præfectus urbi* was the warden of the city, and was anciently an officer of great dignity and importance, but his duties varied much at different periods, and at times were almost nominal. The prætorian prefects commanded the imperial body-guard. The *præfectus annonæ* was an extraordinary magistrate of great importance who presided over the corn-market and the distribution of public charity. In modern France a prefect is an important official, the chief of police in each department, and a kind of justice of the peace.

Prefixes: significant particles joined to the beginning of words. In the Indo-European languages the prefixes are generally adverbial or prepositional in character, and their use with nouns appears to have been originally due to a connection with verbs either in meaning or by direct derivation; thus Eng. *belief* owes its existence to *believe*. In primitive Teutonic these prepositional prefixes were accented in the nouns but unaccented in the verbs. Traces of this appear in modern German—as *ant wort*, but *entsprechen*; *urtheil*, but *ertheilen*; *urlaub*, but *erlauben*. In English the native Teutonic prefixes are relatively few—e. g. *a-* in *arise*, *be-* in *begin*, *for-* in *forget*, *mis-* in *misdeed*, *of-* in *offspring*, *un-* (Germ. *ant-*, *ent-*) in *untie*, *un-* (Gr. *ἀ-*: Lat. *in-*) in *unwise*. The Latin prefixes are the most common; some of them come with Latin words directly from the Latin, as *ab-* in *abscond*, *ad-* in *adapt*, *amb-* in *ambition*, *ante-* in *antecedent*, *bi-* in *bisect*, *circum-* in *circumvent*, *con-* in *conduct*, *contra-* in *contradict*, *de-* in *delegate*, *dis-* in *dissolve*, *ex-* in *express*, *extra-* in *extravagant*, *in-* in *invade*, *in-* (Gr. *ἀ-*: Germ. *un-*) in *insane*, *inter-* in *interference*, *intro-* in *introduce*, *ob-* in *obviate*, *per-* in *pervade*, *post-* in *postpone*, *præ-* in *precept*, *pro-* in *produce*, *retro-* in *retrograde*, *se-* in *seduce*, *semi-* in *semicolon*, *sub-* in *subscribe*, *super-* in *superimpose*, *trans-* in *transpose*; others come from Latin via the French, as *counter-* (< Lat. *contra-*) in *counterpart*, *es-* (< Lat. *ex-*) in *escape*, *en-* (< Lat. *in-*) in *enjoin*, *enter-* (< Lat. *inter-*) in *entertain*, *par-* (< Lat. *per-*) in *pardon*, *sur-* (< Lat. *super-*) in *surface*. The Greek has

also furnished a number of important prefixes, as *anti-* in *antithesis*, *apo-* in *apology*, *cata-* in *catalogue*, *di-* in *diagram*, *dia-* in *diameter*, *en-* in *energy*, *endo-* in *endogamies*, *epi-* in *epitaph*, *exo-* in *exogamous*, *hyper-* in *hypercritical*, *hypo-* in *hypodermic*, *meta-* in *metathesis*, *para-* in *parody*, *syn-* in *synthesis*. In the strictest sense, however, none of these alien prefixes can be regarded as having acquired a position as English prefixes, unless they have proven their vitality by contributing to the formation of new words. The Greek *en-* of *enthusiasm* is only from the Greek point of view a prefix. In English it is merely a syllable of a loan-word. It shows no vitality. Contrast *anti-* in *antifal*, *anti-snapper*. BENJ. IDE WHEELER.

Pregnancy: See OBSTETRICS.

Prejevalsky. COL. NICOLAI MICHAELOVITCH: See PREJEVALSKY.

Prel'ate [from Lat. *prælat'us*, preferred, or placed before; partic. of *præferre*, prefer]: a term applicable to all ecclesiastics of high rank, as well as some of the inferior dignitaries of the papal court. Prelates of the Great Mantle are the lowest in rank; those of the Small Mantle, of higher rank. In the Roman Catholic Church they have mostly the title of "monsignore."

Premise: See LOGIC.

Premium: See INSURANCE.

Premonstratensians [by analogy of Lat. *præmonstra're*, show beforehand, point out the way, from Fr. *Prémontré* < Lat. *pratium monstra'tum*, liter., shown meadow], or **Norbertines**: a religious order established at Prémontré, near Laon, in France, in 1120, by St. Norbert (1080-1134). Norbert was a relative of the Emperor Henry V., and held several rich benefices, when suddenly he was converted, and retired from the world to found a new monastic order, which followed the rule of St. Augustine and were in part canons regular. He became Archbishop of Magdeburg in 1127. The order (which had become very powerful and widespread) kept up the primitive vigor of the rule for about 120 years, but began to decline toward the end of the fifteenth century. It was divided about 1573 into two congregations, the Spanish abbeys having a stricter observance. In 1630 the whole order received the stricter rule. It is not very large, but has convents both of monks and nuns, especially in Austria, Belgium, and Holland. The habit is white. See *Hugonis Annates Ordinis P.* (Nancy, 1734); Winter, *Die Premonstratensen d. 12ten Jahrhunderts* (Berlin, 1865); and Currier, *History of Religious Orders* (New York, 1894).

Revised by J. J. KEANE.

Prence, or Prince, THOMAS: governor of Plymouth, Mass.; b. in England in 1601; was one of the Leyden Pilgrims; arrived at Plymouth, Mass., in 1621; was one of the first settlers at Nansett or Eastham; was chosen governor in 1634, 1638, and continuously from 1657 to his death; was assistant 1635-37 and 1639-57; was distinguished for religious zeal and the promotion of education. D. at Plymouth, Mar. 29, 1673.

Prentice, GEORGE DENISON: journalist; b. at Preston, Conn., Dec. 18, 1802; graduated at Brown University 1823; was admitted to the bar in 1829; edited *The Weekly Review*, Hartford, Conn., 1828-30; from 1830 to his death was editor of the Louisville, Ky., *Journal*, which he made one of the leading Whig newspapers of the country; author of many fugitive poems and of a *Life of Henry Clay* (1831); *Prenticeana* (1859), a collection of his witticisms, has gone through several enlarged editions. D. at Louisville, Ky., Jan. 22, 1870. His *Life* has been written by G. W. Griffin, and a posthumous edition of his *Poems* was issued in 1876.

Revised by H. A. BEERS.

Prentiss, GEORGE LEWIS, D. D.: minister and professor; b. in Gorham, Me., May 12, 1816; was educated at Bowdoin College; studied theology in Halle and Berlin 1839-41; was pastor of the South Trinitarian church, New Bedford, Mass., 1845-51, of Mercer Street Presbyterian church, New York, 1851-58; traveled abroad 1858-60; in 1860 organized the Church of the Covenant in New York, of which he was pastor till 1873; since 1873 he has been Professor of Pastoral Theology, Church Polity, and Missionary Work in Union Seminary. Besides sermons, addresses, and contributions to periodicals, Dr. Prentiss has published *Memoir of Seargeant Smith Prentiss* (2 vols., New York, 1855; new edition 1879); *Discourse in Memory of Thomas Harry Skinner, D.D., LL.D.* (1871); *Our National Bane* (1877); *Life and*

Letters of Elizabeth Prentiss (1882; new edition 1887); *The Union Theological Seminary* (1889); *The Agreement between Union Seminary and the General Assembly* (1891); and *The Problem of the Veto Power and How to Solve It* (1892). —His wife, ELIZABETH (Payson) PRENTISS (b. at Portland, Me., Oct. 26, 1818; d. at Dorset, Vt., Aug. 13, 1878), was married in 1845; published a number of very popular works, including *Little Susy's Six Birthdays* (1853); *The Flower of the Family* (1856); *Fred and Maria and Me* (1868); *Stepping Heavenward* (1869), translated into several foreign languages; *The Percys* (1870); *Aunt Jane's Hero* (1871); *Urbane and His Friends* (1874); *The Home at Greylock* (1876); and *Gentleman Jim* (1879). C. K. HOYT.

Prentiss, SEARGEANT SMITH: lawyer; b. in Portland, Me., Sept. 30, 1808; graduated at Bowdoin College 1826. He practiced law at Vicksburg, Miss., but losing much property by legal process, and partly also because he regarded that State as "disgraced and degraded" by its repudiation of its bonded debt, he removed to New Orleans in 1845, and died at Longwood, near Natchez, Miss., July 1, 1850. He was eminent as a lawyer, and still more so as an orator. In the opinion of such judges as Daniel Webster and Edward Everett he was a peer of the statesmen of the period so prolific in eloquent men. See his *Life*, by his brother, George Lewis Prentiss.

Prepositions [from Lat. *præpositio* (*præ*, before + *po'nere*, place), a translation of the Greek term *πρόθεσις*; *πρό*, before + *θεῖναι*, set, referring to the usual position of these words before the noun]; a class of words which serve the purpose of defining the relation of a noun-word to its governing word in the sentence. Thus in the sentences *he went to it*, *he went from it*, *he went for it*, the prepositions *to*, *from*, *for* set forth the relation existing between the act of going and the thing *it*; similarly in the case of relations between nouns or adjectives and nouns, as *the son of John*, *ready for use*. In the primitive Indo-European, which was a highly inflected language, these relations were expressed chiefly by the case-endings, and prepositions were used only where these relations were not clearly or definitely enough expressed by the case-endings. Such is also approximately the condition in the classical Greek and Latin. The group of words which afterward became prepositions were in Indo-European chiefly, and in their origin probably entirely used as preverbs—i. e. they were closely attached to the verb, and served to define more clearly the nature of the action; cf. Gr. *κατ' ἄρ' ἐξέρο*, he sat down; Sanskr. *tisthā rātham ādhi tām*, step upon this car. In the last example the preverb *adhi*, upon, serves so directly to suggest the aspect of the action toward the governed object that it may be regarded as a preposition. It represents the transition from preverb to preposition. In the English, *to pass by the house*, *what were you thinking of*, it is also difficult to determine whether *by* and *of* are preverbs or prepositions—i. e. whether their connection is closer with verb or noun. The fact that *pass-by* and *think-of* can be inflected in the passive voice, *it can not be passed by*, *it must not be thought of*, points, however, to the conclusion that *pass-by* and *think-of* are compound verbs in nearly the same sense as Gr. *παράδειναι*, or Lat. *deliberare*. BENJ. IDE WHEELER.

Preraphaelites, or Præraphaelites, or Pre-Raphaelites: a very small body of artists and lovers of fine art, called by themselves the Pre-Raphaelite Brotherhood, and formed in London in 1849; less properly, all those artists and others in England or elsewhere who executed or admired artistic work done in supposed sympathy with the aims of the brotherhood—that is, those who painted minutely and with attention to detail; those who sought an unaccustomed reality of gesture or pose in painting or sculpture; or those who took religious and mystical subjects and tried to give them new interpretations; thus the school of Cornelius was called the German Pre-Raphaelites. The name given in this way was often inappropriate and misplaced.

The Pre-Raphaelite Brotherhood, or P. R. B., consisted of Dante Gabriel Rossetti, William Michael Rossetti, William Holman Hunt, John Everett Millais, James Collinson, Frederick George Stephens, and Thomas Woolner. According to the latest writers on the subject and biographers of Rossetti, no other persons ever became members of the brotherhood. They were all very young men; Woolner and Hunt, apparently the oldest, were twenty-seven and twenty-five years of age, the Rossettis much younger. They saw in paintings of the fifteenth century a religious enthusiasm and a simplicity of artistic aim which they longed to re-

call, and they thought that Raphael's early work in Rome marked the change from that purer art to later and less single-minded designing. One of their first objects was to publish a journal, in which their ideas about fine art should be expressed in prose and verse, and embodied in etchings, and *The Germ* was begun in 1850, had its name changed to *Art and Poetry* after the second issue, and never appeared after the fourth number. This little magazine contains Thomas Woolner's poem, *My Beautiful Lady*, and several poems by Dante Rossetti and Christina Rossetti which are contained (often altered) in their collected works.

The avowed purposes of the brotherhood were the encouragement of perfect sincerity and a lofty purpose in the practice of art. Some of their rules or maxims seem now excessively strict, and even fettering, but the fine art of the day in England seemed to young and high-minded men extremely meaningless and feeble, and that of all Europe, so far as they knew it, devoid of any true purpose, and they stated their principles in a dogmatic form by way of protest and counter-action. Thus it was laid down as a principle that a figure should be painted from one and only one person serving as a model. It is evident from the pictures themselves that the painter allowed himself to impart as much of feeling to the expression of the face as he wished and could achieve. Probably, too, he felt at liberty to make stiff movements more easy, or else he did so unconsciously. The one man or woman in the costume desired, with the color and light actually seen in it, he painted just as it seemed to him. Even gesture was to be stiff and awkward if thereby it became natural and dramatic; thus in Millais's picture, taken from Keats's poem *Isabella, or the Pot of Basil*, a painting of *Isabella and Lorenzo* at the supper-table, where Isabella's brothers and their household are seated, one of the brothers reaches out his right leg with energetic kick at the hound whose head lies in Isabella's lap, and the other bites his nails and grins savagely at Lorenzo, who is speaking to Isabella tenderly and handing her fruit. There was also a disposition, like that of the recent impressionists, to paint effects of light and color, generally seen by artists only. There was also a very free use of suggestive and illustrative imagery, aiding the main purpose of the composition.

Artists not included in the original brotherhood, but who were considered Pre-Raphaelites among Englishmen of the years from 1850 and 1860, were Arthur Hughes, Ford Madox Brown, and Edward Burne-Jones. The architects most interested in the Gothic revival were also considered as more or less allied with the Pre-Raphaelites, especially Sir Thomas Woodward and William Burges, and perhaps Philip Webb. John Ruskin was looked upon as the most ardent and influential advocate of Pre-Raphaelite doctrines and practice.

BIBLIOGRAPHY.—*The Fortnightly Review*, vol. xlix., contains Holman Hunt's paper on the brotherhood, and *The Portfolio*, new series, May, 1894, consists of a monograph on D. G. Rossetti by Frederick G. Stephens. Also see Esther Wood, *Dante Gabriel Rossetti and the Pre-Raphaelite Movement*; William Sharp, *Dante Gabriel Rossetti, a Record and a Study*; Harry Quilter, *Preferences in Art, Life, and Literature*; Ruskin's pamphlet, *Pre-Raphaelitism*, and passages in other works. The large-paper edition of the last-named work contains many photographic copies of pictures, and Mrs. Wood's book and Stephens's essay each give several illustrations. The Moxon *Tennyson's Poems* of 1856 contains several wood-cuts after designs by Rossetti, Hunt, and Millais.

RUSSELL STURGIS.

Presburg: See PRESSBURG.

Presbyter [= Lat. = Gr. *πρεσβύτερος*, elder, deriv. (liter., compar.) of *πρεσβυς*, old]: the title of an officer in the Christian Church, given at first on account of age, length of service, or dignity. It was a Jewish-Christian name, and came from the synagogue. In the New Testament the words "presbyter" and "bishop" are interchangeable. In each early church there was a board of presbyters. Their duties were to superintend the church order, discipline, and doctrine, to teach, preach, visit the sick, receive strangers, and preside at the meetings. They were appointed by the apostles or their representatives, or may have been elected or nominated by the people. They were ordained with prayer and the laying on of hands. See J. A. Hodge, *What is Presbyterian Law?* (Philadelphia, 1882); A. T. McGill, *Church Government* (Philadelphia, 1890). See PRESBYTERIAN CHURCH.

Presbyterian Church [*Presbyterian* is from Gr. *πρεσβύτερος*, elder, and *πρεσβυτέριον*, a body of elders. See PRESBYTER]: a distinctive title descriptive of one division of the Church of God. I. *Name.*—The Greek word is used in both the Septuagint and the New Testament to designate a body of officers to whom was committed the government of the Church. In the Septuagint (e. g. Lev. iv. 14, 15) the term synagogue is used for the congregation of Israel, and "the elders (presbyters) of the synagogue" are the representatives of the whole people. In the New Testament the synagogue is a parish church, but the elders of the Jews are members of the Sanhedrin and representatives of the whole people, though possibly they are sometimes local, e. g. Luke vii. 3. In some later writings the elders are the officers of the local synagogue. The title and the duties it implies were retained under the new dispensation, as the Christian Church was the outgrowth of the Jewish. Hence the name is the key to the system.

II. *Constitution.*—The visible Church is held to be the aggregate of those who are known as the people of God. It exists in the form of organized associations. Every such association must have its official representatives; and, since an ecclesiastical organization is of necessity widespread, it must provide both for particular congregations and for the relations of these to each other. In the following description of the Presbyterian Church, as it now exists, the Presbyterian Church in the United States of America is taken as a type, though the features indicated are mainly those that are common to most Presbyterian churches. A particular congregation is generally organized by some recognized authority, but is complete in itself. It elects its own officers, who are—(1) a pastor, (2) a bench of elders, (3) a board of deacons. A pastor, once elected, is installed by the ecclesiastical body, called presbytery, with which the congregation is connected. In case no pastor is installed, an ordained minister may have charge of the congregation, subject to the oversight of the presbytery. The elders are elected by the people and "set apart" by the presiding minister or by the presbytery. To them is committed the spiritual oversight and government of the congregation. Their number is determined by the wishes of the people; it is seldom less than three or greater than twelve. The office is for life, but in some congregations the term of active service is limited by vote. The board of deacons is also elected by the congregation, and its members are "set apart" by solemn ceremony, as are the elders. Their duty is to care for the poor of the congregation and for such temporal interests as may be committed to them. They have no governmental control. In most parts of the U. S. there is a civil corporation, created by State law, technically differing from the ecclesiastical "congregation," though practically consisting of the same persons, which owns and manages the property, through trustees chosen for that purpose. In Scotland and in some parts of the U. S. the duties of trustees are discharged by the deacons.

Governmentally, there are in the Presbyterian body four "judicatures," styled in order the session, the presbytery, the synod, and the general assembly. The session consists of the bench of elders above described. Of this judicatory the pastor is *ex officio* a member and its moderator. The presbytery consists of all the ministers or "teaching elders" (as they are sometimes distinctively called) and one "ruling elder" from each congregation in a limited district. Each minister in that district is, if received by vote, a permanent member of the presbytery. The ruling elders act at particular meetings, being elected by the sessions for that purpose. The duties of this body are "to receive and issue appeals from church sessions, and references brought before them in an orderly manner; to examine and license candidates for the holy ministry; to ordain, install, remove, and judge ministers; to examine and approve or censure the records of church sessions; to resolve questions of doctrine or discipline seriously and reasonably proposed; to condemn erroneous opinions which injure the purity or peace of the Church; to visit particular churches for the purpose of inquiring into their state and redressing the evils that may have arisen in them; to unite or divide congregations at the request of the people, or to form or receive new congregations; and in general to order whatever pertains to the spiritual welfare of the churches under their care" (*Form of Government*). The synod originally consisted of all the ministers and one elder from each congregation within a larger district, which must embrace at least three presbyteries. At present, however, in some of the Presbyterian

churches, the synod is a body of delegates. It stands to the presbyteries within its bounds in the same relation in which each presbytery stands to its churches. It is empowered to receive and issue appeals from the presbyteries, to examine their records, to form or divide or unite these lower bodies, and generally to take proper oversight of presbyteries, sessions, and people under their care. The *general assembly* consists of an equal delegation of ministers and elders from each presbytery. For the proportion and the functions of this judicatory, see *GENERAL ASSEMBLY*.

III. *Essential Principles of Church Polity.*—Three things are essential in Presbyterian polity. First, there must be a presbyter ministry, that is, a body of ordained ministers, equal in order. In this Presbyterians agree with the other churches that hold to the parity of the ministry. They differ, on the one hand, with those who recognize other orders in the ministry (bishops or deacons, for instance), either above or below the order of elders; and, on the other hand, with those who do not set their ministers apart by ordination. Second, there must be ruling elders, distinct from ordained ministers, and co-ordinate with them in the government of the church. Properly speaking, the Presbyterian elder (presbyter) is not the ruling elder, but is the minister, though the opposite use of the term is very prevalent, leading to some confusion concerning the two offices. The setting apart of the ruling elder is often called ordination, like the setting apart of the minister, but the standards of the Presbyterian churches do not teach that the two are equivalent. Third, there is the principle of review and control by the higher judicatories. These are not, as among Congregationalists, merely advisory or arbitrating bodies, but have an actual right of jurisdiction. Connected with these three points are others of less importance. In particular the office of deacon, as above described, is quite different from the office of deacon in other churches.

IV. *Doctrines.*—A church with Presbyterian polity is Presbyterian irrespective of all questions of doctrine; but, as a matter of fact, the Presbyterian churches mainly hold to the type of theology that is called Calvinistic. Several different theological symbols are accepted among the different Presbyterian bodies. Probably those that come nearest to being typical are the Confession of Faith and the Catechisms adopted by the famous Westminster Assembly, and then by the Parliament of England and by the Church of Scotland, 1646-48. These plant themselves first of all upon the fundamental Protestant principle that the books of the Old and New Testaments were given by inspiration, and are the only infallible rule of faith and conduct. From the Scriptures they deduce a system of doctrine controlled at every point by the idea of the sovereignty of God. Human freedom and divine love are affirmed, and all deep ethical and spiritual truths and experiences are either affirmed or taken for granted, but the thing that is everywhere made conspicuous is that God controls beforehand all his creatures and all their actions. Among the principal doctrines held are: First, God in three persons, Father, Son, and Holy Ghost, these three "the same in substance, equal in power and glory." Second, man morally depraved by nature. Third, Jesus Christ an atoning Saviour. Fourth, justification by faith in the Redeemer. Fifth, regeneration and sanctification by the Holy Ghost. Sixth, eternal happiness in the other world for believers, and eternal punishment for the finally impenitent. To the articles of the "Confessions" of the different branches of the Church the officers are required to subscribe at their ordination; but the only usual requirements for membership are repentance from sin, faith in the Lord Jesus Christ, and an unreserved consecration to God. See *CHRISTIANITY*, *CALVINISM*, and the articles on the various specific religious doctrines.

V. *History.*—Presbyterians claim that their history begins even before the apostolic age; that the analogy between the constitution of the Presbyterian church and that of the Jewish church is evident, being much closer than that of flower to seed; that the synagogue had its rabbi, its bench of elders, its appeal to a higher ecclesiastical court at Jerusalem; that the Christian church, very naturally, adopted the principal ideas of that church order to which it succeeded. Further, according to their view, the congregations of the apostolic Church were organized associations of the people of God, now assuming the title of Christians. The officers of these congregations were ordained elders. Appeals went up from one body of ecclesiastical rulers to another. Ordinations to the ministry, as in the case of Timothy, were performed by the "laying on of the hands of the presbytery."

The whole visible Church was regarded as one body, and the decrees of the assembled apostles and elders at Jerusalem were, when sent down to the congregations, received as authoritative. It is claimed but by few that the present order of the Presbyterian church is *precisely* that of the apostolic age; few claim a *jure divino* authority for the system; yet its principles are believed to have undergone little change. After the apostolic age presbyterian government in the Church gradually gave way to prelatical. It is claimed that there are traces of Presbyterianism in all the centuries, but, at best, they are not very distinct. Among the Culdees and other earliest Christians in different parts of Great Britain; among the Albigenes and, later, among the Vaudois or Waldenses, in France and Piedmont; among the Hussites in Bohemia and their successors the Taborites, the Bohemian Brethren, the older Moravian Brethren; among the English Lollards and other early Protestants from Wycliffe to Cranmer and Hooper, from the fourteenth century to the sixteenth—among these, and elsewhere, elements may be distinguished affiliated with Presbyterianism as it now exists, but also other elements not so affiliated. When, however, the Reformers of the sixteenth century broke with the Church of Rome, they found themselves in need of a polity by which to organize the churches of the Reformation. They looked into the New Testament for such a polity, with the pretty uniform result of finding there, each of them, some elements of what we now know as Presbyterianism; though, when it is said that "all the Reformed churches in France, Germany, Holland, Hungary, Geneva, and Scotland were thorough Presbyterians, not only in principle but also in practice," the statement is misleading if we understand by it that all these churches were at once organized into congregations, each choosing ruling elders for itself, with relations of appeal and review and control between each and a higher judicatory. The changes that actually occurred were affected by complications concerning church and state, by the retaining of ideas and usages that had prevailed under Roman supremacy, and, on the other hand, in some quarters by ideas of independency in church government that sprang up along with Presbyterian ideas. In some cases ruling elders were for a city or for a district, and not for a particular congregation. In John Calvin's church at Geneva the ruling elders were appointed not by the people, but by the civil authorities. A Presbyterian polity of some sort, however, came to be very prevalent among the churches of the Reformation. See *REFORMATION*, *GENEVA*, *CALVIN*, *HUSS*, *HUSSITES*, *HUGUENOTS*, etc.

These churches became classified as Lutheran and Reformed. Though the Lutheran churches have always retained certain elements of Presbyterianism in their polity, they are not regarded as Presbyterian churches. The distinctive symbols of the Reformed churches, on the other hand, are regarded as monuments of Presbyterian orthodoxy. This is especially true of the Gallican Confession, adopted by the first national synod of France in 1559; the Belgic Confession, written in 1561, and afterward adopted in Belgium and Holland; the Second Helvetic Confession, written by Bullinger in 1562, and afterward adopted in Switzerland, Scotland, Hungary, France, Poland, and other countries; the Heidelberg Catechism, prepared in 1562; the Canons of Dort, made for the Netherlands in 1619; and various symbols of the British churches.

At present, however, the established Reformed churches on the Continent are hardly to be counted as in sympathy with Presbyterianism. The Churches of Switzerland and of Hungary, of the Helvetic Confession, and the Church of the Netherlands come nearest to being exceptions to this rule. In different localities, more perhaps in France than elsewhere, the churches that now combine a genuine Presbyterian polity with an evangelical Calvinistic theology maintain some sort of continuity with the Reformed churches of the sixteenth century; but, in the main, these churches are relatively small, and are in an attitude of practical dissent from the established churches of the countries where they exist.

In Great Britain the case is somewhat different. The first Scottish General Assembly was organized by John Knox and others in 1560. A presbytery was formed at Wandsworth, England, in 1572, and such Englishmen as Thomas Cartwright (1535-1603) and Walter Travers advocated Presbyterian principles. In 1592 the Scottish church was formally established by act of Parliament. (See the article *SCOTLAND, CHURCH OF*.) Then followed the anti-Presbyterian policy of King James and King Charles and

the Covenant movements of 1638 and 1643. (See COVENANTERS and COVENANT, NATIONAL.) Meanwhile Puritanism, which at that stage was strongly Presbyterian, made great progress in England. In 1643 the Westminster Assembly of English divines, with four assessors from Scotland, was convened in London by act of Parliament. In 1647 and 1648 the various parts of the doctrinal standards framed by them were adopted by the English and Scottish Parliaments. Till the death of Cromwell the Presbyterianism thus defined was nominally (though not actually) the established religion of England. At the restoration of the Stuarts Episcopacy was re-established in both countries. On their overthrow the Presbyterian polity was restored in Scotland. In Ireland Presbyterianism appeared at the beginning of the seventeenth century, was firmly established there by the middle of the century, and has maintained itself with vicissitudes somewhat like those through which the Scottish churches have passed. On the history of Presbyterianism, in addition to articles already referred to, see HENDERSON, ALEXANDER; KNOX, JOHN; WESTMINSTER STANDARDS, etc.

VI. *Some of the existing Presbyterian Churches.*—Presbyterians in America are descended from those of every part of Europe, but in their organized churches only those of Germany, Holland, England, and Scotland are perpetuated. The Reformed Church in Germany is represented by the REFORMED CHURCH IN THE UNITED STATES (*q. v.*), popularly known as the German Reformed Church. Its standard is the Heidelberg Catechism. German immigration began as early as 1684. Churches were organized soon after, and a synod in 1747. Statistics of this and the other churches named are given at the end of this article.

The Reformed Church of the Netherlands took for its standards the Belgic Confession and the Heidelberg Catechism, and later the Canons of Dort; but, notwithstanding its abundant confessional bulwarks, it changed in doctrine and discipline, and in 1835, in protest against the alleged growing laxity, a number of ministers and people separated from it, and are now known as the Christian Reformed Church. In America the oldest church of the Presbyterian order is the daughter of the Reformed Church of Holland, the Reformed Church in America, popularly called the Dutch Reformed Church. It adopts the three standards of the Holland church, and in addition the Nicene and Athanasian creeds. Its earliest congregation was organized in New Amsterdam (now New York) in 1628. Negotiations were in progress for organic union between this church and the German Reformed Church, but the action taken in 1892 was adverse. In 1822 the Rev. Sol Froeligh and others separated from this church and formed the True Reformed Dutch Church. At one time this body had attained to some importance, but it dwindled to a few congregations, and in 1889 these were absorbed into the Christian Reformed Church of the United States. This is a branch of the church of the same name in Holland, and is a comparatively recent body. In 1882 it received a considerable accession from members of the Dutch Reformed synod of Chicago, who were dissatisfied with the refusal of that church to make Freemasonry a subject of church discipline. It now exists in the form of one synod, with seven classes, and about 100 churches, about half of its strength being in Michigan.

The changes in the British Presbyterian churches and their American progeny are more complicated. The Presbyterian churches in Scotland are the Reformed Church of Scotland, the Reformed Presbyterian Church, the Synod of United Original Seceders, the Free Church of Scotland, and the United Presbyterian Church. The origin of the Church of Scotland has already been noticed. During the interval between 1660 and 1689, and especially during the last ten years of that time, many Scotchmen, among whom Richard Cameron was prominent, abjured the sovereignty of King Charles II. and King James II. on account of their tyranny, and especially their violation of the Solemn League and Covenant. These people formed societies, and were known as Cameronians and Covenanters. At the accession of William and Mary, Presbyterianism in Scotland was restored on the basis of the old establishment of 1592, and of the Westminster standards, the Covenant not being re-enacted. For this reason many members of the societies stood aloof from the established church. In 1706 Rev. John Macmillan joined them, and in 1743 the Rev. Mr. Nairn. They then constituted the "Reformed Presbytery." This was the beginning of the Reformed Presbyterian Church of Scotland, whose members are popularly known as Covenanters, or Cameronians. About 1863 a large majority in the Scotch synod of

this Church held that it was consistent with their principles so far to countenance existing political institutions as to vote for a member of Parliament. A minority thought otherwise, and a disruption took place. In 1876 the larger body joined the Free Church of Scotland. The smaller still maintains its existence.

In 1718 Edward Fisher's book, *The Marrow of Modern Divinity*, was republished in Scotland. The General Assembly of 1720 condemned the book. Twelve ministers, of whom Ebenezer Erskine was one, sent to the Assembly a representation to the effect that some of the propositions they had condemned were identical with statements in the Scriptures and in the church standards. In 1723 the Assembly rebuked them for this. They are known as Marrow Men and Representers. In 1731 the Assembly approved the calling of ministers to a congregation by the patrons and elders, without the consent of the congregation. Erskine rebuked this in two sermons preached in 1733. Being admonished for so doing, he and three others protested. They were suspended. In December of that year they organized the Associate Presbytery. In 1745 the number of congregations had increased to forty-five, and the Associate Synod was formed. Two years later a controversy culminated respecting the oath taken by the burgesses of Edinburgh and other towns, which included a profession of "the true religion presently professed within this realm." The Antiburghers held that the swearing of this oath was a sin, to be punished by excommunication, and went through the form of deposing and excommunicating Erskine and the others who held the opposite view, and who were known as Burghers. Both Burghers and Antiburghers increased rapidly, and each claimed to be the Associate Synod; but in 1788 the Antiburghers divided into four provincial synods, and from that time were called the General Associate Synod.

Meanwhile, in 1752, Thomas Gillespie was deposed by the Church of Scotland for refusing to take part in the installation of a minister whom he regarded as thrust upon an unwilling congregation. In 1761 he, with two others, formed the Relief Presbytery. This grew in time into the Relief Church, with a synod and seven presbyteries.

For more than fifty years the Burgher and Antiburgher synods grew side by side, with no intercourse between them. Then controversies arose in each in regard to the power of the civil magistrate in matters of religion. In each the more liberal party was largely in the majority, and was called New Light, while the other party was called Old Light. In 1799 the Old Light Burghers seceded, taking the name Associate Presbytery, which became in 1805 the Associate Synod, or Original Burgher Synod. In 1804 McCrie and three others (Old Lights) withdrew from the Antiburgher Synod and formed the Constitutional Associate Presbytery.

Thus, in 1820, there were in existence in Scotland five little denominations of seceders from the national church. In that year 129 of the congregations of the New Light Antiburgher Synod united with the 154 congregations of the New Light Burgher Synod, forming the United Secession Church. The remaining eight of the Antiburgher congregations united in 1827 with the Old Light Antiburghers, forming the Associate Synod of Original Seceders. In 1839 a majority of the Old Light Burgher Synod joined the Church of Scotland. The remainder, in 1842, joined the Associate Synod of Original Seceders, taking the name of United Original Seceders. A small majority of these, twenty-seven ministers in all, joined the Free Church in 1852. The remainder constitute the present synod of this name. In 1841 James Morrison, minister of the United Secession Church, was deposed for holding, *inter alia*, that the spirit strives with all the unregenerate, and that the atonement is universal; and he and others formed the EVANGELICAL UNION (*q. v.*). In 1847 the United Secession Church joined with the Relief Church, forming the United Presbyterian Church of Scotland, which thus became a large and important body.

This sketch of the Scottish churches is completed by stating that in 1843 the FREE CHURCH OF SCOTLAND (*q. v.*) came out from the established church. The question at stake was measurably the same as in the times of Erskine, namely, the right of a congregation to choose its pastor. It is not surprising that in 1852 and 1876 it absorbed majorities of the Original Seceders and of the Reformed Presbyterians, or that negotiations for union have at times been pending between the United Presbyterian and the Free churches.

In England the Presbyterianism established in 1647-48

failed to take permanent root. Many of the Puritans emigrated and others conformed to the established church. Some of the Presbyterian churches lapsed from orthodoxy, but during the second half of the nineteenth century a new Presbyterianism has grown up in England. Previous to 1876 there was in England a branch of the Scottish United Presbyterian Church and an English Presbyterian church. In that year the two united, taking the name of the English body, the Presbyterian Church of England. There is also in England a synod connected with the Church of Scotland. There is a strong Welsh Church, sometimes called the Presbyterian Church in Wales, but oftener the Welsh Calvinistic Methodist Church. In Ireland are the Presbyterian Church in Ireland, the Reformed Presbyterian Church of Ireland, the Eastern Reformed Presbyterian Church of Ireland, and the Secession Church of Ireland. The second and fourth of these are in connection with the Scottish churches of the same names.

We have already noticed the German and Dutch Presbyterian bodies in America. Had the early Dutch ascendancy been maintained, the Dutch type of Presbyterianism would perhaps have remained dominant. As affairs turned out, the mould of the principal type of Presbyterianism in the U. S. was formed by the fusion of English Puritans with people from the churches of Scotland and Ireland. Into this mould Presbyterians of other types became assimilated, among these very prominently the French Huguenots. Into this main body were absorbed a large proportion even of the German and Dutch Presbyterians, and, probably, a majority of the immigrants who belonged to the Reformed Presbyterian and the Secession churches of Scotland. Many of these last, however, adhered to their old-country preferences and organized churches of their own, and we will briefly follow their history before taking up that of the larger bodies.

The Seceders (Antiburghers mainly) organized the Associate Presbytery of Pennsylvania about 1753 and that of New York in 1776. The Covenanters organized a Reformed Presbytery in 1774. In 1782 the three presbyteries united, forming the Associate Reformed Synod of North America; but some members of each body refused to go into the union, and before 1800 an additional body had been organized, so that the century opened with four of these organizations—an Associate Presbytery or Presbyteries, a Reformed Presbytery, an Associate Reformed Synod, and the Reformed Dissenting Presbytery. Of the last there seems to be no further trace.

The Reformed Presbyterians organized a synod in 1809 and a general synod in 1823. In 1833 a division occurred similar to that which came thirty years later in Scotland, the New Light party holding that it was right to vote and hold office under the Government of the U. S., and the Old Light party holding the contrary. This caused a division. The New Light body has ever since been known as the Reformed Presbyterian Church in North America (General Synod). The other is the Reformed Presbyterian Church in the United States of America (Synod). In 1840 the Reformed Presbyterian Covenanted Church withdrew from the Synod on account of the alleged lack of strictness in that body. In 1883 the Reformed Presbyterian Church in the United States and Canada was formed by separation from the General Synod.

The Associate Presbyterians in 1801 organized the Associate Synod of North America, otherwise known as the Associate Church of North America. In 1858 the number of congregations had become nearly 300. It was then merged into the UNITED PRESBYTERIAN CHURCH OF NORTH AMERICA (*q. v.*), though a small minority continued their separate existence and perpetuate the name of the Associate Church.

The Associate Reformed Presbyterians in 1802 formed a general synod, including the synods of New York, Pennsylvania, Scioto, and the Carolinas. In 1820 the Synod of Scioto withdrew. About the same time an unsuccessful attempt was made to unite the Associate Reformed and Reformed Dutch churches under the name of the Reformed Protestant Church of North America. In 1821 the Synod of the Carolinas became an independent body, which still exists as the Associate Reformed Synod of the South. The same year a union was made illegally between the Associate Reformed body and the General Assembly of the Presbyterian Church. In this attempt the Pennsylvania Synod was practically merged into the General Assembly. The Scioto Synod grew, became a general synod, and after several unsuccessful attempts united again with the New York Synod

in 1855, forming a body of 367 congregations. This body three years later consolidated with the Associate Presbyterians into the United Presbyterian Church. There still remained, however, a separate body named the Associate Reformed Synod of New York. By 1894 all the congregations of this body save two were absorbed into other churches.

The first presbytery in the American colonies was that of Philadelphia, formed in 1705. In 1716 the Synod of Philadelphia was constituted. In 1729 it adopted the Westminster Confession of Faith. In 1745 the presbyteries of New Brunswick, New York, and a part of that of Newcastle withdrew and formed the independent Synod of New York. This was called the New Side Synod, and the old Synod of Philadelphia the Old Side. The Old Side stood aloof from Whitefield and revivals, and insisted on a full course of scholastic study for ministers; the New Side affiliated with Whitefield and judged of ministers by their qualifications and not by their scholastic studies only. The synod came together again in 1758 as the Synod of New York and Philadelphia. The Old Side ministers were in the majority at the disruption; at the reunion the New Side outnumbered them three to one.

Four ministers withdrew in 1779 and formed the Presbytery of Morris County. Three other affiliated presbyteries were formed within the next eighteen years. They were known as the Associated Presbyteries. In no very long time they were absorbed by other bodies.

In 1788 the Synod of New York and Philadelphia had increased to sixteen presbyteries. In 1789 these were distributed into four synods, and the General Assembly of the Presbyterian Church in the United States of America was organized. Very soon after, as the effect of a plan of united work with the Congregationalists of New England, the churches of the assembly multiplied greatly in the new settlements of New York and Ohio. In the first decade of the nineteenth century differences arose among the Scotch-Irish Presbyterians in the Cumberland valley, and these resulted in the formation of the CUMBERLAND PRESBYTERIAN CHURCH (*q. v.*). In the following decades arose the division into Old School and New School. The New School men were charged at the time with laxity in doctrine and discipline. This they denied, and they certainly made good their denial. As the Old School party was strong in the Southern States, the party was charged with proslavery sympathies; but it does not appear that this was true in such a sense as to affect their ecclesiastical conduct. The difference was partly a difference of race and temperament, English blood being relatively more prominent among the New School men, and Scotch-Irish blood among the Old School men. The Old School men magnified the prerogatives of church government and church office, were ambitious of power in the church courts, were very ready to bring men before church courts for trial, were impatient of any restrictions that should prevent a majority in a church court doing as it pleased. The New School men were not ambitious to distinguish themselves as ecclesiastical leaders, insisted on constitutional restrictions as limiting the power of majorities in church courts, preferred to deal with innovations rather by study and argument than by prosecution. In 1837 the Old School men, finding themselves in a majority in the General Assembly, passed a vote excommunicating several of the synods in which the New School men were most numerous. The New School men denied the constitutionality of this, but accepted the situation under protest, and were soon in good working order as a church by themselves. In 1858 the Southern presbyteries of the New School church withdrew and formed the United Synod of the Presbyterian Church. In 1862 the Southern constituency of the Old School church withdrew and formed the General Assembly of the Confederate States of America, a name which at the close of the civil war was changed to the Presbyterian Church in the United States. The following year this body formed an organic union with the United Synod of the south, and a few years later incorporated the synods of Missouri and Kentucky, which had been practically excommunicated by the Old School General Assembly in 1866. In 1869 the Old School and New School General Assemblies after thirty-two years of separation were reunited.

With the addition of the Welsh Calvinistic Methodist Church in the U. S. the list is substantially complete.

In Canada, Presbyterianism was planted in nearly as many different forms as in the U. S., and passed through somewhat similar stages. The several movements for union culminated in 1875, when practically all the Canadian Pres-

byterian churches were consolidated into one church bearing the name The Presbyterian Church in Canada. In Australia, New Zealand, and other British dependencies, and in South Africa, are vigorous bodies of the Presbyterian order.

VII. *Church Institutions.*—The Presbyterian churches commonly manage their missionary work, domestic and foreign, and other special forms of church work, through permanent boards or permanent committees. For example, the Presbyterian Church in the United States of America has the following organizations of this sort: The trustees of the assembly, the boards of home missions, of foreign missions, of education, of publication and Sabbath-school work, of church erection, of ministerial relief, of freedmen, of aid for colleges and academies, and the permanent committee on temperance. The other Presbyterian churches have similar arrangements. In addition, many particular synods and presbyteries are incorporated, having boards of trustees of their own, authorized to hold and use property for church purposes. The Presbyterian churches also have a large number of educational institutions. (See COLLEGE, and the names of particular institutions.) Further, they have hospitals and asylums in many parts of the earth, and also historical societies, houses of publication, clubs, family papers, reviews, etc. The Young Men's Christian Association and the Young People's Society of Christian Endeavor have been especially fruitful in their work among Presbyterians.

VIII. *Present Condition of Presbyterianism.*—The various evangelical Presbyterian churches number about 4,125,000 communicants, representing a population of about five times that number—nearly one-fifth of the Protestant population of the world. In order to give an account of the different Presbyterian bodies by name it has been necessary to describe the series of disruptions and reunions that have characterized Presbyterian history. It should be remembered that this phase has never had more than a small relative importance as compared with the Christian work done in these churches, which have always been distinguished for the number and character of their educational institutions, for the extent of their foreign missionary operations, for their liberal contributions for religious and educational purposes, and for thoughtful preaching.

In 1872 a movement was made in the U. S. toward bringing the scattered families of Presbyterianism into at least a federative union. This movement was responded to in other lands. The result was a council held in London, July, 1875, to agree upon a constitution of confederation. The first general council of the confederation was held at Edinburgh July, 1877; the second at Philadelphia Sept., 1880; the third at Belfast June and July, 1884; the fourth in London July, 1888; the fifth in Toronto Sept., 1892. The union is styled The Alliance of the Reformed Churches holding the Presbyterian System. It is popularly known as the Pan-Presbyterian Council.

In the different branches of the Presbyterian church there is more or less of movement toward creed revision. Several of the British churches have adopted changes in the Westminster standards, or explanatory declarations, or both. In the largest American Presbyterian church there has been wide but fruitless discussion on this subject. Correspondence is also in progress with reference to the formulation of a creed which shall express the consensus of doctrine in all the churches of the alliance.

IX. *Statistics.*—The following general summary, and the statistics for Great Britain, are taken from the volume of the Toronto council, with corrections and supplementation. The fuller statistics for North America are taken, except when the contrary is indicated, from official sources for 1894:

GENERAL SUMMARY.

COUNTRIES.	Churches.	Pre-by-terans.	Pastoral charges.	Minis-ters.	Com-muni-cants.
European continent	31	221	5,280	5,602	752,901
The United Kingdom	12	276	5,149	4,642	1,436,152
Asia	6	14	160	108	20,344
Africa	10	18	228	174	131,931
North America	17	658	11,921	12,782	1,708,543
South America	3	5	52	37	3,425
Western islands	2	6	39	41	10,869
Australia	2	43	463	405	39,590
New Zealand	2	14	194	166	19,119
Grand totals for 1892	91	1,255	24,495	23,957	4,125,904
Totals for 1888		1,406	25,787	23,077	3,721,680

FULLER STATISTICS FOR GREAT BRITAIN AND NORTH AMERICA.

CHURCHES.	Clas- ses or presby- teries.	Congre- gation.	Minis- ters.	Communi- cants.
Church of Scotland	84	1,685	1,500	593,393
Reformed Presb. Church of Scotland	2	13	8	1,185
United Original Seceders	1	29	26	3,617
Free Church of Scotland	74	1,092	1,142	338,978
United Presb. Church of Scotland	29	617	606	185,298
Presbyterian Church in Ireland	36	557	637	102,735
Reformed Presb. Church of Ireland	4	36	29	.....
Eastern Reformed Presb. Church of Ireland	2	8	.....	.....
Secession Church of Ireland	2	10	7	1,230
Welsh Calvinistic Meth. Church	24	1,446	672	136,051
Church of Scotland in England	4	14	15	3,800
Presbyterian Church of England	11	385	308	65,941
Reformed Church in America (D. Ref.)	35	612	614	100,811
Christian Ref. Church in America	7	119	71	13,351
Reformed Church in the U. S.	55	1,583	885	212,830
Presbyterian Church, U. S. A.	223	7,387	6,641	895,997
Cumberland Presbyterian Church	126	2,881	1,708	184,138
* Cumberland Presb. Church (colored)	22	285	200	15,000
Presbyterian Church, U. S.	73	2,718	1,319	199,167
Associate Pres. Synod of North America	4	33	14	1,100
† Associate Ref. Pres. Churches	.....	2	7	350
Associate Ref. Synod of the South	9	131	103	10,088
Ref. Presb. Church in N. A. (Gen. Synod)	6	48	35	+ 4,602
Ref. Presb. Church in U. S. A. (Synod)	12	119	109	9,787
+ Ref. Presb. Covenanted Church	.....	4	.....	37
+ Ref. Presb. Church in the U. S. and Canada	.....	1	.....	600
United Presb. Church of North America	64	939	833	115,272
* Welsh Calv. Methodist Church in the U. S.	18	175	117	12,202
Presbyterian Church in Canada	48	2,606	1,087	181,370
* Church of Scotland in Canada	1	10	9	1,000
* Ch. of Scotland in the Maritime Provinces	2	12	8	1,000

* Records of Toronto Council.

† U. S. Census of 1890.

X. *LITERATURE.*—The literature of Presbyterianism is extensive. First. It has its place in many general historical works, particularly those that treat of religious and missionary movements in the Reformation and post-Reformation period. A valuable bibliography of this period is contained in Fisher's *History of the Reformation*. Second. Presbyterian statistics and other information are to be found in the census reports and other archives of the U. S. and other nations. Such material in compendious form is given in such works as *The Census of the Churches* (1894) and *The Religious Forces of the United States*, vol. i. in the American Church History Series (1893), by H. K. Carroll; *Our Country* (revised edition 1891), by Josiah Strong; *Problem of Religious Progress* (1881), by Daniel Dorchester; and *The Churches and Churchless of Scotland*, by Robert Howie. Third. Sessions, presbyteries, synods, general assemblies, and the Alliance are record-keeping bodies, and their records and archives, either in manuscript or published, are the true sources of information. The prominent churches publish their minutes annually, and some publish an additional volume of reports and documents. Collections of these are accessible in libraries. Among the publications of this kind that have an interdenominational value may be mentioned the *Scottish Church and University Almanac*, Nevins' *Presbyterian Year-book*, and the quadrennial volumes of the Alliance of the Reformed Churches. For the earliest period, see *Introduction to the Records of the General Assembly, 1646-47, Minutes of the General Assembly, 1644-49* (Edinburgh, 1874), and *The Westminster Assembly, its History and Standards* (London, 1883), by A. F. Mitchell; *History of the Westminster Assembly of Divines* (4th ed., revised, Edinburgh, 1878), by W. M. Hetherington; and *Documentary History of the Westminster Assembly* (*Presbyterian Review*, Jan., 1880), by C. A. Briggs. Fourth. A unique work, of importance to those interested in the creed-revision movements of 1887-92, is the scrap-book entitled *Confessional Revision*, made by Winthrop S. Gilman, of which complete copies exist in the libraries of Union, Auburn, and Princeton Theological Seminaries. Fifth. The doctrinal position of the Presbyterians is defined in the published standards of each Church. The well-known *Confession of Faith of the Scottish and American churches* is the most prominent example. A good account of the celebrated statements of Presbyterian doctrine may be found in *Creeds of Christendom*, by Philip Schaff (5th ed. 1890). Of Presbyterian theological works the following are a few among many: *History of Christian Doctrines* (1889) and *Dogmatic Theology* (2d ed. 1889), by W. G. T. Shedd; *Christian Dogmatics* (1887), by J. J. Van Oosterzee; *Systematic Theology* (1873), by C. Hodge; *Outlines of Theology* (1862, and later editions), by A. A. Hodge; *Sys-*

tem of Christian Theology (4th ed. 1890), by H. B. Smith; *Present Day Theology* (1893), by L. F. Stearns; *Systematic Theology* (Nashville, 1870), by R. Beard; *The Doctrine of the Covenants in Reformed Theology* (1891), by G. Vos; and *The Institutes of the Christian Religion* (1891-95), by E. V. Gerhart. Sixth. Works on Church polity: *The Books of Discipline* of the several churches; *The Law of Covenants in Scotland* (1867), by A. T. Innes; MacPherson's *Presbyterianism* (Scottish); Levi's *Digest of the Presbyterian Church of England*; *Digest of Deliverances in the United Presbyterian Church*, by A. G. Wallace; *Assembly Digest*, by S. J. Baird (1856, rev. ed. 1858); *The Presbyterian Digest of 1886*, by W. E. Moore; *Digest of the Presbyterian Church (South) to 1887*, by W. A. Alexander; *Manual of Church Polity* (1878), by S. M. Hopkins; *What is Presbyterian Law?* (1884), by J. A. Hodge; *Relations of Civil Law to Church Polity* (1875), by Justice William Strong; and *Manual of Law and Usage* (1888), by B. F. Bittinger. Eighth. Works on the history of Presbyterianism: Knox's *History of the Reformation in Scotland*; Burton's *History of Scotland*; McCrie's *Vindication of the Scottish Covenanters*; *History of the Puritans*, by Stowell, Hetherington, and Neal; Plumley's *The Presbyterian Church throughout the World* (1875); Stoughton's *History of Religions in England* (1884); and Blackie's *History of Presbyterianism in New England* (1881). Church of Scotland: The histories of Calderwood, Spotswood, Row, and Woodrow, among the older authorities; those of Hetherington (1853), Stanley (1872), Walker (1882), Moffat (1884), P. M. Muir (1893); and *St. Giles Lectures*, first series (1881). Reformed Church in the U. S.: *Tercentenary Monument, Chambersburg* (1863); *History of the Reformed Church*, by L. Mayer (1851), by E. V. Gerhart (1863), by J. H. Dubbs, in *American Church History Series*, vol. vii. (1895), and *Historic Manual* (1885), by J. H. Dubbs. Reformed Church in America: *Manual* (3d ed. 1879), *Centennial Discourses* (1876), *Centennial Volume of the New Brunswick Seminary* (1884), and *The Reformed Church in America in the American Church History Series*, vol. vii. (1895), by E. T. Corwin; *History of Rutgers College* (1879), by T. S. Doolittle; *The Huguenots on the Hackensack* (1886) and *The Reformed Church in America* (1856; 3d ed. 1889), by D. D. Demarest. Reformed Presbyterian Church of Scotland: Naismith's *Historical Sketch* (1887). United Presbyterian Church of Scotland: M'Kerrow's *History of the United Secession Church* (1841); Struther's *History of the Relief Church* (1843); and MacKelvie's *Annals and Statutes of the United Presbyterian Church* (1873). Free Church of Scotland: Hanna's *Life of Dr. Chalmers*; Rainy's *Life of William Cunningham*; Walker's *Life of Buchanan*; Buchanan's *Ten Years' Conflict* (1849); Bryce's *Ten Years of the Church of Scotland* (1859); *Our Church Heritage* (1874), *Religious History of Scotland* (1882), and *Scottish Church History* (1880), by N. L. Walker; *The Free Church of Scotland* (1893), by Peter Bayne; and (in one volume) *Scotland's Free Church*, by G. B. Ryley, with the *Summary of Free Church Progress*, by J. M. McCandlish (1893). Presbyterian Church of England: T. McCrie's *Annals of the English Presbytery from the Earliest Period to the Present Time* (1872); Skeats's *History of Free Churches in England, A. D. 1688-1851* (1869); Drysdale's *The Presbyterians in England* (1889); Black's *Presbyterianism in England in the Eighteenth and Nineteenth Centuries*; and D. Fraser's *Presbyterian Church in England* (1892). Welsh Calvinistic Church: *Encyclopædia Cambrensis* (10 vols., in Welsh, Denbigh, 1882). Presbyterian Church in Ireland: *Ecclesiastical History of Ireland* (1875), by W. D. Killen; *The Presbyterian Church in Ireland*, by P. Adair (1866), by J. S. Reid (1867), and by W. Cleland (1892). Reformed Presbyterian: Glasgow's *History of the Reformed Presbyterian Church; Reformation Principles as Testimony*. United Presbyterian Church: *United Presbyterianism* (2d ed. 1883), by W. J. Reid; *The United Presbyterian Church*, by A. G. Wallace, in Hay's *Presbyterians* (1892), and by J. B. Scouller, in vol. ii. of the *American Church History Series* (1894). Cumberland Presbyterian Church: *The Presbyterian Church in Kentucky* (1847), by R. Davidson; *The Cumberland Presbyterian Church*, by B. W. McDonnold (1888), and by R. V. Foster in vol. ii. of the *American Church History Series* (1894). Presbyterian Church in the United States of America: Hotchkiss's *History of Western New York* (1848); *The Presbyterian Church in America* (1857), by R. Webster; *Sketch of Presbyterianism in Central New York* (1877), by P. H. Fowler; *History of the Division in the Presbyterian*

Church (1852), by G. N. Judd; Brown's *Historical Vindication of the Abrogation of the Plan of Union* (1855); *History of the New School* (1868), by S. J. Baird; *Presbyterian Reunion* (1870); *Centennial Historical Discourses* (1876); *Historical Almanac* (10 vols., 1858-68), by T. M. Wilson; *Constitutional History of the Presbyterian Church* (1840), by C. Hodge; *The Presbyterian Church* (revised ed. 1873), by E. H. Gillett; *Presbyterians* (1892), by G. P. Hays; *American Presbyterianism* (1885), by C. A. Briggs; and *Presbyterians*, by R. E. Thompson, in the *American Church History Series*, vol. vi. (1895). Presbyterian Church in the U. S.: Howe's *Presbyterian Church in South Carolina* (vol. i., 1870; vol. ii., 1883); James H. Thornwell's *Collected Writings* (Richmond, 1881-86), his *Life and Letters* (1875), by B. M. Palmer; and *The Southern Presbyterian Church*, by T. C. Johnson, in vol. ii. of the *American Church History Series* (1894). Welsh Calvinistic Methodist: *Welsh Methodism* (in Welsh, 3 vols., Wrexham, Wales, 1850-56), by J. Hughes; *The Welsh Calvinistic Methodists* (Rome, N. Y., 1854), by W. Roland; *Welsh Calvinistic Methodism* (London, 1872), by W. Williams; and *The Welsh in America* (in Welsh, 1872), by R. D. Thomas. The Presbyterian Church in Canada: *History of the Presbyterian Church in Canada*, by G. Bryce (1875), by W. Cleland (1890), by W. Gregg (1890); and *Short History of the Presbyterian Church in Canada from the Earliest to the Present Times* (1892), by W. Gregg.

Revised by W. J. BEECHER and C. K. HOYT.

Prescott, WILLIAM: soldier; b. at Groton, Mass., Feb. 20, 1726; served in the expeditions against Cape Breton (1754) and Acadia (1756), attaining the rank of captain; became a farmer in the town of Pepperell, where he inherited a considerable landed estate; commanded a regiment of minutemen 1775; took part in the battle of Lexington, and commanded in that of Bunker Hill (according to the usual account); resigned from the army 1777, but took part as a volunteer in the campaign against Burgoyne in the same year; and sat in the Massachusetts Legislature for several years. D. Oct. 13, 1795.

Prescott, WILLIAM HICKLING: historian; b. at Salem, Mass., May 4, 1796. He entered Harvard College as a sophomore in 1811. Not long after he received injuries which eventually resulted in total blindness in one eye and partial loss of sight in the other. Owing to this misfortune he was forced to employ a reader for his historical investigations, and in writing he used an ingeniously contrived frame, the "noctograph." He graduated at Harvard in 1814 with high honors in classics and literature; traveled in the Azores, England, France, and Italy 1815-17, and settled in Boston, where he was married in 1820. He chose as his special field of literary work modern Spain and the Spanish conquests in America. In the course of his researches he procured from Spain copies of a large number of valuable manuscripts. His first book, *History of the Reign of Ferdinand and Isabella* (3 vols., Boston, 1837), was the result of ten years of labor. It was recognized in Europe as the most meritorious historical work which had yet appeared in America, and was translated into French, Spanish, Italian, German, and Dutch; yet it is stated that Prescott himself, with characteristic modesty, refused to give it to the world until urged to do so by his friends. In 1843 appeared his most brilliant work, *History of the Conquest of Mexico*; it was followed by *Biographical and Critical Miscellanies* (1845); *Conquest of Peru* (1847); and *History of the Reign of Philip the Second* (3 vols., 1857-58, incomplete). In 1858 he edited Robertson's *Charles the Fifth*, with a supplement on the life of the emperor after his abdication, and he was the author of historical and critical articles in *The North American Review* and other periodicals. His relations with Irving, Motley, and Ticknor were particularly cordial, and their mutual concessions honored them all. Irving, who had begun a work on the conquest of Mexico, resigned the field to Prescott as soon as he heard that the latter had taken it up, and Prescott aided and encouraged Motley to write his *Dutch Republic*, though the subject was partly covered by his own *Philip the Second*. Prescott, like Irving, was a brilliant writer and a painstaking investigator, but his tendency to hero-worship and to picturesque coloring often produces a false impression. He himself was aware of this, and tried to counterbalance it by occasional rigid condemnation of such men as Cortés and Pizarro, but his evident sympathy and his gorgeous descriptions blind us to the cruelty and injustice of the conquer-

ors. His works are among the American classics and have had numerous editions. D. in Boston, Jan. 28, 1859. See Ticknor, *Life of W. H. Prescott* (1864), and for critical estimates Allibone's *Dictionary of Authors* and Bancroft's *Mexico*, vol. i., pp. 7, 17, 701-702. HERBERT H. SMITH.

Prescription [from Lat. *præscriptio*, liter., a writing before or in front of; in Roman procedure, a defense which, if proven, renders unnecessary the examination of the plaintiff's allegations, and which was therefore put at the top of the formula sent to the referee; deriv. of *præscribere*, write before; *præ*, before + *scribere*, write]: the conversion of an actual into a legal state of things by lapse of time. It is evident that prescription, in this sense, plays a very important part in public law. In the relations of state to state, and of class to class within the same state, power actually asserted is constantly transforming itself into right, and rights left unexercised are sooner or later lost.

In private relations, lapse of time seems to have had equally great and equally general results in early society. Originally, rights of all kinds appear to have been created by successful force and extinguished by the failure to exercise them. In civilized states, however, the law does not give prescription so wide an effect. Certain rights only are established by the exercise of the corresponding power, and certain rights only are lost by non-user. To the former category belong, regularly, rights over things. To the latter category belong certain rights *in re*, and nearly all rights of action, or claims, whether *in rem* or *in personam*. For the Roman and modern European law governing the prescriptive extinction of claims, see LIMITATION OF ACTIONS; what remains to be noted is the law governing the prescriptive establishment and extinction of rights over things.

1. *The Roman law* started with the rule that all corporeal objects capable of private ownership passed, in relatively short terms, into the ownership of the possessor; movables in one year, immovables in two years. This method of acquiring property right was called "taking by use" (*usucapio*). In the provinces, where usucaption, as an institution of the civil law, was held to be inapplicable, an analogous protection was given to the possessor of realty by the "prescription of long time." The rules of usucaption and of prescription were subjected, partly by legislation and partly by interpretation, to certain qualifications, and the two institutions were fused into one by Justinian. According to the rules laid down by him, the possessor of movables acquired ownership in three years; the possessor of immovables in ten years *inter presentes* (i. e. when both the prior and the present possessor resided in the same province), and in twenty years *inter absentes*. In order to ripen into ownership the possession had to be "juristic" and must have been acquired *bona fide*, which regularly implied color of title. In calculating the term of possession the possessor was permitted to reckon the possession of him from whom he obtained possession (*accessio possessionis*), provided the latter also had acquired *bona fide*. Things incapable of ownership (*res extra commercium*) were, of course, incapable of prescription; also, by the rule of the Twelve Tables, things which had been stolen, and by a later enactment things of which the possession had been acquired originally by force.

This "ordinary" prescription was supplemented in the codification of Justinian by a much more sweeping *præscriptio longissimi temporis*. By virtue of this so-called "extraordinary" prescription, possession, if acquired *bona fide*, was converted into ownership whenever the previous owner's actions were lost by limitation. The period in this case was thirty or forty years.

Lesser rights over things, e. g., the servitudes or easements upon realty, were capable of being acquired by prescription in ten or twenty years.

As to the loss of rights over things by non-user, distinctions were drawn. Ownership was not lost by non-user, but only in consequence of the creation of a new adverse ownership. Real or "praedial" servitudes were extinguished by non-user whenever the exercise of the right involved positive acts on the part of its holder (as, for example, in the case of a right of way). When the servitude merely imposed upon the owner of the servient estate the duty of not doing certain things (which was regularly the case with the so-called "town servitudes") the servitude was extinguished only by "usucaption of liberty," i. e. the owner of the servient estate must do that which he was forbidden to do and must maintain this attitude of opposition for the legal

period (ten or twenty years). The so-called "personal" servitudes were not extinguished by non-user.

All the shorter prescriptions of the Roman law were suspended during the minority of the true owner, and in certain other cases where he was unable to press his claim. No such suspension was recognized in the case of the prescriptions of thirty or forty years.

2. *Mediæval Developments.*—Teutonic custom recognized, as regarded immovables, no acquisition of ownership by lapse of time, but only a strengthened claim of the possessor to legal protection. This protection was given through the rules of procedure and particularly of evidence. He who had possessed for a "year and day," however vicious his original possession, had at least the advantage of the defensive position; and if his possession was based on a colorable title, like inheritance or conveyance in folk-moot, he might either ignore opposing claims or defend himself by proving, with the aid of compurgators, his possession, and by his "sole oath" the manner in which he acquired possession. This protection was obviously based rather on the extinction of opposing claims than on the acquisition of prescriptive right.

As regarded movables, Teutonic custom treated possession as ownership except in the case of things lost or stolen; but here again the protection of the possessor was based, originally, on the fact that the owner of movables who had parted with possession of his free will was allowed no action of recovery against other persons than his bailee.

The Church accepted the Roman rules of prescription, but with one important modification. The Roman law required that possession should be obtained *bona fide*, but did not demand the continuance of *bona fides*. In other words, the fact that the possessor discovered, after prescriptive possession had been established, that his title was bad, did not interfere with the completion of the prescription. The Church made such a discovery fatal to the completion of prescription (*mala fides superveniens nocet*). This rule was generally recognized and enforced by the secular courts.

3. *Modern legislations* generally recognize, in some form and to some extent, the Roman theories of prescription (Fr. *prescription*, Germ. *Ersitzung*). According to the analogy of the Roman extraordinary prescription, the European codes generally treat the extinction of the previous owner's action of recovery as establishing the ownership of the honest possessor. The Code Napoléon goes further and discards the Roman requirement of *bona fides*. The rules of ordinary prescription are substantially Roman, but in some legislations the character of the title on which prescription can be based has been modified. The Roman law permitted prescription when the possessor erroneously imagined that he had color of title; so, for example, when he acquired possession through a representative or agent and erroneously supposed that the agent had acquired by some legal method of transfer (so-called "putative" title). The Roman law, again, permitted the heir to prescribe, although his ancestor had held possession for another as bailee or lessee, etc., provided the heir was ignorant of this fact (title *pro herede*). In the latter case prescription is excluded by the French law; in the former case it is excluded by the Austrian law, which admits prescription only when the possessor has at least a color of title.

The whole doctrine, however, has lost or is losing much of its importance in modern European law, by reason of changes in the law concerning acquisition of ownership. As regards movables, the tendency is to give further protection to the honest possessor than was given as Roman law. In a large number of cases honest possession carries with it a perfect title, exception being made only in the case of lost and stolen property. The Code Napoléon, which goes furthest in the protection of the honest possessor, lays down no rules at all concerning the prescriptive acquisition of movables. The matter is regulated by treating honest possession as equivalent to ownership, except in the case of things lost or stolen, and by limiting the action for the recovery of lost or stolen things to three years.

In the German law there is a tendency to exclude prescription of realty. This tendency is due to the development of the "land-book" system (see RECORDING) and to the *publica fides* which entries in the land-book enjoy. In Prussia and in a large number of minor German states prescription is absolutely excluded as against a registered title; and in some of these states, in which registration is made

essential to title, prescription of unregistered land gives only a right to demand registration. The German draft code excludes real property from prescription.

The Austrian code, which does not go so far in the protection of the registered title, makes the entry in the land-book a basis for a peculiar prescription of perfect title without actual possession. The person registered as owner obtains "full right" against all the world in three years.

4. *Theory.*—Prescriptive acquisition is defended on the same grounds which are held to justify the *Limitation of Actions* (*q. v.*). Statutes of prescription are also "statutes of rest." The wrong apparently done to him who loses his right in consequence of the establishment of an adverse right disappears when it is considered that he has only himself to blame, that he is the victim of his own negligence. An independent reason for recognizing prescriptive acquisition is found in the fact that it not merely transforms imperfect into perfect titles, but that it also transforms derivative into original titles, and frees owners from the necessity of proving the titles of their predecessors. The former result of prescription is occasional, the latter is constant. This constant conversion of derivative into original titles is really the most important function discharged by laws of prescription; and it is because the same end is gained, as regards realty, by the German registration laws, and as regards movables, by the protection given to the honest possessor as such, that prescription is losing its importance in modern European law.

IMMEMORIAL PRESCRIPTION.—Ordinary prescription and the so-called extraordinary prescription of thirty or forty years create and extinguish only certain kinds of property rights. It is commonly asserted by European jurists that by virtue of the so-called "immemorial prescription" any sort of status may become a legal status; and that, in particular, private rights which can not be established by any other sort of prescription (e. g. obligations) may be established by the fact that they have been exercised "time out of mind." According to one theory, immemorial prescription absolutely creates rights; according to another, it creates a presumption that the powers actually exercised are rightful—a presumption that can be overturned only by showing that their origin was unlawful. The doctrine is not based wholly upon the Roman law, which recognized immemorial prescription only in a very limited class of cases (*viz.*, rights of way, water rights, etc., *quorum memoria non extat*), but upon certain provisions of the canon law and the rules of old German custom. The canon law, however, recognized immemorial prescription only as establishing rights of ecclesiastical supervision, rights to tithes, and rights to certain tolls and tributes, all of which are properly public, not private rights; and while old German custom upheld as presumably rightful a state of things which had existed for at least two generations, provided the older members of the community had neither known nor heard of a contrary state of things, the rights thus established were either quasi-public rights or rights capable of what the Romans called quasi-possession. Those who, nevertheless, affirm the general recognition of immemorial prescription in old German law not infrequently confuse the establishment of legal rules by immemorial custom with the establishment of rights by prescription. The doctrine of immemorial prescription seems to have no place in modern private law. It is ignored by all the European codes. MUNROE SMITH.

Prescription: English and U. S. Law.—In the common-law system the term *prescription*, though borrowed from the civil law and embodying the same legal conception, is used in a much narrower sense. Here it describes the acquisition by lapse of time only of those rights over the land of others which the Roman law described as *servitudes*—such as easements and profits (see *EASEMENT* and *HEREDITAMENTS, Incorporeal*)—and it has no reference to the acquisition of title to lands or goods by long occupation. The theory of the common law as to the title to lands by *adverse possession* was that the property in the land was at once transferred by the disseisin and occupancy to the wrongful taker, and that the lapse of time operated not to confer any additional right upon the latter, but only to make him more secure by depriving the former owner of his remedies against the wrongful transfer of title. (See *LIMITATION OF ACTIONS, Real Property*.) The theory of *prescription*, on the other hand, is that long and uninterrupted enjoyment of a use or profit in another's land is of itself conclusive evidence of a right lawfully acquired at some remote period in the past.

It is in the highest degree probable that many of these prescriptive rights go back to a time when the land over which they are asserted was common land, and when the use in question was merely the exercise of a common right, and that the private ownership of the land affected was imposed upon these original rights of enjoyment and was exercised in subordination to them. This is especially true of that extensive class of rights known as "rights of common" (see *HEREDITAMENTS, Incorporeal*), as well as of those customary rights which are hereinafter described. This historical view of the origin of prescriptive rights, however true in fact, could not long withstand the feudalization of the common law of property. In a system under which all lands were held, directly or indirectly, of the king, as lord paramount, there was no room for any theory of original ownership of lands in common. (See *ESTATES, FEUDAL SYSTEM, and PROPERTY*.) Accordingly a support for these prescriptive rights was found in the doctrine of a "lost grant." This doctrine was expressed in terms of a legal presumption, that uninterrupted, notorious, and adverse enjoyment of the right asserted, from time immemorial (*i. e.* for so long a time "that the memory of man ran not to the contrary"), was evidence of a grant of such right in the remote past by the then owner of the "servient tenement" to the ancestor or predecessor (as the case might be) of the person now claiming the right. This theory of a lost grant was, of course, a fiction, pure and simple, and was invented in order to give a color of legality to the prescriptive claim, there being in English law no countenance for the doctrine of the civil law that mere persistence for any length of time in a wrongful state of affairs converts it into a right and lawful state of affairs. Originally, however, the fiction was taken very seriously by the judges, and the question as to whether there had in fact been such a grant as was alleged was submitted to the jury for their determination. At a later period the doctrine took its place as a true presumption of law (see *PRESUMPTIONS*), the existence of the grant being arbitrarily assumed by the law from the fact of use and enjoyment for the required term and under the proper conditions. It was still possible, however, to rebut this presumption by showing that such a grant as the one alleged could in fact never have been made. This appears to be the state of the law in England at present in cases not covered by the statute hereinafter referred to. (See *3 Harv. Law Rev.* 183.) In the U. S., however, the fictitious character of the doctrine of a lost grant has, as a general thing, been fully recognized and evidence is not admitted to rebut the allegation. This result is commonly expressed by saying that the presumption of a grant has become "conclusive," but the true view of the matter would seem to be that the law no longer indulges in any presumption regarding the origin of the right in question, but arbitrarily holds that due and proper enjoyment thereof shall be conclusive evidence of the existence of the right.

The length of time requisite to answer the description of "immemorial" enjoyment has varied greatly from time to time, the period of limitation of real actions (see *Real Property*, under *LIMITATION OF ACTIONS*) having usually been adopted by the courts as the measure of the prescriptive term. This rule formerly required the tenant to show that his possession or enjoyment dated back to the accession of Richard I. (A. D. 1189), but, when the lapse of centuries rendered this an inconvenient measure of the right claimed, it was shortened by statute (32 Hen. VIII., c. 2, A. D. 1540) to sixty years, and finally to twenty years, at which it now stands in England and most of the U. S. The courts having taken over this period of limitation as the measure of the prescriptive term, it follows that a right in the nature of an easement or profit over the land of another may now generally be acquired by enjoyment of the right for twenty years, though different periods, varying from fifteen to thirty years, have been adopted in a few of the States. A disability existing at the time the prescriptive period began to run will be allowed in computing the latter, as in the case of the limitation of actions for the recovery of real estate. In England the whole subject is now for the most part regulated and the length of the prescriptive term fixed by a Prescription Act (2 and 3 Wm. IV., ch. 71, A. D. 1832), but in the U. S. the doctrine continues to be governed by the common law as above set forth.

Not all easements or rights in the nature of easements may be acquired by prescription. The use or enjoyment relied upon as the foundation of the right must be of such a character that it is a visible and notorious infringement

upon another's property rights. It is wholly immaterial whether the person against whom the right is claimed has actual knowledge of the infringement or not, but the acts relied upon must be of such a character that he might or should have known of them. In all cases of *positive* easement—such as rights of way, of drainage, and the like—and in all profits, the notoriety of the enjoyment is conclusively presumed; but where the easement is of the kind described as *negative*—such as lateral support, light, etc.—and where the user is unobtrusive and of such a nature that it can not be conveniently interrupted, the courts have been loath to recognize a right founded upon mere prescriptive enjoyment. As applied to the easement of light the principle has long been established in England under the name of "ancient lights," and the English courts have lately applied it to an easement of the support of one house by another (*Angus vs. Dalton*, 3 Q. B. D. 85; 4 Q. B. D. 162; 6 App. Cas. 740), but they have refused to extend it so as to include a right to the flow of air to a windmill or to legalize a nuisance arising from the vibration of a wall in consequence of the operation of a pestle and mortar. In the U. S. the courts have generally refused to recognize the validity of prescriptive claims to negative easements on the ground of the unsuitability of the doctrine to the conditions of life and property in a new country.

Prescriptive rights as here described should be carefully distinguished from similar rights existing by local or special custom, with which they are often confounded. In England (though not, it would seem, in the U. S.; see *Acker-man vs. Shelp*, 3 Halsted [N. J.] 125) all persons residing in a certain community or belonging to a certain calling may have common rights, in the nature of easements, over the land of an individual by virtue of a local custom of great antiquity. What distinguishes these customary rights from prescriptive rights proper is the fact that they attach to the persons belonging to the group in question by virtue merely of their domicile or calling, as the case may be, and that a person who has newly become a member of the community or guild in question is entitled to the right equally with all other members thereof, whereas in the case of prescription proper the person asserting the right must show that it has descended to him from his ancestors or predecessors in title, as the case may be, or at least that it has been enjoyed by himself for the prescriptive period.

In addition to the authorities cited in the course of this article, see Gale on *Easements* and Washburne on *Easements and Servitudes*.

GEORGE W. KIRCHWEY.

Prescription: in international law, a founding of good title to territory which without a treaty of cession or any well-defined right has for a considerable length of time been held in possession by a state. The objections to it are (1) its indefiniteness, since no fixed limit of time exists to constitute prescriptive possession; (2) the false resemblance to the common law doctrine, inasmuch as a dispossessed state can not be bound to declare war in order to prevent prescription from running against it; (3) its frequent violation at the dictate of national policy.

In spite of such arguments, the principle of a prescriptive title to territory has obtained in international law to quiet an originally doubtful title and to remove the uncertainty which would result if ownership of territory, though wrongfully acquired, after years of uninterrupted enjoyment could be called in question. Thus Wheaton believes this doctrine to be founded upon the general consent of mankind and man's sense of its mutual utility, and that it tends to promote the general welfare.

Phillimore asserts that "the peace of the world, the highest and best interests of humanity, the fulfillment of the ends for which states exist, require that this doctrine be firmly incorporated in the code of international law."

Hall declares that "the object of prescription as between states is mainly to assist in creating a stability of international order, which is of more practical advantage than the bare possibility of an ultimate victory of right," at the same time pointing out the defects of the theory. These opinions are shared by nearly all publicists. In accordance with this principle, Poland, divided between three states under no pretext of legality, has now lost its identity, and legally belongs to them. Among the proofs of prescriptive possession may be mentioned publicity, long continued (though not necessarily immemorial) occupancy, absence of interruption, and the use of the state's resources upon the land.

THEODORE S. WOOLSEY.

Prescription: a written formula for the compounding and dispensing of medicines. Previous to the nineteenth century physicians dispensed their remedies, and the prescription was chiefly a record for the guidance of an assistant, who performed the manual work, and for the preservation of valuable or standard curative combinations; but with the separation of the vocations of physician and apothecary the prescription has become the medium of communication between them, the written instructions of the former to the latter. The ingredients of a prescription are commonly designated in Latin; the nomenclature of botany and of chemistry determines the names of vegetable and mineral remedies, and their technical names are the only ones by which they can be definitely known and correctly prepared. The enumeration of the several articles is preceded by the symbol *R*, an abbreviation of Lat. *recipe* (take). This symbol has also been regarded as a modification of the sign \mathcal{R} , the symbol of Jupiter, with which the ancients prefaced their prescriptions to propitiate the gods and insure a favorable action of their drugs. The several component parts of a prescription should be enumerated in the order—(1) of their chemical relation and pharmaceutical combination; (2) with reference to the object sought by each. The chief therapeutic or remedial agent should be prominent; co-operating remedies and those producing other and secondary effects, termed *adjuvantia*, receive the second position; articles intended to modify or correct the action of the preceding, termed *corrigentia*, come next; and, lastly, substances, liquid or solid, intended to secure definite quantity or consistency, to insure solubility and uniform subdivision of doses, and variously known as the *vehicle*, *excipient*, or *menstruum*. The latter term arose from the superstition of ancient chemists and alchemists that dissolvents acted best at the time of the lunar changes. The quantities of the components are expressed by symbols. The prescription terminates with the abbreviation *M.* of Lat. *misce* (mix). Appended to the prescription the physician usually adds instructions of the dose and time and method of taking. These are usually in Latin, which the apothecary translates and transcribes on the label of the dispensed medicine; but the custom is growing of restricting the use of Latin to the prescription proper, and stating the direction for use plainly in English.

Revised by H. A. HARE.

Presentment: in criminal law, strictly, the act of a grand jury which of its own motion and from its own knowledge, or from evidence placed before it, and without a bill of indictment, makes a written accusation charging some person or persons with the commission of some public offense. At the common law, before criminal proceeding can be instituted against the accused upon this accusation, an *INDICTMENT* (*q. v.*) must be framed, but in some of the U. S. this rule is modified, and a trial may be had upon the presentment. Sometimes in the U. S. grand juries make general charges of public evils or offenses for the purpose of calling the attention of the public or the proper officers to them, without intending that they shall be a basis for an indictment or information. See *GRAND JURY*. F. S. ALLEN.

Preservation of Food: the art of treating articles of food so as to prevent their deterioration and loss through lapse of time. Although applicable to all perishable foods, it is of especial importance in relation to fruit. The value of fruits in the diet of human beings can hardly be overestimated. Their juices regulate the biliary secretions and the action of the digestive organs, and purify the blood. Grapes, peaches, strawberries, blackberries, and, pre-eminently, apples, if partaken of freely when at their ripest and best, go far toward obviating the need of cathartics and astringents.

Desiccation.—Even a partial appreciation of the nutritive, alterative, and curative properties of fruits, roots, and other vegetable edibles at an early age begot the desire to preserve them during the seasons when fresh supplies were not procurable. Succulence made them valuable, yet for a long time desiccation was the only method of preventing them from decaying into worthlessness. Dried dates, packed in bags, under powerful pressure, were as essential to the Arab in his desert wanderings as jerked buffalo, dried in the sun or smoked over the fire, was to the North American Indian. Delicious juices during this process became granulated sugar, and much of sweetness and distinctive flavor were lost. The antiseptic effect of desiccation upon flesh and fish was aided by salt, and certain fruits and green cereals were packed down in this, the saline taste being ex-

tracted by soaking in several waters before eating. Peaches, figs, apricots, limes, prunes, cherries, and grapes boiled in sirup and then desiccated were known as candied sweet-meats. They are popular still under the name of crystallized fruits. Ginger and other medicinal roots are sometimes preserved by mere desiccation, natural or artificial, or are cooked in sirup and then dried. Fruits, vegetables, meat, and fish are now dried in kilns far more rapidly and effectually than by the heat of the sun, the waste by shrinkage being reduced to a minimum, and the very form of the juice-cells remaining almost unchanged.

Method of Canning.—In canning the chief agent is heat; the object is to retain as far as practicable the natural character of the article subjected to the process, and to arrest at a given point agencies which would, in the natural course of events, cause decay. To effect this air must be absolutely excluded. The minutest flaw in the can or in the rubber padding the tightly screwed top will admit bacteria, the presence of which means putrescence. It is requisite, also, that the substance to be preserved should be made hot through and through. The heart of the fruit or vegetable, or the center of the lump of flesh or fish to be canned, must be of the same high temperature with the outside, or the germs which cause decomposition will not be destroyed.

The larger fruits are prepared for canning by paring and removing hard portions that would resist the action of heat, and decayed parts that would mar the flavor and color. As the fruit is pared it is dropped into cold water, lest it should "rust," that is, darken with exposure to the air, with consequent injury to the flavor. When ready for heating the prepared peaches, pears, or apples are packed in a kettle of clean bell-metal, of agate ironware, or of iron lined with porcelain. Sugar, in the proportion of one tablespoonful to each pound of fruit, is scattered between the layers, and the whole is brought slowly to the boiling-point. This reached, the contents of the kettle are cooked gently three minutes, to insure a thorough and even temperature. There must be no diminution of heat throughout the operation. The glass jars or tin cans designed to receive the fruit must be made hot, filled to overflowing directly from the kettle, and sealed instantly. The fruit and liquor in cooling will leave a vacuum between the cover and the contents. Were space left while the fruit is hot it would be filled with germ-laden air, and the process be imperfect. Small fruits are canned in the same way, with the omission of the prefatory paring. Vegetables of every kind are put up in accordance with the leading principles of thorough heating and hermetical sealing. When the work is done skillfully the preserved fruit is good for two years, often for ten.

Meats of various sorts, and such fleshy fish as salmon and sturgeon, are cut into neat pieces, boiled for a longer time than fruits and vegetables, and sealed hot. Chicken and tongue are sometimes cooked tender, packed into glass or metal cases, and the interstices between the pieces filled with well-seasoned meat-jelly or "aspic." This is a hot liquid when the cans are sealed, but congeals in cooling and tends to preserve the meat, while adding much to the palatableness and elegance of the dish when served. Sardines, anchovies, and other small fish are cooked in oil, pressed into tin boxes or glass jars, covered with boiling oil, and sealed. *Pâtés* and potted meats are made of well-cooked meats highly seasoned, ground into a paste, and pressed hard into cases. The surface is covered with melted butter or lard, scalding hot, and the cover is air-tight.

Somewhat similar in principle to canning is the use of dry sand, sawdust, ground cork, and desiccated earth in packing grapes, apples, and pears for long keeping—the intent in each case being exclusion of the outer air. Whenever this can be accomplished the integrity of the article to be preserved is tolerably sure. Other approved agents are tin-foil and raw cotton.

Pickles.—Almost every variety of esculent known to man is prepared and stored for table use by means of spiced vinegar. Green vegetables, liable to spoil by reason of the succulence that is their chief recommendation, must first be made firm. This is done by steeping them in strong brine for a number of days. Several times during the process the pickling substances are taken out, cleansed, and picked over, all doubtful specimens being rejected and the sound returned to freshly made brine. When sufficiently hard they are transferred to a vessel containing pure, soft water, and left thus for twenty-four hours. A kettle is lined with green vine-leaves, the cucumbers, mangoes, green peppers, melon-rind, gherkins, or whatever other articles are on hand, are

packed into it with alternate layers of vine-leaves, and covered thickly with the same. Powdered alum is sprinkled between the layers and over the topmost stratum, and cold water poured in until the kettle is full, after which the contents are slowly cooked, or steamed, for a couple of hours, or until the vegetables are of a fine green. They are then thrown into ice-cold water, and lie in it for an hour or more. Finally, they are packed in a jar and scalding vinegar, highly spiced, is poured over them. The vinegar is strained off, heated, and returned to the pickles every two or three days for a fortnight. The jars are then covered and set away in the cellar or other cool place for the pickles to ripen. Thus prepared they keep good for years.

Meats and every variety of fish, oysters, clams, lobsters, shrimps, etc., are pickled by being partially cooked in clear water, and while lukewarm treated with boiling vinegar seasoned with whole spices, red pepper, and a little salt. These must be sealed boiling hot. Pickled oysters and clams, if put up in glass vessels, should be kept in a dark place, as the light darkens, and even has a tendency to decompose them.

Raw meats and fish are preserved from decomposition by plunging them into and keeping them below the surface of a solution of salt and water strong enough to float an egg. This process is technically known as corning. While it prevents decay, it hardens fiber and grain and renders the food more indigestible than when fresh. Beef and the legs and shoulders of pork are often treated with a mixture of saltpeter, sugar, and salt, rubbed well into them before they are covered with brine—treatment repeated at stated intervals for two or three weeks, until the corning or pickling is complete.

Olives, young limes, and anchovies are preserved by scalding them in salt and water, then filling the bottles in which they are packed with the same. Cucumbers, mangoes, and the like can be kept in simple brine for months, but deteriorate in tenderness and flavor.

Curing is done by suspending flesh or fish that has already undergone pickling in the smoke of smoldering wood, usually hickory or oak, and leaving it thus for an indefinite time, seldom for less than a month. A blackish crust, that tastes and smells of the creosote which is the antiseptic agent here, while it supplements the work of the brine and saltpeter, is not always proof against the invading host of bacteria and other invisible enemies. Unless hams, shoulders, and rounds are further defended by stout linen cases, which, in turn, are fortified by whitewash or paint, they can not be reckoned upon with safety. Some housewives envelop bacon in thick paper and bury it in sifted ashes. Buffalo-meat and salted fish hang all winter from the ceiling of wigwam and hut; the flitch of bacon of "ye olden time" hung in the cotta's wide-mouthed chimney. The Greenlanders and Lapps dry and then smoke reindeer venison and seal-meat. In Labrador and other regions where herring abound tens of thousands of barrels of these fish are salted, smoked, and pickled annually for the home and foreign market. The Yarmouth bloaters of England hold a high place in this class of staple provisions.

Eggs may be preserved good for two months by washing them all over with a solution of gum tragacanth and water, letting them dry in the shade, and packing them, the small ends downward, in bran, meal, flour, or salt. Another way is to arrange them, small ends downward, in a crock and cover them with lime-water. This is made by mixing a pound of lime, 2 oz. of salt, and half an ounce of saltpeter in a gallon of boiling water, stirring it until all are dissolved, and letting it get perfectly cold before it is added to the eggs. Still another more expensive method of keeping eggs is to pack them as above directed and pour over them half-congealed lard as cool as it can be and yet flow, and letting it harden about the eggs. Some housewives grease eggs with lard or oil and pack them in bran or salt.

Charcoal is a potent antiseptic. Butter may be kept sweet for a long time by fitting into the bottom of crock or firkin a linen bag of powdered charcoal. A bag of coarse charcoal is often kept in the barrel of pickled meat, and bits, wrapped in thin cloths, introduced into the inside of fish and fowl after they are cleaned, will ward off decomposition for a day or two.

Preserves.—This term is popularly applied to fruits cooked in sirup in the proportion of a pound of sugar to one of fruit. Our great-grandmothers called them "conserves," and gave them honorable place among their stored delicacies. Under the head of preserves come jams and marmalades.

lades, the only difference between these and the conserve proper being that less sugar is needed for jams, and that they and marmalades are stewed down to a smooth paste. In the regular preserve care is taken to retain, as far as may be, the form of the fruit. Clearness of sirup and agreeable color in the conserve are much esteemed by housewives. The process is delicate and tedious, and for some years the quicker and more economical method of canning threatened to supersede it entirely.

Fruit jellies are made by pressing and straining the juice from the pulp, boiling it clear, and adding a pound of sugar for each pint of scalding liquid, stirring the mixture over the fire until the sugar is dissolved, and filling heated glasses or china jars with it. When the jelly is cold and firm the surface is covered with tissue-paper, saturated with spirits, before metal or paper tops are fitted upon the glasses.

Alcoholic liquors are efficient agents in the preservation of fruits. A rich sirup is made in which the fruit, pared or with the skins on, is gently stewed until tender and clear; the liquor is added an instant before the kettle leaves the fire. When this preliminary stage is neglected the substance immersed in the spirits becomes tough and acrid.

Condensed Milk.—See MILK.

Extreme cold, by suspending natural processes which would induce decay, has long been recognized as a valuable accessory in preserving food. Food of every description, including the most delicate fruits, is transported from one side of the continent to the other in refrigerator-cars. Summer hotels have immense store-rooms, constructed upon the refrigerator principle, in which fish, poultry, and what is sold as "butcher's meat" may be kept for long periods. The beef killed upon the Texas plantation finds a market in New York and Boston. Adirondack trout and salmon from the Kennebec river set forth tables in New Orleans and San Francisco.

MARION HARLAND.

Preservation of Timber: the act or process of rendering timber more durable. Methods which accomplish this end are important as positive aids in arresting the progress of the exhaustion of the timber-supply. The extent to which the various practical methods of preserving timber are used depends upon the cost of timber, the nature of the structure, etc.

Decay of wood proceeds from agencies both internal and external. *Cellulose*, which constitutes the great bulk of woody tissue, is by itself an exceedingly imperishable substance, but appears, when in contact with fermenting or putrefying nitrogenous matters, to be capable of entering into decomposition like its isomers and congeners sugar and starch, forming humus-like substances, devoid of coherence. Fermentation or putrefaction can not take place in the absence of moisture, and hence perfect seasoning of the wood is a powerful preservative. This process, however, is exceedingly consumptive of time and expensive; being nugatory, moreover, in case the wood is to be exposed to moisture. It has been thought that this internal destructive agency is best antagonized by the use of chemical agents. Other internal destructive agencies arise from the eggs of insects deposited in the wood or under the bark. This may be sometimes, though not always, remedied by stripping off the bark; impregnation with agents poisonous to the developing larvæ is surer. External destroying agencies are many, and are most powerful when the wood is exposed to simultaneous action of air and moisture, which engender and foster a number of destructive processes. Under seawater, and between high and low tide, the teredo is another destructive agent. In tropical countries ants are enemies of timber structures. Contact with iron also destroys cellulose rapidly, through a slow combustion set up between the carbon of the cellulose and the oxygen of ferric oxide. A species of disintegration called DRY ROT (*q. v.*) is also caused by the action of some fungi. See also ROT.

The following are a few of the more prominent methods of treatment for rendering wood durable that have been practiced and have met with approval.

The Method of Kyne.—Impregnation with a solution of *corrosive sublimate*, bichloride of mercury. This was the first method experimented with in the U. S., and great expectations were entertained regarding it. It is founded on the known property of corrosive sublimate to form insoluble compounds with albuminoid bodies.

The Methods of Boucherie.—Impregnation with *sulphate of copper*, also with *chloride of calcium*. Sulphate of copper has much preservative power, and is cheaper and far

less dangerous to handle than corrosive sublimate. It is, however, removed gradually from the wood by moisture. Chloride of calcium renders the wood fire-proof, adding also great strength and toughness. The latter substance has never been sufficiently or fairly experimented with, considering its cheapness and the enormous advantages it holds out. Dr. Boucherie was also the inventor of a method of making the preservative liquids penetrate the tree while still standing. Notches are cut in the trunk near the roots, and caoutchouc bags holding the solutions bound on. The tree sucks up the liquid through the evaporation from the leaves above.

The Method of Burnett.—A solution of *chloride of zinc*. This agent, like *corrosive sublimate*, operates by combining with the fermentable albuminoids, but is much cheaper and not noxious. For many uses burnettized timber is no doubt very valuable.

The Method of Bethell.—The impregnation of the wood with heavy oils of coal-tar, called in Great Britain "creosote oil"—in the U. S. "dead oil." This method has been largely used in Europe, and apparently with much success, even against the salt-water teredo, which other methods do not resist. The oil was forced into the pores of the timber in a strong receiver by a pressure of 13 or 14 atmospheres.

The Method of Seeley.—This is an improvement on that of Bethell. The wood is immersed in the oil—a crude carbolic acid being used, which is believed to be much more efficient than the common dead oil—in a closed tank, and the temperature raised to 300° F. The air and moisture are thus expelled from the timber, which is then suddenly introduced into a bath of cold carbolic acid. By this ingenious process an absolute impregnation is accomplished.

Revised by IRA REMSEN.

Preserves: See PRESERVATION OF FOOD.

President: in the U. S., the chief magistrate of the nation, chosen by a college of electors elected by the voters of the several States. The term of office is four years, after which the President may be a candidate for re-election, but custom and precedent are against electing him for a third term. The office, which was established by the Constitution of 1787, imposes upon the incumbent the obligation to see that the laws are faithfully executed, authorizes him to grant pardons and reprieves, to conclude treaties with the concurrence of the Senate, to veto unwise legislative measures, which can then be passed only by a vote of two-thirds of each house of Congress, and to appoint officers to administer the laws. He is commander-in-chief of the army and navy of the U. S., and of the militia of the several States, when called into the service of the U. S. Upon the death, removal, or resignation of the President, the Vice-President succeeds him in office. If, for any reason, both the President and the Vice-President are unable to serve, a member of the cabinet, in the following order, acts as President until the disability is removed or a President is elected: the Secretary of State, Secretary of the Treasury, Secretary of War, Attorney-General, Postmaster-General, Secretary of the Navy, Secretary of the Interior, and Secretary of Agriculture.

Presidential Electoral Commission: a board appointed during the second session of the Forty-fourth Congress of the U. S. to determine questions arising out of the presentation of two or more discordant certificates of the votes of the electoral colleges of certain States in which the election of presidential electors had been contested. The result of the election depended on the voice of three States, Florida, Louisiana, and South Carolina, in which both parties claimed the victory; and of a fourth, Oregon, in which one elector was claimed to have been elected by a minority, in consequence of a constitutional disqualification affecting one of the candidates of the majority. From Louisiana, Oregon, and South Carolina, the certificates presented were in each case twofold, and from Florida threefold. The electoral congress was so divided between the opposing parties that the choice of the Democratic electors in any one of the contested States would have given the majority to the Democrats, while the choice of the Republicans in all would give that party a majority of one. An angry controversy arose as to the constitutional mode of deciding between these competing certificates. The dispute assumed proportions which even threatened the peace of the republic. For the purpose of averting the impending danger a joint committee of fourteen members from the two houses was appointed early in Jan., 1877, to devise, if possible, some

means satisfactory to all of ascertaining the legal result of the election. The bill reported by this committee on Jan. 18 and passed by both houses in the following week provided for the creation of a tribunal to be composed of five Senators, five Representatives, and five associate justices of the Supreme Court of the U. S., four of the latter being designated by their districts in the bill itself, the fifth to be subsequently chosen by these four; to which tribunal should be referred the conflicting certificates, with the authority to ascertain the legal vote of each State in which the election was contested. The bill further provided that the decisions of such tribunal in every case should stand, unless rejected by the concurrent vote of both houses.

On Jan. 31 the commission was elected, three Republicans and two Democrats being taken by agreement from the Senate, and three Democrats and two Republicans from the House. The four justices having chosen a Republican, the relative strength of the two parties in the commission was eight Republicans to seven Democrats. When the subject had been argued by the ablest legal counsel that could be engaged on both sides, the vote in favor of the respective certificates was eight Republicans against seven Democrats, the eight Republicans voting in favor of the Republican electors in each of the contested States, thus giving to their party the majority of 185 to 184 in the electoral congress. The decision was communicated to the joint convention of the houses of Congress on Thursday, Mar. 1, and on Mar. 2 the president of the convention announced that Rutherford B. Hayes, of Ohio, had been duly elected President of the U. S.

Revised by C. K. ADAMS.

Presidio of San Francisco: a military post in the north-west suburbs of San Francisco, Cal. It takes its name from the Spanish *presidio*, a garrison or fortress, the Spanish garrison defending San Francisco having been located near this site. The post is arranged for the accommodation of sixteen companies, but usually the garrison is much smaller. It is distant $4\frac{1}{2}$ miles from the railway station in San Francisco, with which it is connected by a city railway. The reservation is large—1,540 acres—affording sites for gun and mortar batteries for harbor defense.

J. M.

Presque Isle, pres'keel: town; Aroostook co., Me.; on the Aroostook river, and the Canadian Pacific Railway; 42 miles N. by W. of Houlton, the county-seat (for location, see map of Maine, ref. 3-F). The river affords abundant power for manufacturing, in which the town has large interest. There are a number of saw and grist mills, starch-factories, and machine-shops, a national bank with capital of \$50,000, a trust and banking-house with capital of \$50,000, and a weekly newspaper. Pop. (1880) 2,446; (1890) 3,046.

Press: See PRINTING-PRESSES.

Pressburg (Hun. *Posony*; Lat. *Posonium*): town; one of the finest of Hungary; on the north bank of the Danube, near the frontier of Lower Austria (see map of Austria-Hungary, ref. 5-F). It was the Hungarian capital from 1541 till 1784, when Joseph II. restored that dignity to its former possessor—Buda. It has a stately cathedral and a city-hall, begun in 1090 and 1288 respectively, an academy, museums of antiquity and natural history, and numerous other excellent educational and philanthropic institutions. Ruins of its magnificent royal castle, destroyed by fire in 1811, crown the neighboring hill 277 feet above the river. It manufactures chemicals, leather, and gold and silver ware, and carries on a large trade in grain and wine. Pop. (1890) 52,411, of whom less than a fourth are Hungarians, the majority being Germans.

E. A. GROSVENOR.

Pressensé, prâ'ssân'sâ, Edmond (DEHAULD), de, D. D.: clergyman and author; b. in Paris, Jan. 24, 1824; was educated in Paris, Lausanne, Halle, and Berlin; was pastor of the Chapelle Taitbout, Paris (Evangelical or Independent Protestant), 1847-70; received the degree of D. D. from Breslau 1869, from Montauban 1876, and from Edinburgh 1884; an eloquent and earnest preacher, his whole energies were devoted to the maintenance of the freedom of the Church from state interference and from dependence upon state aid, and to the presentation of Christianity as the means of solving the important moral and social questions of the day. After the proclamation of the republic he was elected a member of the French Assembly, and a life senator Nov. 13, 1883. Among his principal works are *Conférences sur le Christianisme dans son Application aux Questions sociales* (Paris, 1849); *Histoire des trois premiers siècles de l'Église Chrétienne* (1858-77, 6 vols.; 2d ed. 1889,

seq.; Eng. trans. 1869-77; introduction to new edition separately trans. under title *Ancient World and Christianity*, Eng. trans. 1888); *L'Église et la Révolution française* (1864; 2d ed. 1867; Eng. trans. *The Church and the French Revolution*, London, 1869); *Jésus Christ*, see *THEOLOGY*, Vol. III, (1866; 7th ed. 1884; trans. into English by Annie Harwood, London, 1866; 4th ed. 1871); *Le Concile du Vatican* (1872); *Études contemporaines* (1880; Eng. trans. *Contemporary Portraits*, 1880); *Les Origines* (1882; Eng. trans. *Study of Origins*, 1883). D. in Paris, Apr. 8, 1891.

Revised by S. M. JACKSON.

Pressing to Death: See PINE-FORTELL DUEL.

Pressure-sense: the apparatus in the skin, muscles, etc., and its nervous connections, which gives sensations of weight or pressure. Such a sense, apart from touch and muscular-movement sensation, is claimed by expert investigators, and very delicate determinations have been made upon the minimum perceptible pressure, the pressure giving pain, the smallest perceptible difference of pressures, etc. See PSYCHO-PHYSICS and SENSATION.

J. M. B.

Prester John (*Priest John*): a semi-mythical character who figured largely in the geographical romances of the Middle Ages, whose true country and period are difficult to be fixed with certainty. According to general belief, there was somewhere in the interior of Asia or Africa a kingdom which had been converted from Islam to Christianity, governed by a priest-king named John, who was exceedingly anxious to open friendly intercourse with the Church of Rome. During two centuries numerous embassies were sent to Central Asia, and even to Abyssinia (1481-95), in search of the lost Christian nation, but the search proved fruitless. The origin of the legend appears to date from the Nestorian missions which in the eleventh and twelfth centuries penetrated to Karakorum in Turkestan, and converted the khan of that district, named Ung, who was overthrown and killed by Genghis Khan in 1202. He appears to have authorized the Nestorians to make in his name certain requests of the pope, and to their glowing narratives, sent to the Greek emperor and to the Kings of France and Portugal, Europe was indebted for a favorite cycle of legends which may be read in Assemani's *Bibliotheca Orientalis*. Father Rubruquis, sent by St. Louis, King of France (1253), in search of Prester John, penetrated to Karakorum. (See his interesting narrative in Purchas's *Pilgrims*.) There are extant letters from Prester John to the Greek emperor Manuel (1165) and one to him by Pope Alexander III. (1177). See G. Oppert, *Der Presbyter Johannes in Sage und Geschichte* (Berlin, 1864; 2d ed. 1870); F. Zamke, *Der Priester Johannes* (Leipzig, 1876-79, 2 parts); and note in Col. Yule's edition of the *Travels of Marco Polo* (London, 1871; 2d ed. 1875).

Revised by S. M. JACKSON.

Preston: town; in Lancashire, England; on the Ribble, at the head of its estuary; 28 miles N. N. E. of Liverpool (see map of England, ref. 7-F). It is substantially built, principally of brick, at a height of about 120 feet above the river. The town-hall, designed by Sir Gilbert Scott, is a French Gothic structure with a spire. The Roman Catholic church, St. Walburge's, has the highest spire (306 feet) built in England since the Reformation. Three public parks were laid out in 1867. Preston was constituted a port in 1843, and since 1885 the channel has been deepened and a dock of 40 acres constructed. It is one of the chief seats of the Lancashire cotton industry. (See LANCASTHIRE, *Industries*). There are also iron and brass foundries, tanneries, rope-walks, glass-works, ship-building yards, engineering and machine shops, breweries, and distilleries. As capital of a district which was granted to the cathedral church of York, the place came to be known as Priests' town, afterward Preston. Near Preston, Aug. 17, 1648, Cromwell totally routed the royalists. Preston returns two members to Parliament. Pop. (1893) 110,225.

Preston, HARRIET WATERS: author; b. at Danvers, Mass., about 1843. She has spent much time abroad, and is known especially as a translator from French and Provençal. In 1873 she published a translation of the *Mireio* of the Provençal poet Mistral, and in 1881 a spirited rendering of Virgil's *Georgics*. She is also the author of *Love in the Nineteenth Century* (1874); *Troubadours and Trouvères* (1876); *A Year in Eden* (1886); and other works.

H. A. BEERS.

Preston, MARGARET JUNKIN: author; b. in Philadelphia about 1835; daughter of Rev. George Junkin, who became,

in 1848, president of Washington and Lee University, and wife (1857) of Col. J. T. L. Preston, professor in the Virginia Military Institute; is author of *Silver Wood, a Book of Memories* (1856); *Beechenbrook, a Rhymer of the War* (1866); *The Young Ruler's Question* (1869); *Old Songs and New* (1870); *Cartoons* (1875); *Colonial Ballads* (1887); and other writings in prose and verse, chiefly upon topics connected with the civil war. Her translation of the *Dies Irae*, which appeared in 1855, has been highly commended.

Revised by H. A. BEERS.

Preston, Right Rev. THOMAS SCOTT, V. G.: prelate; b. at Hartford, Conn., July 23, 1824; graduated at Trinity College, Hartford, 1843; entered the Protestant Episcopal ministry 1846; assistant rector Church of the Ascension, New York, and later of St. Luke's; became a Roman Catholic 1849; studied at St. Joseph's Theological Seminary, Fordham, N. Y.; ordained a priest 1850; assistant at the cathedral, New York; subsequently pastor St. Mary's, Yonkers, N. Y.; appointed parish priest of St. Ann's, New York, 1861; appointed chancellor of the diocese of New York 1853, and vicar-general 1873; appointed domestic prelate in the pope's household, with title of monsignore, 1881; promoted prothonotary apostolic 1888; author of *Ark of the Covenant* (1860); *Life of St. Mary Magdalene* (1861); *Sermons for the Seasons* (1864); *Life of St. Vincent de Paul* (1866); *Christian Unity* (1866); *Purgatorial Manual* (1867); *Reason and Revelation* (1868); *Christ and the Church*, etc. D. in New York, Nov. 4, 1891. Revised by J. J. KEANE.

Prestwich, JOSEPH, F. R. S.: geologist; b. at Clapham, London, England, Mar. 12, 1812; educated at University College, London; received medals from the Geological Society 1849, the Royal Society 1865, and the Institute of Civil Engineers for his contributions to science; has been repeatedly appointed by the Government on scientific commissions; Professor of Geology at Oxford University 1874-88; president of the Geological Society of London 1870-72; vice-president of the Royal Society 1870-71; and president of the international congress of geologists in London 1888. Prestwich's more important researches relate to Pleistocene submergences of the land and the evidences of prehistoric man. In 1886-88 he published a manual of geology in two volumes. D. at Darent Hulme, Shoreham, Kent, June 23, 1896.

Revised by G. K. GILBERT.

Presump'tions [from Lat. *presumptio*, a taking beforehand, a supposing beforehand, presumption: *pre*, before + *su'mere*, take]: assumptions of fact made by the law and embodied in legal rules (*presumptions of law*). The term has been involved in much ambiguity, owing, on the one hand, to its familiar use to describe mere inferences of fact (*presumptions of fact*), as well as to its employment, on the other hand, to cover a class of legal fictions whereby new rules of substantive law are introduced under the guise of assumptions of fact (*conclusive presumptions of law*).

All presumptions are originally presumptions of fact of varying weight according to the strength of the inference in a given case. The law, for its own purposes, selects certain of the strongest of these presumptions of fact, and adopts them, gives them a weight beyond that which logic and reason attach to them, and arbitrarily *assumes* that the inference is the correct one unless and until evidence is produced to prove that it is not. Here, then, we have the "presumption" proper, the "presumption of law."

Every fact which tends, however slightly, to support the fact sought to be established by evidence raises a "presumption of fact." Suppose it be required to prove that X is dead. It is proven that he has been missing for a year; that he was last seen embarking on a long voyage; that the vessel in which he embarked has never been heard from. Each of these facts, as a matter of logic and reason, suggests more or less strongly the probable fate of X. They all "raise a presumption," i. e. suggest the inference that X has lost his life by drowning. But this presumption of fact has no legal sanction. Its appeal is to logic, to the reasoning faculty, and its force is no greater in a court of law than in the forum of logic and reason outside.

But the inference from the facts proven may in a given case be so obvious or so clearly demanded by the policy of the law that it would be mischievous to leave it to be drawn by the untrustworthy reason of a jury or even of a particular judge. Hence the law, distrustful of individual judgment, prescribes in advance what inferences shall be drawn from certain facts. Thus if a man has been absent from

home for seven years, and unheard of during that time, the law will not in a particular case allow the court or jury to draw the inference that he is probably alive, but arbitrarily directs the inference that he is dead. Hence we have the familiar presumption of law that seven years' unexplained absence is presumptive evidence of death.

A presumption, then, is a rule which fixes the legal value of a fact or facts in evidence, and this legal value may be exactly the same as the logical value of the fact, but is more likely to be in excess of its logical value. As, for example, there may be cases where the absence of a person for seven years would not logically demand the conclusion that he is dead, but the law draws that conclusion in all cases, nevertheless. Of course this presumption may (like all true presumptions) be rebutted by showing that the man is actually alive. The presumption has in that case performed the usual office of presumptions of law in shifting the burden of proof from the party in whose favor the presumption was drawn to the party who seeks to rebut it.

It has already been intimated that what is known as a conclusive presumption of law is not properly speaking a presumption at all, but a rule of substantive law which has in the process of legal evolution lost its inferential or presumptive character, though continuing to be expressed in terms of presumption. It is obvious that whenever a presumption becomes conclusive it can only be by discarding as immaterial the fact which is assumed. In other words, the facts in evidence now have consequences attached to them which are entirely independent of the intermediate facts "presumed" to exist. This process is well illustrated in the development of the doctrine of a "lost grant," as the foundation of rights claimed by prescription. (See PRESCRIPTION.) In the present state of that doctrine, as it obtains in the U. S., at least, twenty years' enjoyment under the proper conditions of the right claimed is said to raise a "conclusive presumption" that the right had a lawful origin. But this is only a more awkward and roundabout way of saying that twenty years' enjoyment of itself confers the right claimed. The law no longer indulges in any presumptions on the subject, but it continues to veil the new rule behind the legal fiction of a presumption.

The number of presumptions of law is very large, and is constantly being augmented by the process of judicial legislation above described, as well as by direct legislative act. They play an important part in the due and orderly administration of justice, and furnish the best existing means for the modification and amelioration of the law by the process of adjudication.

See Greenleaf on *Evidence*, Best on *Evidence* (Chamberlayne's edition), and Prof. J. B. Thayer's article, *Presumptions and the Law of Evidence*, 3 *Hurv. Law Rev.* 141.

GEORGE W. KIRCHWEY.

Pretender: a name frequently applied to the Stuart claimant to the British throne after the death of the exiled James II. The Pretenders were the son and grandson of that monarch, the lineal heirs to the throne, which they respectively attempted to recover by means of the "Jacobite" insurrections in Scotland in 1715 and 1745. See the articles JAMES FRANCIS EDWARD STUART and CHARLES EDWARD.

Pretoria: capital of the South African Republic; on the Apies, a head-stream of the Limpopo; 1,040 miles by rail N. E. of Cape Town. Railways connect Pretoria with Lourenço Marques on Delagoa Bay and with Durban and Cape Town. The town lies at an elevation of 4,500 feet in a plain surrounded by hills. It has become important as a place of resort for the miners of the northern gold-fields. New public buildings, including a parliament-house, have been constructed. Pop. 12,000, of whom about three-fourths are whites.

Previous Question: in parliamentary law, the question whether the main issue shall now be voted on. In the U. S. the motion is made and seconded by supporters of the issue for the purpose of shutting off further debate; they therefore, of course, vote in the affirmative on the previous question itself. In the British Parliament the previous question is brought forward and seconded by opponents of the main issue, who vote against the motion when put for the purpose of preventing the putting of the main question. See PARLIAMENTARY LAW and CLOTURE.

Previtale, prā-vēc-taa'lā, ANDREA: painter; b. at Bergamo, Italy, in the latter part of the fifteenth century. He probably studied under Giovanni Bellini in Venice, as his earliest known work, an altar-piece at Borgo Sant' Antonio,

bears the inscription *Andreas Bergomensis dissipatus (sic) Jo Bellini*. The altar-piece of St. John the Baptist in Sto. Spirito at Bergamo is considered his finest work. D. of the plague at Bergamo in 1528. Many of his pictures are at Bergamo. The National Gallery in London possesses a *Madonna and Child* by him. W. J. STILLMAN.

Prévost d'Exiles, *prā vō dāz zēl*. Abbé ANTOINE FRANÇOIS; novelist; b. at Hesdin, Artois, France, Apr. 1, 1697. After a good education he vibrated for a time between the army and the order of the Jesuits. In 1719 he entered the order of Benedictine monks of Saint-Maur, and for several years gave himself to serious study. He left the order somewhat irregularly (1727 or 1728), fled to Holland, and devoted himself to letters. His first work, *Mémoires d'un homme de qualité* (8 vols., 1728-32), revealed his gifts as a story-teller, and was very successful. He went to England in 1733, and in 1734 was permitted to return to Paris. D. Nov. 23, 1763. Among his works are *L'Histoire de M. Cléveland* (8 vols., 1732-39); *Le Dague de Kikernu* (6 vols., 1735); translations of Richardson's *Pamela* and *Clarissa*; and above all the *Histoire du chevalier des Grieux et de Manon Lescaut* (1731), one of the masterpieces of the French novel of all times. It has often been republished. His *Œuvres choisies* were published in 1783 and in 1810-16. A. G. CANFIELD.

Prévost-Paradol, -prāvā dōl. LUCIEN ANATOLE; author; b. in Paris, France, Aug. 8, 1829; became Professor of French Literature in Aix in 1855; was a frequent contributor to Parisian journals, and wrote *Revue de l'Histoire universelle* (1854); *De l'État de la Famille dans l'Éducation* (1857); *Essais* (3 vols., 1859-63); *Quelques pages d'Histoire contemporaine* (4 vols., 1862-66); and *La France nouvelle* (1868). In 1870 he went as ambassador to Washington. D. C. He arrived in July, but on Aug. 11 committed suicide.

Preyer, THIERRY WILLIAM, M. D., Ph. D.; psychologist and physiologist; b. in Manchester, England, July 4, 1841; educated in Manchester, London, Duisburg, Bonn, and at the Universities of Bonn, Berlin, Heidelberg, Vienna, and Paris; became privat docent at Bonn in 1865, Professor of Physiology at Jena in 1869, and privat docent at Berlin in 1888. His principal works are *Die Grenzen des Empfindungsvermögens und des Willens* (Bonn, 1868); *Ueber Empfindungen* (Berlin, 1867); *Elemente der reinen Empfindungslehre* (Jena, 1877); *Die Katalexe und der thierische Hypnotismus* (Jena, 1878); *Die Entdeckung des Hypnotismus* (Berlin, 1881); *Ueber den Farben- und Temperatursinn* (Bonn, 1881); *Ueber die Grenzen der Tonwahrnehmung* (Jena, 1876); *Akustische Untersuchungen* (Jena, 1879); *Die Seel des Kindes* (Leipzig, 1881; 3d ed. 1890); *Spezielle Physiologie des Embryo* (Leipzig, 1883-84); *Elemente der allgemeinen Physiologie* (Leipzig, 1883); *Die Erklärung des Gedankenlesens* (Leipzig, 1885); *Die Bewegungen der Seesterne* (Berlin, 1887); and *Der Hypnotismus* (Vienna, 1890).

J. MARK BALDWIN.

Priacanth'idæ [Mod. Lat., named from *Priacanthus*, the typical genus; Gr. *πρίων*, saw + *ἀκανθα*, spine]: a family of fishes of the sub-order *Acanthopteri*, distinguished by their very large eyes and small rough scales, which extend on the snout and jaws. Over twenty species are known from different tropical seas, in all of which some species are found. They are generally of a reddish color.

Revised by F. A. LUCAS.

Pri'am (in Gr. *Πρίαμος*): son of Laomedon and Strymo, and the last King of Troy. His original name was Podarceus, but he received the name of Priam because he was ransomed (*πρίσσειν*) by his sister Hecione from Heracles. He was the husband of Hecuba, the father of Hector, Paris, Polyxena, Cassandra, Deiphobus, Helenus, Troilus, and others. During his reign fell the Trojan war, which ended with the destruction of Troy and the extinction of his race. The matchless words of the *Iliad* of Homer narrate a small portion of the events of the Trojan war. J. R. S. STERRETT.

Pribilof or Pribyloff Islands: a group of small volcanic islands in Bering Sea; 192 miles N. of Unalaska, 200 miles S. of St. Matthew, and about the same distance W. of Cape Newenham, on the mainland. The climate is disagreeable; but the perfect isolation of these islands, and the mist and fog which prevail, cause the fur-seal to select these grounds for the purpose of breeding. The great seal-producing island is St. Paul, with a shore-line of 42 miles, of which 16½ miles are frequented by the fur-seals. See SEAL-FISHERIES.

Revised by G. K. GILBERT.

Price: See POLITICAL ECONOMY.

Price: town; capital of Carbon co. (organized from the northern part of Emery County in 1894), Utah; on the Price river, and the Rio Grande Western Railway; 78 miles S. E. of Provo City, 122 miles S. E. of Salt Lake City (for location, see map of Utah, ref. 5-N). It is in an agricultural, stock-raising, and mining region, is the immediate starting-point for Fort Duchesne and the Uintah and Uncompaghe Indian reservations, and is the shipping-point for a mine of remarkably pure asphaltum. The town has a church, two public schools, and a weekly newspaper. Pop. (1895) 604.

Price, BONAMY; economist; b. in the island of Guernsey, May 22, 1807; graduated at Oxford, 1829; soon afterward became assistant master at Rugby School, where he remained as teacher till 1850, and Professor of Political Economy at Oxford University 1868. Prof. Price was a distinguished representative of free-trade doctrines, which he presented to the public of the U. S. in 1874 in a series of lectures. He was the author of *The Principles of Currency* (1869); *Of Currency and Banking* (1876); *Practical Political Economy* (1878); and of many articles in reviews and magazines. D. in London, Jan. 8, 1888.

Price, IRA MAURICE, B. D., Ph. D.; educator; b. near Newark, O., Apr. 29, 1856; graduated at Denison University 1879; Professor of Greek and Modern Languages, University of Des Moines (now Des Moines College), Iowa, 1879-80; instructor in French and German, Morgan Park Military Academy, 1880-83; instructor in correspondence, School of the American Institute of Hebrew, 1882-84; Ph. D., University of Leipzig, 1887; instructor in Hebrew and cognate languages, Baptist Union Theological Seminary, 1886-88; professor of same department 1888-92; Associate Professor of the Semitic Languages and Literatures in the Graduate School of the University of Chicago. He is author of *An Introduction into the Inscriptions discovered by Mons. E. de Sarzec* (Munich, 1887); *Syllabus of Old Testament History* (1891; 3d ed. 1892); associate editor of new edition of Gesenius's *Hebrew Grammar* (Boston, 1892); member editorial staff of the *Standard Dictionary of the English Language* (New York, 1893-95).

Price, RICHARD, D. D., LL. D., F. R. S.; philosopher; b. at Tynton, Glamorganshire, Wales, Feb. 22, 1723; educated at Talgarth and Coward's Academy in London; became a Presbyterian minister; was chaplain to a Mr. Streatfield at Stoke Newington 1743-56, and pastor of churches at Hackney and Newington Green for the remainder of his life. D. in London, Apr. 19, 1791. Author of many papers in the *Philosophical Transactions*, and of numerous theological, economical, and political publications, among which were *A Review of the Principal Questions and Difficulties in Morals* (1758); *Observations on Reversionary Payments, Annuities, etc.* (1769); *An Appeal to the Public on the Subject of the National Debt* (1771); *The Nature and Dignity of the Human Soul* (1776); *Observations on the Nature of Civil Liberty, Principles of Government, and the Justice and Policy of the War with America* (1776); *Additional Observations, etc.* (1777); *An Essay on the Present State of Population in England and Wales* (1779); and *Observations on the Importance of the American Revolution* (1784). The pamphlets on American affairs forcibly and eloquently advocated the claims of the colonists to an ample redress of grievances, and 60,000 copies of the first pamphlet on this subject were sold in a few months. Dr. Price's various writings on the doctrine of chances, annuities, and the duration of life entitle him to a high place among the founders of the science of vital statistics, and his financial publications give him similar rank in regard to political economy. In religious opinions he was a precursor of the Unitarian movement, agreeing in many things with his friend Dr. Priestley. See his *Memoirs*, by his nephew, William Morgan. F. R. S. (1815).

Price, STERLING; soldier; b. in Prince Edward co., Va., Sept. 11, 1809; settled in Charlton co., Mo., 1830; served in the Legislature; was member of Congress 1845-47; colonel of Missouri volunteers in the Mexican war; captured Taos, N. M.; commanded at the battle of Canada, N. M., Jan. 24, 1847; was made brigadier-general July 20, 1847, and appointed military governor of Chihuahua; gained the battle of Santa Cruz de Rosales Mar. 16, 1848. He was Governor of Missouri 1853-57; presided over the State convention of Feb., 1861; was appointed major-general of the State forces by Gov. Claiborne F. Jackson, and endeavored to pre-

cipitate the withdrawal of Missouri from the Union, but was foiled in his purpose by the promptness of F. P. Blair and Nathaniel Lyon in compelling the surrender of the State guard at St. Louis, and defeating the militia at Boonville. In the South, however, the Governor and Price recruited an army of about 8,000 men, and, being joined by McCullough with 3,000 from Arkansas, defeated Lyon and Sigel at Springfield Aug. 7. Price quarreled with McCullough, who withdrew his forces; captured Lexington, with 3,000 prisoners, after a four days' siege, Sept. 20, for which he was thanked by the Confederate Congress; was soon forced to retreat into Arkansas; was appointed major-general in the Confederate service Mar., 1862; took part in the battles of Pea Ridge, Iuka, and Corinth; was in command of the department of Arkansas 1863-64, when he entered into a combination with Clement Vallandigham, of Ohio, and other Northern sympathizers with the Confederacy, founding the secret organization known as Knights of the Golden Circle, of which he was "grand commander," and which nearly 25,000 Missourians joined. He invaded Missouri Sept., 1864, advancing with nearly 20,000 men as far as Pilot Knob, but failed to rally the Knights to his standard on account of the measures taken by Gen. Rosecrans in the discovery and repression of the plot; presented himself before Jefferson City and pushed westward to the Kansas border, but being pursued by Pleasonton and Curtis, had to retreat to Arkansas, thereby terminating in disaster a movement which had been expected to result in the conquest of Illinois and other States. After the war Gen. Price went to Mexico and founded a colony of ex-Confederate officers near Córdova; but the downfall of Maximilian involved that of the colony, and he returned to Missouri early in 1867 in poverty and broken health. D. in St. Louis, Sept. 29, 1867.

Price, THOMAS RANDOLPH, A.M., LL.D.: professor of Greek and English; b. in Richmond, Va., Mar. 18, 1839; educated at University of Virginia (1856-59), Universities of Berlin and Kiel (1859-61); served in the Confederate army; Professor of Latin and Greek at Randolph College 1867-70, Greek and English 1870-76; Professor of Greek in the University of Virginia 1876-82; became Professor of English Language and Literature, Columbia College, 1882; author of *The Teaching of the Mother-Tongue* (1877); *Shakespeare's Verse Construction* (1889); editor of *Othello*, Banksie edition of Shakspeare (1890). C. H. THURBER.

Prichard, JAMES COWLES, M.D.: ethnologist; b. at Ross, Herefordshire, England, Feb. 11, 1786; resided in youth at Bristol; studied medicine at Bristol, London, and Edinburgh; began practice as a physician at Bristol in 1810, and received medical appointments at the Clifton Dispensary, St. Peter's Hospital, and the Bristol Infirmary. In 1813 he published his chief work, *Researches into the Physical History of Mankind* (4th ed. 1841-51). Dr. Prichard then applied himself to philology, and produced his standard treatise on *The Eastern Origin of the Celtic Nations* (1831; 2d ed. 1857). In 1843 he issued his *Natural History of Man* (4th ed. 1855); became 1845 commissioner in lunacy; was for many years president of the Ethnological Society, and published several works on medical subjects. D. in London, Dec. 22, 1848.

Prickly-ash, or Toothache-tree: the *Xanthoxylum americanum*; a large prickly shrub, belonging to the *Rutaceæ*; found in most parts of the U. S. The leaves have the smell of lemons. The bark is aromatic and stimulant, and is used as a remedy for toothache, for rheumatism, and other diseases. *X. carolinianum*, the Southern prickly ash, has a more southern range. It becomes quite a large tree. Its bark is extremely pungent, and is armed with curious prickly warts. *X. floridanum* and *X. pterota* grow also in Florida. China, Japan, South America, and the West Indies abound in species of this genus, nearly or quite all aromatic, pungent, and medicinal.

Prickly Heat: a popular name for eruptive skin diseases, occurring in hot weather and characterized by itching and sensations of stinging. Disordered digestion, constipation, and abnormal perspiration are causes. The disease is known as "miliaria" in technical language. In India there is quite a formidable variety of lichen called by this name. A popular treatment is the use of saline cathartics, which doubtless are sometimes advantageous. Soothing lotions containing carbolic acid, camphor, and similar sedatives are useful, and the disease is often avoided by susceptible persons by frequent bathing and protection from the sun's rays. W. PEPPER.

Prickly-pear: any cactus of the genus *Opuntia*, especially *O. vulgaris*, a native of many places in the U. S. from Massachusetts southward and westward. It is naturalized extensively in the Old World. Its fruit is smooth and eatable, but not so good as that of *O. ficus indicus*, which is prickly. Some of the numerous species are used for forage in Mexico. The erect kinds are serviceable hedge-plants. One species is the official emblem of Mexico. Some prickly-pears afford food to the cochineal insect.

Prideaux, prid'ō, HUMPHREY, D. D.: b. at Padstow, Cornwall, England, May 2, 1648; educated at Westminster School; educated at Christ Church, Oxford, and graduated 1672; published a Latin account of the Arundelian marbles, *Marmora Oxoniensia* (1676); became rector of St. Clement's, Oxford (1679); prebendary of Norwich 1681, archdeacon of Suffolk 1688, and dean of Norwich 1702. D. at Norwich, Nov. 1, 1724. Author of a *Life of Mahomet* (1697), once very popular, and of *The Connection of the History of the Old and New Testaments* (4 vols., 1715-18), which is frequently reprinted.

Pride's Purge: See CROMWELL, OLIVER.

Priessnitz, VINCENT: hydropathist; b. at Gräfenberg, Austrian Silesia, Oct. 5, 1799, of peasant parents; became the inventor of hydropathy, and in 1822, by special authority from the Austrian Government, the founder of the Gräfenberg water-cure, which he administered till his death Nov. 28, 1851. See HYDROPATHY.

Priest [O. Eng. *præost*, like Germ. *priester*, an early loan-word from Lat. *presbyter*, in a Vulg. Lat. form of **prebister*. In Rom. languages the word appears as Ital. *prete*; Fr. *prêtre*, Provenc. *preste-s*. Lat. *presbyter* = Gr. *πρεσβύτερος*, elder]; one authorized to perform certain public religious acts, particularly religious sacrifices; in hierarchical churches, one of the second order of the ministry. In all nations of antiquity among whom a system of worship received any considerable development there existed also a system of priesthood. The priest stood in a sort of mediatorial relation between God and man, and under the Hebrew legislation this was divinely recognized and received the emphatic sanction of divine appointment. In earliest times the functions of the priest appear to have been discharged by the head of the family, who, as the recognized superior of all its members, was the fittest person to appear for them before God. Hence came what is called the "patriarchal priesthood." As the family multiplied into the tribe the duties of its head became too numerous for the proper discharge of the priesthood, as well as often incongruous, and persons were specially selected to fill the office, as in the case of Jethro, "the priest of Midian." When the tribe became a nation a class of men was set aside for the same purpose, although the monarch often remained at the nominal head of the priesthood thus established, as was the case in Egypt. Among the most ancient nations, India, Egypt, and the Hebrews, the priesthood was hereditary, and in the two former constituted a class distinctly separated in their whole life from the rest of the nation, and in Egypt endowed with large landed estates and great wealth. Among the Hebrews, on the contrary, the priests were only allowed cities necessary for their residence, and were cut off from other inheritance in land among the tribes of Israel. They were only in so far a caste as was necessary for the discharge of their duties, and in all other respects were on the same footing as their fellow citizens, it being especially noteworthy that all were entirely equal before the law. Their support was provided for by a tithe from the Levites of the tithes received by them from the whole body of the people, and also by assigned portions of most of the sacrifices. As there was no provision in the Hebrew law for the enforcement of the payment of the tithes, their income was dependent upon the general fidelity of the people. The especial function of the Aaronic priesthood was to come near to God—themselves of the people, yet specially sanctified on their behalf to approach God and obtain from him pardon and blessings for their brethren. Hence their chief characteristic must be holiness, which was set forth in the Levitical law in every possible symbolical way, as well as directly commanded. The first of all their duties was the offering of sacrifice, thus "making atonement for the people." No sacrifice could be offered or incense burned without their intervention. They had also, as naturally connected with this, the general care of the sanctuary and the multitudinous duties flowing from this; and, as being themselves especially trained in the

law, to them was assigned the duty of teaching it to the people. They had, however, little or nothing of the *pastoral* relation toward the people; their duties were almost wholly official. Their qualifications were Aaronic descent, perfect physical formation, and, during their ministrations, freedom from legal uncleanness and abstinence from wine and intoxicating drinks. There was no limitation of age. In marriage they were only restricted to virgins or widows of one of the tribes of Israel. When largely multiplied, in the time of David and Solomon, they were divided into twenty-four courses, which were placed on duty each one week in turn. When on duty, like the Egyptian priests, they wore linen robes and were unshod. The whole order culminated in the high priest, whose office was also hereditary, and who by the magnificence of his official robes was marked as very much elevated above his brethren. He was peculiarly the appointed mediator as a type of the promised Redeemer to come, and alone once in every year entered the Holy of holies. He could marry only a virgin within the priestly family. Later there was a "second priest," or vice high priest. The whole Hebrew priesthood, having its main function in the "making of atonement," necessarily ceased with the coming of Christ. By Canon 34 of the Anglican Church one must be twenty-four years of age before he can be admitted to the priesthood; anciently thirty years was required. Still by dispensation for sufficient cause it may be, and has occasionally been, conferred at an earlier age. In the Protestant Episcopal Church the person priested must be twenty-four years old, and usually the interval of a year is required between ordination to the diaconate and admission to the priesthood. Consult Kalisch, *Preliminary Essay to Lev. viii.*; Küper, *Das Priesterthum des alten Bundes*.

Revised by W. S. PERRY.

Catholic theology teaches that Christ, "a high priest according to the order of Melchisedech" (Heb. v. 10), instituted at the Last Supper not only a sacrament, but a sacrifice also, and by commanding the apostles to do what he had done for a commemoration of him (Luke xxii. 19), established the priesthood of the new Law. The offering of the eucharistic sacrifice in the Mass, the clean oblation identical with that of the cross, is the principal function of the Christian priest. Also by his ministration the faithful partake of the fruits of this sacrifice, chiefly in Holy Communion, and, according to their various needs, in the sacraments of baptism, penance, and extreme unction. Confirmation and holy orders are administered by the bishop, while in matrimony, as theologians generally hold, the contracting parties are the ministers and the priest or bishop is the official witness. The priest, moreover, is charged with the preaching of the Gospel, and with the religious instruction and spiritual direction of those committed to his care. The jurisdiction necessary for exercising sacerdotal functions is given by the bishop of the diocese in which the priest permanently or temporarily resides, and the priesthood itself is conferred by the bishop at ordination. It imparts to the worthy recipient those graces or supernatural helps which he needs for the faithful discharge of his duties, and imprints upon his soul a character which can never be effaced. Once ordained, the priest, though he may be deprived of the right to exercise his office, always retains the essential power of consecrating the body and blood of Christ. See Lambrecht, *De Summo Sacrificio* (Louvain, 1875); Probst, *Sakramente und Sakramentalien* (Tübingen, 1872); Cardinal Manning, *The Eternal Priesthood* (1883).

J. J. KLANE.

Priestley, JOSEPH: physicist and writer on theology; b. at Birstal-Fieldhead, near Leeds, England, Mar. 24, 1733 (N.S.); was son of a cloth-dresser; was placed at a free grammar school, and at a Presbyterian academy at Daventry; obtained by private study a knowledge of the classics and modern languages, to which he added Hebrew and the rudiments of Chaldaic, Syriac, and Arabic; rejected some points of the Calvinistic theology before entering college, but was ordained in 1755 assistant minister to an independent congregation at Needham-Market, Suffolk; left that post in 1758 on account of having adopted Unitarian views; taught a private school at Nantwich, Cheshire, 1758-61, making there numerous experiments in physics, and writing his first published work, *The Scripture Doctrine of Remission* (1761); was teacher of languages and literature in an academy at Warrington 1761-67, during which period he made the acquaintance of Dr. Richard Price and of Dr. Franklin, and prepared, at the instance of the latter, his

History and Present State of Electricity, with Original Experiments (1767), which procured him the degree of LL. D. from the University of Edinburgh and election as fellow of the Royal Society; was pastor of Mill Hill Chapel, Leeds, 1767-73; made there important researches in pneumatics and chemistry, which he gave to the world in his *Directions for Impregnating Water with Fixed Air* (1772), and *All History and Present State of Discoveries relating to Light, Heat, and Colors* (2 vols. 4to, 1772); published his *Institutes of Natural and Revealed Religion* (3 vols., 1772-74), which he had begun eighteen years before; was from 1773 to 1780 librarian and literary companion to the Earl of Shelburne, whom he attended in 1774 in a tour on the Continent; made in that year the discovery of oxygen (called by him dephlogisticated air; see CHEMISTRY), soon followed by that of other gases, besides contributions to theoretical chemistry set forth in his *Experiments and Observations on Different Kinds of Air* (3 vols., 1774-77); published (1774-78) *Disquisition relating to Matter and Spirit*, and other philosophical works which excited much controversy. In 1780 Priestley retired from the service of Lord Shelburne with a life-pension of £150, became minister to the principal Independent congregation at Birmingham, and addressed to an eminent Frenchman his *Letters to a Philosophical Unbeliever*, in which he contended strongly for the doctrines of a revelation and a resurrection. This was followed by his *History of the Corruptions of Christianity* (2 vols., 1782); *History of Early Opinions concerning Jesus Christ, compiled from Original Writers, proving that the Christian Church was at first Unitarian* (4 vols., 1786), and other works, including *Letters to Burke, occasioned by his Reflections on the Revolution in France* (1791). The last treatise procured him an honorary citizenship in the French republic, and was the cause of a riot at Birmingham (July 15, 1791), in which Priestley's house was pillaged and his library, manuscripts, and scientific apparatus scattered through the streets, he himself escaping personal violence by flight. For three years he resided at Hackney as the successor of Dr. Price, instituted a suit for compensation for his losses, in which he was successful after nine years' delay, and in 1794 removed to the U. S., where his sons already resided. He settled on his son's farm at Northumberland, Pa., where he passed the remainder of his life; wrote replies to Volney and Paine, and several other works of little comparative importance, the most elaborate being *Notes on all the Books of Scripture* (Northumberland, 4 vols., 1803). He declined a professorship in the University of Pennsylvania, but occasionally preached at Philadelphia, and delivered there two series of *Discourses relating to the Evidences of Revealed Religion* (1796-97). D. at Northumberland, Pa., Feb. 6, 1804. His autobiographical *Memoirs*, with a continuation by his son, appeared in 1806, and a collection of his *Theological and Miscellaneous Works* (26 vols., Hackney, 1817-32) was edited by John Towell Rutt, vols. i. and ii. being composed of his *Life and Correspondence*. A bibliography of Dr. Priestley's productions, prepared at Washington (1875), gives the titles of more than 300 separate publications.

Revised by R. A. ROBERTS.

Priestley, Sir WILLIAM OVEREND, M. D., LL. D., F.R.C.P.: obstetrician; b. near Leeds, Yorkshire, June 24, 1829; grand-nephew of Joseph Priestley; educated at the University of Edinburgh and took the degree of M. D. in 1853; received the senate gold medal for original research at graduation; settled in London as a physician in 1856; became lecturer on midwifery at the Middlesex Hospital; Professor of Obstetric Medicine in King's College, London, and physician to King's College Hospital 1862; and later consulting physician to King's College Hospital. He is a fellow of several colleges, and member of various learned societies; has been examiner in the University of London, Royal College of Physicians, Royal College of Surgeons, University of Cambridge, and Victoria University; in 1875 and 1876 was president of the Obstetrical Society of London. He has published *On the Development of the Gravid Uterus*; *On the Pathology of Intrauterine Death*; and was joint editor of Sir J. Y. Simpson's *Obstetric Works*. He was knighted in 1893.

Prieto, pre-ñtō, JOAQUIN: general and politician; b. at Concepcion, Chili, Aug. 20, 1786. After serving in the Spanish militia he joined the patriots in 1811; took part in all the revolutionary struggles, holding high military offices; was prominent in congress from 1823 as a leader of the conservative party; joined in the conservative revolt of

1829-30, deciding its success by his victory over Freire at Lircay Apr. 17, 1830, and on the death of Ovalle was made provisional president by congress Mar. 22, 1831. He was confirmed in the post by a regular election, holding it by re-election until Sept., 1841. With him began the prosperous though somewhat reactionary rule of the conservative party in Chili. A constitution (still in force, though somewhat amended) was adopted in May, 1833; there was an unsuccessful revolt in 1836, and Chili aided Peruvian malcontents to overthrow the Peru-Bolivian confederation 1837-38. After retiring from the presidency Gen. Prieto was counselor of state, senator, and commandant at Valparaiso, where he died Nov. 22, 1854.

HERBERT H. SMITH.

Prim, JUAN: Count of Reus and Marquis of Castillejos; b. in Reus, Catalonia, Spain, Dec. 6, 1814; entered the Spanish army in boyhood; obtained rapid promotion during the first Carlist war; became colonel in 1837; was soon afterward elected to the Cortes, plotted against the government of Espartero, and in 1843 placed himself at the head of a revolt in Catalonia. He aided materially in effecting the return of Christina, but, falling under suspicion of treason, was tried and sentenced to death. He was pardoned, however, and appointed governor of Puerto Rico. He was commander of the reserve division in the war against Morocco 1859-60, gaining a great military reputation and the title of marquis. As commander of the Spanish contingent in the allied intervention in Mexico 1861, he was instrumental in bringing about the convention of Soledad, Feb. 19, 1862, in which assurance was given that the independence of the Mexican republic would not be disturbed. On his return to Spain he successfully defended his conduct in the Cortes, denouncing the ambitious plans of the French emperor; was banished from Madrid Aug., 1864; devoted himself thenceforth to the overthrow of Isabella, for which object he entered into various combinations and headed several unsuccessful insurrections, especially that of Jan., 1866, in Aragon and Catalonia, but ultimately succeeded in organizing the movement which in Sept., 1868, through the aid of Serrano and Topete, resulted in the flight of the queen to France; was welcomed with enthusiasm at Madrid; became Minister of War and head of the cabinet in the new provisional government; conducted several negotiations for founding a new dynasty in Spain; furnished the pretext for the Franco-German war of 1870-71 by his offer of the crown of Spain to Prince Leopold of Hohenzollern, and in the autumn of 1870 obtained from the Cortes the election of the Italian prince Amadeus, Duke of Aosta. On the day that the new king landed at Barcelona (Dec. 28) Prim was attacked by assassins in a street of Madrid, and received eight balls in his body, and died two days later (Dec. 30, 1870).

Revised by F. M. COLBY.

Primary Elections: in U. S. politics, a term usually applied to the preliminary meetings of the voters of any political party to nominate candidates for offices to be filled by the people at a subsequent election, or to choose delegates to a convention that will make such nominations. The word caucus is sometimes used with reference to a meeting of certain members of a legislature or other deliberative body to decide upon harmonious action with reference to pending business. (See CAUCUS.) It will be seen that the primary election is the source of all nominations, from that of the village constable or pathmaster (unless these officers are both nominated and elected in town meeting) to that of President, although this has not been true throughout the history of the country. From 1800 till 1824 the presidential candidates of one party at least, and often of both, were designated by the members of Congress in a congressional caucus, though in the later years some of the State Legislatures also made nominations. In 1828 the presidential candidates were nominated by the State Legislatures, and in 1832 the present system of nomination by convention founded upon the primaries was started.

In rural districts, or in smaller towns where the voters of each political party are personally known to one another, the ordinary primary election is not generally seriously abused. The local political leaders are likely to pack the meetings in the interest of their favorites; but this can be successfully done, with rare exceptions, only when there is apathy on the part of many voters. In the larger cities, owing to the lack of acquaintance among the voters, there are many opportunities for fraud, and many abuses. The necessity of some means of identifying voters has led in New York and other large cities to the formation of local political associations;

and from these associations have come the worst abuses. A check list of names of voters is of course necessary, no person being allowed to vote whose name does not appear on the list. This machinery of registration, and the necessity of having some authority to call meetings, make the appointment of a committee imperative. These committees, often reappointed, soon know their districts so well that they can manage them better than any one else; hence they have much influence with higher party officials. In New York each assembly district has had its local association in the nature of a permanent club, and its committee, associated with a central committee, which has had the general direction of affairs in the city. The two leading parties have had, under somewhat different forms, practically the same method of working. The direction of affairs has been held, in the main, in the hands of the central committee; and as membership in the local associations has been limited by pledges of support of regular candidates selected by the committee, pledges that many men could not give, the control has been retained. This rigid control has at times permitted not more than one-sixth, or even not more than one-tenth, of the voters to take part in nominations, and even these were compelled to follow the dictates of the small central executive committee. In such circumstances nominations could be made by the "boss" at will.

Much thought has been given to finding remedies for these evils in making nominations, but none that have been suggested are entirely satisfactory. The system of proportional representation, as found in three cantons of Switzerland, by lessening the strength of parties and party feeling is said to have had a marked influence toward purifying nominations and elections. (See REPRESENTATION.) Under the present system of party government in the U. S., probably more has been accomplished than in any other way by what are called "Primary Election Laws" in several States. By these laws—found in more or less complete form in Ohio, Kentucky, Missouri, California, Illinois, Kansas, West Virginia, Wyoming, Wisconsin, Oregon, Washington, etc.—primary elections are no longer to be considered entirely as voluntary meetings. The most complete laws provide regulations for duly calling and publishing notices of meeting, for registration of voters, for inspectors, challenging, voting, etc., with severe penalties against fraud, as well as against bribery or undue influence of any kind. Late practice in some districts in New York shows that a good system of minority representation in the primary election itself has had excellent results.

JEREMIAH W. JENKS.

Primary Schools: See COMMON SCHOOLS.

Primate [viâ O. Fr. from Lat. *prîmas, primatîs*, one of the first, chief, (in Mediæv. Lat.) a primate, deriv. of *prîmus*, first]: originally, in the ecclesiastical system of the Roman Catholic Church and the Church of England, the first in rank of the archbishops in a country. Thus in England the Archbishop of Canterbury was long primate, but at present the Archbishop of York is styled "Primate of England," while Canterbury takes the higher title of "Primate of all England." The Church of Ireland Archbishop of Dublin has the title "Primate of Ireland," and the Church of Ireland and Roman Catholic Archbishops of Armagh are each called "Primate of all Ireland." Five or six French prelates are called primates, but the Archbishop of Lyons is "Primate of primates." Again, the Archbishop of Braga is Primate of Portugal, although inferior in rank to the Patriarch of Lisbon. These facts indicate that the office of primate has to some extent and in certain cases become a titular one, or at least a mere indication of a comparatively unimportant precedence.

Revised by W. S. PERRY.

Primates [Mod. Lat., from Lat. *prîmas, primatîs*, of the first, chief, excellent, deriv. of *prîmus*, first]: an order of monodelph mammals including man, the monkeys, and the lemurs. These are all externally distinguished by the fore as well as hind limbs being completely or almost entirely exerted outside of the common integument, and thus distinguished from the ordinary quadrupeds, in which the proximal joints are inclosed therein; the members have also generally five digits, developed on the hands as well as feet; the innermost or first of the hand or fore foot being the thumb, which is, however, frequently suppressed, and the corresponding and innermost digit of the foot being thickened and generally opposable like the thumb to the other digits, only in man assuming parallelism with them; this great toe is always furnished with a depressed nail; the teeth are not distinctive, being modified according to

several types; they are, however, at least in one stage, incisors, canines, and molars; of the incisors there are in each jaw generally four, and never more, although they may be reduced to two, or all in the upper jaw may be suppressed; the clavines are always completely developed and co-ordinated with the development of distinct shoulders and their distance from each other; the brain has a large cerebrum which completely overlaps the olfactory lobes in front, and behind more or less covers the cerebellum; on the interior surface of each hemisphere behind a peculiar sulcus (the so-called calcarine) exists, which is co-ordinated with the development of a raised portion (the hippocampus minor) within the posterior corner of the ventricle by which the posterior lobe of the cerebrum is traversed. The order as thus distinguished includes two sub-orders—

(1) *Anthropoidea*, comprising the families *Hominidae* (man), *Simiidae* (the large tailless apes), *Cercopithecidae* (the Old World monkeys, baboons, etc.), *Cebidae* (the common New World monkeys), and *Mididae* (the marmosets, etc.); and (2) *Prosimia*, with the families *Lemniscidae*, *Tarsidae*, and *Daubentonidae*. The order, as thus limited and defined, is the result of studies of recent zoologists. Linnaeus, who framed the name, embraced under it in addition to the forms above indicated, all the *Chiroptera* and *Viviparous*. By Cuvier and his numerous followers the true *Primates* were differentiated into two orders—*Bimana* (including man) and *Quadrumana* (including the monkeys and lemurs). The naturalness of the association of man with the monkeys is now almost universally conceded, and the main question in dispute at the present time is whether those forms (the anthropoids) should be associated with the lemuroids in a single order, or the two distinguished as independent orders. The differences between them are certainly great, and the discovery by Alphonse Milne-Edwards of the peculiarities of the lemuroid placentas adds to the arguments in favor of their separation, and the question is a very evenly balanced one. See, further, the names of the sub-orders and families.

Revised by F. A. Lucas.

Primaticcio, *prō-mī-a-tē-ō* (Ital.), FRANCESCO, painter; b. at Bologna, 1490, of a noble family. Innocenzio da Imola and Bagnacavallo were his first masters, but it was at Mantua, where he studied under Giulio Romano, that he learned the art of color and modeling in stucco as a means of decoration. He gave proof of his talents in this line by the two pieces in the Palazzo del Te. He painted also several subjects after Giulio Romano's designs, so that when Francis I. of France asked Duke Gonzaga to send him a painter capable of directing the decoration of Fontainebleau, Primaticcio was sent as the best of Romano's followers. After nine years, during which time his work gave much satisfaction, he became the superintendent of the king's buildings, succeeding in this post the Florentine Rosso, who had died, and of whom Primaticcio had always been extremely jealous. After the death of Francis I. he continued to hold the same post under Henry II., and Francis II. made him commissary-in-general of all the buildings in the kingdom. He gave the designs for all statues, decorations, fountains, goldsmiths' work, and of all court pageants. He built the first château at Meudon for the Cardinal de Lorraine, and adorned it with sculpture and paintings. He became the artist in highest renown, and was a protector of art, except when touched by jealousy of any extraordinary talent. He was an implacable enemy of Benvenuto Cellini, whom he tried to deprive of commissions by conspiring against him together with the king's mistress, Madame d'Estampes. The Gallery of Ulysses at Fontainebleau was considered one of the finest works of the kind in France. The painting is utterly ruined by time, so that the designs are known to us only through engravings. Primaticcio died in Paris in 1570. The Louvre contains two of his works, which are very rare in Italy; in Bologna the most remarkable is that in the Zambeccari Gallery, representing a concert of three women.

W. J. STILLMAN.

Prime, SAMUEL IRENEUS; editor and author; son of Dr. Nathaniel S. Prime; b. at Ballston, N. Y., Nov. 6, 1812; graduated at Williams College 1829; studied theology at Princeton; was ordained to the ministry of the Presbyterian Church, and preached several years, but on account of ill-health withdrew from the pulpit in 1840, when he became editor of *The New York Observer*, the leading religious paper of his denomination—a post he retained till his death; several times visited Europe, and published some forty volumes, chiefly anonymous. Among his books are *Travels*

in Europe and the East (2 vols., 1853); *Letters from Switzerland* (1860); *The Bible in the Levant* (1859); *Memoirs of Rev. Nicholas Murray* (1862); *The Bible in the Levant* (1874); and *A Life of St. Francis of Assisi* (1874). D. at Manchester, Vt., July 18, 1885. His autobiography appeared, ed. by W. Prime, in 1886.

Prime, WILLIAM COWPER; journalist; b. at Cambridge, N. Y., Oct. 31, 1825. Graduated at Princeton College, and practiced law in New York till 1861. He was afterward editor of the *New York Journal of Commerce*; traveled in Egypt and Palestine; was made Professor of the History of Art at Princeton in 1884. His published writings include *The Life of St. Francis* (1848); *Real Life in Egypt* (1857); *The Life of the Holy Land* (1857); *Corn, Meads, and Seals* (1860); *I Go A-fishing* (1878); *Pottery and Porcelain* (1878); *Holy Cross* (1879); and other works; edited *McClellan's Own Story* (1886), and wrote a biography of Gen. McClellan for that volume. H. A. BEERS.

Prime Mover: the term employed to designate a machine, the office of which is to transform the energy expended in some natural source of power into available work. For example, a quantity of water falling from one level to another represents an expenditure of energy due to the force of gravity, equivalent in foot-pounds to the product of the weight of the water multiplied by the height of fall in feet. In falling without obstruction or resistance the velocity of the water continually increases, and the energy is usually dissipated in the shock at the bottom of the fall. To render this source of power available, a water-wheel may be introduced, which, receiving the impulses of the falling particles, causes a portion of the work to be transformed into useful work, and the water reaches the bottom of the fall with its energy diminished by precisely the quantity which has been so transferred or transmuted into the work absorbed by the water-wheel.

While prime movers generally have the characteristics of other machines in many respects, yet only a few machines can be classed as prime movers. In prime movers the construction and arrangement of their parts depend on the nature or source of the energy which is to be utilized, and demand the application of a wide range of the physical sciences. Questions of *economy of power* should receive first consideration. See MACHINES AND MACHINERY.

The sources of energy in nature which are made available for useful purposes by the aid of prime movers are heat, the energy of falling water, the motions of the atmosphere, and electricity or magnetism. The latter being, however, regarded as referable to heat, and the second and third sources mentioned being manifestations of the force of gravity, the ultimate sources of available energy may be considered to be *heat* and *gravitation*. As regards *muscular energy*, men and animals may be regarded as prime movers—perfect exhibitions, in this respect, of the imperfect results of human efforts in artificial constructions.

The heat-engine, under the form of the steam-engine, holds the first place in importance among all the prime movers. In the investigations and experiments connected with economy in its use and its adaptation to various purposes, especially to the propulsion of steamships, it has engaged the attention of scientific men, practical engineers, and artisans to a greater extent than all others combined; and the developments arising from its use have given rise to a special branch of engineering science. The use of the water-wheel in the form of the turbine, the second prime mover in importance, has been greatly extended through the new facilities afforded for its construction by steam machinery and the arts and industries developed by it. Hot-air engines, gas-engines, and electro-dynamic engines are prime movers more restricted in their applications, but they possess respectively peculiarities which render them advantageous under certain conditions. The windmill is another prime mover which in favorable localities is of great value. See DYNAMO-ELECTRIC MACHINE, GAS-ENGINE, HOT-AIR ENGINE, STEAM-ENGINE, WATER-POWER, and WINDMILLS.

Revised by R. A. ROBERTS.

Prime Numbers [*prime* is liter. first, i. e. in any series of multiples into which a prime number can enter, from Lat. *prī-mus*, first]; those whole numbers which can not be exactly divided by any other whole number except 1. Two numbers are prime with respect to each other when they can not both be divided by any whole number except 1. Thus 2, 3, 5, etc., are prime numbers; 6 and 25 are prime with respect to each other. No rule has been found for discover-

ing prime numbers by a direct process. A method of sifting out numbers not prime was described by Eratosthenes, and for that reason is generally known as Eratosthenes's sieve. The method is as follows: Since every even number is divisible by 2, we may omit or sift out all such numbers, and remembering that 2 itself is prime, we write down the series of odd numbers up to any limit, say up to 99: 1, 3, 5, 7, 9, 11, 13, 15, etc. We begin with the first prime number after 2, which is 3, and counting from it, we strike out every third number, because all such numbers are divisible by 3, and therefore are not prime. We then begin with 5, and counting from it we strike out every fifth number, because all such numbers are divisible by 5. We then begin with 7, and counting from it, we strike out every seventh number. The remaining numbers, up to the square of the next prime number whose multiples are to be struck out, are prime. In this way we find that the prime numbers less than 100 are 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97. The operation of sifting may be extended to any series of whole numbers, but beyond a certain limit the operation becomes tedious. In applying the method just described it is to be remembered that if a number can not be divided by a prime number less than its own square root, that number must be prime. Thus in the case supposed we need not go farther than 7, because 7 is the greatest prime number less than $\sqrt{100}$. From the nature of the process of Eratosthenes it is evident that the number of prime numbers in a given interval will be less the higher that interval commences. The number of prime numbers up to 10,000 is 1,230; the number between 10,000 and 20,000 is 1,033; between 20,000 and 30,000 it is 985, and so on. Many tables of prime numbers have been published of greater or less extent: those of Burckhardt extend to the number 3,036,000; Glaisher's tables extend from 3,000,000 to 6,000,000; Dase's from 6,000,000 to 9,000,000. The highest number that has been shown to be prime is $2^{31}-1=2,147,483,647$; this was found by Euler.

Revised by S. NEWCOMB.

Primitive Methodists: See METHODISM.

Primitive Wesleyans: See METHODISM.

Primogeniture [Lat. *prī'mus*, first + *genitū'ra*, a begetting, being born, but in meaning deriv. of *primogē'nitus*, first-born; *prī'mus*, first + *gig'ni*, *genitus*, be born]: the preference in inheritance which the law accords to the eldest born. The sole and exclusive heirship of the eldest son in the English rule of primogeniture dates back directly only to the complete establishment of the feudal system of land tenure in England after the Norman conquest. On the Continent, however, in the feudal states which were erected on the ruins of the Roman empire, the principle had already completely triumphed over the Teutonic as well as the Roman ideas of succession. Its obscure origin and the rapidity with which it overran Western Europe at this time constitute one of the puzzles of legal history. In the multitude of different customary rules of descent which a study of primitive society discloses, it is seldom that the student comes upon any traces of it. The right of the eldest son prevails, indeed, but it is as a right of political succession, and not of succession to property. In this latter form it was unknown either to the Greek or to the Roman jurisprudence, and the "birthright" of the Hebrew and of the Hindu law, which is sometimes confounded with the rule of primogeniture, was at the most only a recognition of the claim of one of several sons (not necessarily the eldest) to a double portion of the inheritance.

The general acceptance of the doctrine of primogeniture in the Middle Ages would seem to indicate that it was peculiarly adapted to the necessities of that mixture of political, social, and property relations which we call the feudal system. With the well-nigh complete disappearance of that system, however, the rule of primogeniture has generally been swept away, surviving only, on the Continent, as a rule regulating succession to the crown. In England only has it been preserved in full force and virtue. There it still prevails, as a rule or canon of descent of real property, "that," to use Blackstone's statement of the rule, "the male issue shall be admitted before the female," and, "where there are two or more males in equal degree, the eldest only shall inherit; but the females all together." Of course, under a system of law in which the landowner may freely alienate his estate by will, it is really optional with him whether he will, by dying intestate, subject his real property to the rule of primogeniture or not. The system has been persistently

attacked of late, but it has become too closely bound up with the habits and traditions of the English people to be easily dislodged.

The rule of primogeniture was introduced, along with the rest of the common law, into the English colonies in America, but the principle has long since been repudiated, by statute or constitutional inhibition, in all of the States as being unsuited to the spirit of their institutions. In the U. S., as also in Canada and the English colonies generally, all descendants of the same degree inherit the real property of their ancestor equally as tenants in common. See Maine's *Ancient Law and Early History of Institutions* and the *Commentaries* of Blackstone and Kent.

GEORGE W. KIRCHWEY.

Primrose [(by confusion with rose) < M. Eng. *primerole*, viā O. Fr. from Lat. *prī'mula*, primrose, deriv. of *prī'mus*, first, named from its early flowering]: any plant of the genus *Primula*, although many have separate names. They are handsome flowering herbs, largely European. The true primrose is *P. grandiflora* of Europe. *P. officinalis* is the cowslip, of which the polyanthus is a cultivated form, all of these running into many varieties. The birdseye primrose (*P. farinosa*) belongs to a humbler division of the genus. This and the related *P. mistassinica* are indigenous to the northern parts of North America. *P. auricula*, the parent of the auriculas of the gardens, is a native of Southern Europe. The oxlip is *P. elatior*. The Chinese primrose (*P. sinensis*), now one of the commonest house-plants, represents a different section of the genus, to which *P. cortusoides*, a choice Siberian species, also belongs. *P. obconica*, from China, is a species much prized for greenhouse culture. It has pungent hairs which are irritating-poisonous to some persons. The evening primroses are species of *Enothera*, of a wholly different family, and took the name from a very superficial likeness of the corolla to that of the true primrose.

Revised by L. H. BAILEY.

Primrose Family: the *Primulaceæ* (from *Primula*, the typical genus); a family of gamopetalous, dicotyledonous herbs, widely distributed over the world, but chiefly in the cooler parts of the northern hemisphere. Plants of this family are characterized by having stamens of the same number as the lobes of the corolla, and opposite them, on the tube or throat, a single style and stigma, and a one-celled ovary with a free central placenta, bearing several or numerous ovules. To this must be added the herbaceous character, to distinguish them from the *Myrtinaceæ*, tropical trees or shrubs which have a similar floral structure. Except a slight acidity, *Primulaceæ* are nearly inert plants, of no economic importance beyond the beauty of their blossoms. Besides the PRIMROSE (*q. v.*) and its near allies, the cyclamen, the beautiful dodecatheon of the U. S., popularly known as American cowslip and shooting-star, and one species of *Anagallis*, are familiar in ornamental cultivation.

Revised by CHARLES E. BESSEY.

Prince [viā O. Fr. from Lat. *prin'ceps*, *prin'cipis*, one who is first, leader, chief, ruler, sovereign; *prī'mus*, first + *ca'pere*, take]: a title which sprang from that of the Roman *princeps senatus*, which became a title of the Roman emperors, and from them passed to mediæval and modern sovereigns. There are also sovereign rulers who have no higher title than prince. Nobles of the blood are in general called princes, whether they officially bear this or some inferior title. In continental Europe there are also princes who are not related to sovereign families (called in Germany *Fürst*, and not *Prinz*). Strictly, all English nobles of higher rank than viscount are entitled to be styled princes, but in practical use princes of the blood are the only ones so designated.

Prince, THOMAS: clergyman and author; b. at Sandwich, Mass., May 15, 1687; graduated at Harvard 1707; went to England 1709; attended lectures at Gresham College, London; preached at Combs, Suffolk, 1712-16, and elsewhere in England; returned to Massachusetts 1717; was ordained colleague of Rev. Dr. Joseph Sewall, pastor of the Old South church, Boston, Oct. 1, 1718; devoted many years to the collection of materials for the civil and religious history of New England, and gathered a valuable library, which he bequeathed to the Old South church. D. in Boston, Oct. 22, 1758. When the Old South church was desecrated by British soldiery during the war of the Revolution, manuscript documents in the Prince library were stolen or destroyed. The books, tracts, and MSS. remaining, 1,500 in number, were deposited in the Boston Public Library in 1860. Prince

published, in addition to sermons, many occasional writings, including *An Account of the First Aurora Borealis* (1717); *Earthquakes of New England* (1755); and a revision of the *New England Psalm-book* (1758); and undertook a work valuable from its extreme accuracy of detail, *New England Chronology*, of which, however, only vol. i. (1736) and part of vol. ii. (1755) appeared, extending only to 1633 (new ed. 1826).

Prince Edward Island [named in 1798 in honor of Edward, Duke of Kent, father of Queen Victoria]: an island in the Gulf of St. Lawrence, constituting, since 1873, the smallest province of the Dominion of Canada (see map of Province of Quebec, Prince Edward Island, etc.). Area, 2,133 sq. miles. Pop. (1891) 109,088. Twenty-four minor islands belong to the province. There are numerous bays, harbors, and promontories. Northumberland Strait, on the S. and W., separates it from the mainland of Nova Scotia and New Brunswick. The soil is very fertile. The surface is generally level, with some low hills. The climate is insular and therefore not severe. The forests are greatly reduced. They consist of birch, elm, maple, ash, beech, pine, spruce, fir, hemlock, cedar, juniper or tamarack, poplar, and willow. Vast quantities of sea-manure are everywhere accessible. The waters teem with fish—mackerel, herring, cod, and many other species—and the north shore is one of the best fishing-grounds in North America. The manufacturing interests are not extensive, but ship-building is an important industry. A railway extends the whole length of the island. Wheat, oats, barley, rye, potatoes, buckwheat, and garden vegetables are raised. Cattle, horses, swine, sheep, and poultry are bred extensively. The island is divided into three counties—King's, Queen's, and Prince—each of which elects ten representatives to the Legislative Assembly. There has been a system of free public schools since 1821. The system includes grammar or higher schools, secondary schools, and normal schools for the training of teachers. There are three denominational colleges—Roman Catholic, Anglican, and Wesleyan—all at Charlottetown, the capital. During the summer the island is visited by regular lines of steamers and by thousands of fishing-vessels. In winter the island was formerly almost inaccessible, but this disadvantage has been partly remedied by a steamship owned by the Government, and specially designed for winter navigation. There is a submarine telegraph.

History.—The island (the *Île St. Jean* of the French) was discovered by the Cabots in 1497. It began to be settled by the French (1715), who increased rapidly for many years. In 1764, having come under British rule, it was abandoned by many of the French, and it was then parceled out among sixty-seven grantees, who agreed to furnish a numerous colony of Protestant settlers (not English) for the colony. Though these conditions were never fulfilled, the great estates were not broken up until 1875, when their absentee landlords were finally bought out under the Land Purchase Act of that year. The Roman Catholic religion was never fully tolerated till 1830. There is a Roman Catholic bishop of Charlottetown, and that body is more numerous than any other denomination. Revised by C. C. ADAMS.

Prince of the Peace: See GODOY, MANUEL, *de*.

Prince of Wales, Cape: See CAPE PRINCE OF WALES.

Prin'ceps [Lat., the first man]: the civil title of the Roman emperors, as *imperator* was their military title. How the word first came to be used in this sense is a matter of dispute, many holding (with Mommsen) that it was a new designation, created to comprehend the various powers concentrated in the hands of Augustus, in 27 B. C., by virtue of which he became the "first citizen"; while others, with apparently better reason, maintain that it was nothing more than a continuation of the ancient title of *princeps senatus*, and that from its absolute use in the first instance by the senators (as *princeps noster*) it was gradually extended, until Augustus himself made official use of it in this way, and thus established the title as the imperial designation. It should be understood, however, that this dispute has regard only to the origin of the designation, and that in any case the word *princeps*, as applied to Augustus and the succeeding emperors, has a significance entirely new. For while no unprecedented powers had been lodged in the hands of Augustus, he was the first to unite in one person military authority, in the provinces and at home, with several of the most important civil offices, such as the tribunitian power, the censorship, and the supreme pontificate.

G. L. HENDERSON.

Prince Rupert's Drops: glass drops with an elongated, tapering form, made by throwing melted glass into water. A smart blow upon the large end makes no impression, but if the smallest part be picked off the small end, the whole falls into powder. They derive their name from the fact that Prince Rupert, a nephew of Charles I., introduced them into England.

Prince's Feathers: See AMARANTH.

Prince's Islands: eight islands in the Marmora at the entrance of the Gulf of Nicomedia. Prinkipo, Chalki, Antigone, and Proti are the chief. Most enchanting in climate and natural scenery, in all ages they have been the favorite resort of the wealthy and luxurious classes of Constantinople. Many emperors and members of the Byzantine imperial families have resided there. Also they have been occupied by numerous monasteries, some of which still exist. At Chalki is the chief theological seminary of the Orthodox Church, manned by an able and learned corps of professors. The disastrous earthquake of July, 1894, wrecked many buildings and caused great loss of life. E. A. G.

Prince's Metal: See BRASS.

Princeton: city; capital of Bureau co., Ill.; on the Chi., Burl. and Quincy Railroad; 22 miles W. S. W. of Mendota, 105 miles W. S. W. of Chicago (for location, see map of Illinois, ref. 3-D). It is in an agricultural and coal-mining region, and contains flour-mills, grain-warehouses, agricultural-implement works, foundry and machine-shop, 2 libraries (High School, founded 1867, Matson, founded 1879), 3 national banks with combined capital of \$315,000, and 3 weekly newspapers. Pop. (1880) 3,439; (1890) 3,396.

Princeton: city; capital of Gibson co., Ind.; on the Evansv. and Terre Haute and the Louisv., Evansv. and St. L. Consolidated railways; 24 miles S. of Vincennes, 27 miles N. of Evansville (for location, see map of Indiana, ref. 11-B). It is in an agricultural region, and contains flour-, woolen-, and planing-mills, grain-elevator, carriage-factories, a public library (founded in 1879), a national bank with capital of \$75,000, a State bank with capital of \$100,000, and three weekly papers. Pop. (1880) 2,566; (1890) 3,076.

Princeton: borough; Mercer co., N. J.; on the Delaware and Raritan Canal; 10 miles N. E. of Trenton, 50 miles S. W. of New York city (for location, see map of New Jersey, ref. 4-C). It is on a high ridge, 3 miles from the main line of the Penn. Railroad, with which it is connected by a branch line, and commands an extensive view of the surrounding country. The borough is laid out with wide streets, beautifully shaded and ornamented with broad lawns, and contains some quaint colonial houses and many fine modern residences. The old graveyard has been called "the Westminster of America," because of the eminent persons buried there. There are 8 churches, Evelyn College for young women, a national bank with capital of \$50,000, a State bank with capital of \$100,000, a savings-bank, 2 weekly newspapers, and 4 college periodicals. Princeton is most widely noted as the seat of Princeton University (see NEW JERSEY, COLLEGE OF), and of the Theological Seminary of the Presbyterian Church in the United States of America (founded in 1812; now has about 300 students). It is also noted as the scene of a battle in the Revolutionary war, which proved the initiative of operations by which the British were driven from the greater part of the two Jerseys. Washington surprised and captured Trenton on Dec. 26, 1776, and concentrated his army there a few days afterward. Cornwallis, resuming command of the British in the Jerseys after the surrender of Trenton, made his headquarters at Princeton. On Jan. 2, 1777, Cornwallis advanced the greater part of his army toward Trenton, intending to attack the Americans on the following day. Washington, learning that only a small force remained at Princeton, made a night march thither, surprised the British at day-break on Jan. 3 near the college, and routed and dispersed them within thirty minutes, inflicting a loss of 100 killed and wounded and of 230 prisoners, and sustaining a loss of less than 30. Though the forces engaged were small, the result was of great value in encouraging the colonists, who had become disheartened by many reverses. Pop. (1880) 3,209; (1890) 3,422; (1895) 3,488. H. C. CAMERON.

Pringle, THOMAS: poet; b. at Blaiklaw, Teviotdale, Scotland, Jan. 5, 1789; graduated at Edinburgh University; became clerk to the commissioners on the public records of Scotland; began in 1811 to publish occasional poems; became in 1817 coeditor with James Cleghorn of the *Edin-*

burgh *Monthly Magazine*; was at the same time editor of the *Star*, a semi-weekly newspaper, and of *Constable's Magazine*; emigrated to South Africa 1820; taught school at Cape Town; became librarian to the colonial Government, and successively edited two newspapers; returned to England 1826; became secretary of the Anti-Slavery Society 1827; published *African Sketches* (1834), etc., and left a posthumous *Narrative of a Residence in South Africa* (1835). D. Dec. 5, 1834. See *Poetical Works of Thomas Pringle, with a Sketch of his Life*, by Leitch Ritchie (1838).

Printing [deriv. of *print*, shortened from *imprint*, from O. Fr. *empreindre* < Lat. *imprimere*, impress; *in*, in, on + *premere*, *pressum*, press]: the processes which are involved in making copies, generally in ink and by pressure, of letter-press or of designs engraved, etched, or drawn upon a solid surface. In its most restricted sense, and that in which it is used in this article, it is synonymous with typography (in its widest sense), and includes typesetting, electrotyping, stereotyping, etc., and the taking of impressions from the inked surface of the type thus set up, or of plates made from them on presses specially constructed for the purpose; but in a wider sense lithography, engraving, zincography, and embossing books in raised letters for the blind, as well as the reproduction of photographic images by the action of the sun on specially prepared paper, etc., are all included.

History.—From the earliest historic period some mode of engraving and producing impressions or devices has been known, but it seems not to have advanced beyond the form of seals until the time of the Babylonians and Assyrians. Their buildings were generally built of burnt brick, which were stamped with an inscription according to the character of the edifice, and bore the name of the reigning monarch. In many instances these impressions show clearly that the stamp was engraved in relief and applied to the plastic clay. The Assyrians, unlike any other nation of antiquity, employed terra-cotta prisms, cylinders, and tablets for all the purposes of writing and the preservation of their literature. (See ASSYRIAN LITERATURE.) The Egyptians also used stamps to impress the bricks used for their buildings. The stamps appear to have been used to mark the destination of the bricks. The Chinese have used a simple mode of printing from an early date. A work supposed to have been written during the reign of Wu Wang (in the twelfth century B. C.) mentions the blackening of engraved characters, but this is probably an allusion to some mode of making inscriptions more legible by blackening the letters. According to their chronicles, the early attempts of their present mode of printing were made about 50 B. C., but no great advance was made till the reign of Ming-Tsung (927-934 A. D.), when Fung-Taou made copies of the classical books by taking impressions from stone plates, into which the letters had been cut; in the impression therefore the letters were white on a field of black. Fung-Taou then printed an edition of the nine *King*, or classical books, for the imperial college at Peking, from wooden blocks engraved in relief; this work was completed in 952. In 1041 a Chinese blacksmith cut the most frequently used characters upon cubes of porcelain paste, which he then baked until hardened. These, being of different heights and thicknesses, were placed in a kind of cement, pressed down evenly, and printed from; but this process seems not to have extended after his time. Various attempts have been made to substitute separate characters for the engraved blocks, but it is rendered difficult because every word in Chinese requires a separate character, instead of each word being composed of elements resolvable into the simple alphabet of Western nations. It is estimated that there are about 80,000 of these characters, though not more than 14,000 to 15,000 are in regular use. Movable type, both of wood and of copper, have long been in use in China, and some large works have been printed from them. (See ENCYCLOPÆDIA.) The *Peking Gazette* is printed from movable wooden type (see NEWSPAPERS), and millions of pages of books and periodicals in Chinese are annually printed from movable type at the mission presses and elsewhere. The Greeks were early acquainted with engraving on metal, their maps being cut with lines below the surface, but it does not appear that they multiplied copies from them. The ancient Romans made use of metal stamps, with characters engraved in relief, to mark their articles of commerce and brand cattle. The old Roman potters appear to have possessed separate stamps for letters, as some of their clay lamps show that the inscriptions were made by impressing each letter separately. The British Museum contains several

Roman stamps with the letters engraved in relief, which seem to have been used to print the owner's signature on documents. Although the Romans had no mechanical mode of multiplying literature, they had a well-organized system of slave-labor, which enabled books to be written cheaply, and nearly every one could boast of having one or more volumes. With the decline of Roman civilization literature was despised by all ranks of society. During the following centuries the taste for literature was cultivated by a few; the Church through her scribes fostered the transcription of the Bible, the classics were multiplied, and gradually the people acquired a thirst for knowledge which was but poorly supplied. With the introduction of the art of paper-making, about the beginning of the eighth century, epistolary correspondence increased, books were multiplied more rapidly, and with the endeavor to supply the people more cheaply with religious reading wood-engraving was invented, first to disseminate scriptural scenes, and afterward to make illustrations and texts for books in imitation of the manuscripts of the period.

Block-printing and Block-books.—Toward the beginning of the thirteenth century wood was engraved upon in Italy, Sicily, and Spain to produce designs with the aid of ink on fabrics of linen and silk. Playing-cards were produced by the same method, and afterward colored by hand or by means of stencil-plates. Old manuscripts of this time are in existence which have initial letters, and sometimes pictures printed, while the text is in handwriting. There is in the library of Upsala, Sweden, a curious volume known as the *Codex Argenteus*, or *Silvered Book*, a translation of the four Gospels, so called because the letters are in silver on leaves of purple vellum, supposed to have been made not later than the sixth century. From the indentation on the other side of the leaf, and the turned letters found occasionally, it seems to have been made by the separate stamping of each letter upon the leaf. About the beginning of the fifteenth century single prints of a religious character appeared, from Germany and Holland. These pictures, or image-prints, were made of many sizes, generally engraved in outline, and highly colored. The earliest known with date is that of St. Christopher carrying the infant Saviour upon his back across a river. It has a legend of two lines at the foot, with the date 1423. Three copies are known to be in existence. It is about 8 by 11 inches in size, printed on paper, and in ink almost black, differing thus from other image-prints, which are generally in a dull or faded brown ink. There are many other image-prints which are referred to about the same date. Manuals of devotion followed, of a limited number of pages, generally containing pictures with a few words beneath or in the interior, some having the pictures on one leaf and the explanation or text on the other. The most notable of these were the *Biblia Pauperum*, or *Bibles for the Poor*, or rather books for indigent preachers, consisting of a series of rude engravings, each occupying a page, on one side of the leaf only, and divided into compartments having pictorial illustrations of the most remarkable incidents mentioned in the Pentateuch, the Gospels, and the Apocalypse, and accompanied with explanations in Gothic characters. The two pages facing each other were engraved on one block of wood, and the book put together in sections of two leaves, two pages of illustrations being followed by two blank pages. It was a folio, printed on paper, in ink of a dull or rusty-brown color, and contained forty pages, each engraving being 10 inches long and 7½ inches wide, without folios; but the first twenty pages were marked in alphabetical order from *a* to *v*, and the last twenty with the same letters having a dot before and after, as *a.* to *v.* Its date is referred to about 1420. At least four distinct editions from wood, two Latin and two German, have been discovered. Of the first edition there are known to be fifteen copies, varying in slight particulars, but tending to prove a common origin. The workmanship of the *Biblia Pauperum* is like that of other block-books, of which notable examples of an early date are the *Apocalypsis Johannis*, three works on the *Virgin Mary*, the *Enndtkrist* or *Antichrist*, *Ars Memorandi*, *Ars Moriendi*, and *Speculum Humane Salvationis*. Sotheby, in his *Principia Typographica* (1858), describes twenty-one block-books, all distinct works.

Introduction of Typography.—There is no exact and entirely acceptable account of the invention of typography from the pen of any eye-witness or contemporary chronicler. Our knowledge of the subject has been gathered from the imprints of the first books; from casual and often inexact

notices of early writers, who relate hearsay testimony; and from legal records, sometimes of doubtful authority. And the notices are deficient in necessary details. They show that the invention was not fully appreciated, either by the printers or by the public. When the eye-witnesses were dead, and the merit of the invention was acknowledged, explicit and positive testimony began to appear, but this testimony was usually colored by family or national pride. The claimant of earliest date is Laurens Janszoon Koster, of Haarlem, whose name was first mentioned in print in 1588. It is said that Koster invented types of wood about 1428, and types of metal at a later date, that with these he printed the *Speculum Salutaris* and other little books, and that about 1440 one John (by implication John Fust or Faust), then a workman in Koster's employ, stole his types and his secret, carried them to Mentz, and there introduced typography. Koster died soon after, leaving no known successor nor any school or process of printing that can be claimed as his. Dr. Van der Linde, in his *Haarlem Legend*, has proved the falsity of the Koster legend, but William Blades, in his *Pentateuch of Printing*, holds that even if the Koster legend be proved untrue, there is evidence of a petty but unsuccessful practice of typography in Holland before 1450. This evidence is indirect, inferential, and unsatisfactory. Other claimants for the honor of the invention are Albert Pfister, of Bamberg, Germany, an engraver on wood, whose first dated book is of the year 1461; Pamphilo Castaldi, of Feltre, Italy (to whom a statue was erected there in 1868), who is said to have taught Fust how to make types before 1454; John Mentel, of Strassburg, who is said to have been a printer as early as 1440; and Procope Valdfoghel, a goldsmith of Prague, who taught "artificial writing" by means of metal letters at Avignon, France, in 1444. The testimony in favor of these and of other claimants of minor importance has not withstood critical investigation. John Gutenberg is the only claimant who is known to have received honor as the true inventor during his lifetime. He did not put his name on any of his books; he did not personally make any claim to be the inventor; he did not clearly describe his invention. Most of our knowledge of him and his work is derived from legal documents and the testimony of friends, who meagerly and often inaccurately described his processes. The records of a suit at law in which judgment was recorded Dec. 12, 1439, show that he was then at variance with his copartners, Dritzehen, Riffe, and Heilmann. It appears from the written testimony that he had been engaged in the development of a secret process, from which all the partners hoped to get great profit at the fair of Aix-la-Chapelle to be held in 1440. Only one of the witnesses testified that the work was printing. It does not appear that Gutenberg was then successful as a printer, for there is no book that can be even plausibly claimed as the result of his work in Strassburg. The genuineness of this legal record has been challenged by Dr. Hessels, but it has been accepted as trustworthy by most bibliographers. Unfortunately, it was destroyed by the Prussian army in the siege of Strassburg in 1870. In 1448 Gutenberg was a resident of Mentz, with a printing-office in the house of his uncle. In 1455 he appears as defendant in a suit brought by John Fust or Faust for the recovery of 1,550 guilders, lent for the purpose of "making tools" for "vellum, paper, and ink," and for the "work on the books." Fust won the suit and took possession of the printed work and types of Gutenberg. This did not prevent Gutenberg from establishing a new printing-office, which he is supposed to have managed until his death in 1468. As Fust and his son-in-law, Peter Schoeffer, continued to print after 1455, and as there is some reason to believe that there was a third unknown and unnamed printing-house in Mentz before 1455, it is difficult to specify the books made by Gutenberg. The *Letters of Indulgence* of 1474, 1475, and 1476, and six small pamphlets have been attributed to him, on account of the similarity of their types with the types of his books, but the evidence is not sufficient. The *Bible* of 42 lines, usually bound in three volumes, folio, two columns to the page, published before 1456; the *Bible* of 36 lines, three volumes, folio, two columns to the page, of unknown date (certainly before 1460, and possibly before 1450); and the *Catholicon* of 1460, a Latin dictionary of 748 pages folio, two columns to the page, are the best specimens of the work reasonably accredited to his press—all of them unmistakable productions of a master. In 1465 Gutenberg was appointed by the elector as one of his courtiers, in recognition of his services. When he died the elector forbade his printing-office to be removed from

Mentz. Gutenberg's neglect to assert himself as the inventor of printing was incompletely remedied by his friends and successors, but it was generally admitted before the year 1500, by printers everywhere, in France, Germany, Italy, and the Netherlands, that Gutenberg was the inventor of typography. A tablet certifying his right as an inventor was put up soon after his death in the church at Mentz, and another in 1509 in a law school of that city. Statues have been erected to him in Mentz, Frankfurt, and Strassburg. The merit of Gutenberg's invention was largely in his superior method of making types by means of punch, matrix, and mould. When he began his experiments he found already in common use paper, printing-ink, engraving in relief, some form of printing-press, and the art of printing playing-cards and block-books. Possibly isolated types were then in use, but they could not be used to profit, because they were not scientifically made and sufficiently exact. That Gutenberg derived advantage from the successful experiments of earlier block-book printers is probable, but he must have added to the common stock of knowledge much more than he found. Gutenberg's method of type-making was the only key to the invention of practical typography. It was so considered by him when he speaks in the *Catholicon* of 1460 of the new art as dependent on "the admirable proportion, harmony, and connection of the punches and matrices." Fust and Schoeffer further say in the *Psalter* of 1457 that the book was made by the "masterly invention of printing and also of type-making." The printing-press is never mentioned by any early writer as an important factor in the development of the invention. Gutenberg's process of type-making has been improved in details, but its elementary principles have not been found susceptible of any improvement.

A few years after the sacking of Mentz (1462) the pupils and the workmen of Fust and Schoeffer were dispersed, the discovery was made public, and the art spread over Europe. From Mentz the art was transplanted to Rome in 1467 by Sweynheym and Pannartz; to Paris in 1469; to England in 1477; and to Spain in 1474. Hawkins, in his *Titles of the First Books* (New York, 1884), gives a chronological table of 236 places where the art was practiced during the fifteenth century, with the names of the printers when known, and of the first productions of their presses. Of the various editions of books published in the sixteenth century, one-half were Italian, of which one-half were Venetian; one-seventeenth were English.

Printing in America.—The date of the introduction of printing into America is uncertain, but from the record of three early Spanish authorities it is believed that the art was introduced into Mexico by Viceroy Antonio de Mendoza, who arrived in that country in Oct., 1535. The first printer's name was Juan Pablos, and the first work printed the *Escala espiritual para llegar al Cielo* of San Juan Climaco, a translation from the Latin into Castilian by the printer himself. No copy of the work exists. The first book with date establishes the fact that a press was working in the city of Mexico in 1540. It is called *Manual de Adultos*, dated Dec. 13, 1540, a quarto in Gothic letter, printed by Juan Cromberger, whose imprint is also on several other books printed from 1540 to 1544. This Cromberger was a celebrated printer of Seville, and books bearing his imprint at this place also appeared both before and after the dates of the Mexican works. It is suggested, to reconcile all the statements brought to light, that Juan Pablos may have been at Seville in the employ of Cromberger, who was charged by Mendoza with the establishment of a printing-press in the city of Mexico, and who sent Juan Pablos over to conduct the business in the name and for the benefit of his master; that after Cromberger's death Pablos became the owner of the establishment, and was in this way, although not the first owner of a printing-press, entitled to the honor of calling himself the first printer of Mexico. The next press established in the New World was at Lima, Peru, about 1584, the earliest known book printed there being the *Doctrina Christiana*, a quarto in the Quichua and Aymara languages, printed by Antonio Ricardo in 1584. Several other religious works by the same printer in 1585 and 1586 are in existence. Between 1540 and 1600 there is recorded the issue of ninety-three works in the city of Mexico and seven in Lima. In 1639 the first press in North America was erected at Cambridge, Mass., in the house of the president of Harvard College, Rev. Henry Dunster, through the efforts of Rev. Joseph Glover, who died while bringing the press and materials to this place. It was

placed under the direction of Stephen Daye, by whom the first work issued was *The Freeman's Oath*, followed by *An Almanack* in the same year. Daye was succeeded about 1649 by Samuel Green, under whom, in 1660-63, was printed the celebrated Indian Bible of Eliot, and other of his works in the Indian language. This press is still active, and known as the "University Press." The next press was established in Boston in 1676, after which printing gradually extended throughout the colonies. In 1775 the whole number of printing-houses in the British colonies was fifty.

Early Printed Books.—It is interesting to note the peculiarities of the first printed works. An edition consisted of a limited number, for 200 or 300 was then esteemed a large issue. The size was either large or small folio, sometimes quarto. The leaves were without running title, direction-word, folios, or paragraphs. The words were printed close together; abbreviations were numerous; the orthography was arbitrary; the sentences were distinguished only by the single or the double point, but subsequently the virgule / was used for the simple pause, answering to our comma. The initial letters at the beginning of a chapter or important division were left blank to be filled in by hand. In some works the embellishments surrounding the text were illuminated in colors, even gold and silver, and charged with saints, birds, flowers, etc. The printer's name, residence, etc., were either omitted or put at the end. The date was often omitted, sometimes obscurely indicated, or printed either at full length or by numerical letters, and sometimes in several ways together, as, "One Thousand cccc. and lxiii," etc., but always at the end. A variety of characters was uncommon; as a rule a Gothic letter of the same size was used through the work.

Type.—These are the letters or characters used in typography. A type is a thin metallic bar, like Fig. 1, which represents the letter M, and has the following characteristics: *c* is the face; *f*, the body; *g*, the nick; *a* to *b*, the width or set; *b* to *d* the height of the printed character; *c* to *e*, the height to paper; *d*, the shoulder; from *d* to the face is called the beard; *h*, the groove left in dressing by cutting off the superfluous metal left by the mould, which leaves two parts for the bottom of the type, called the feet; the thicker stroke of a letter is called the stem or body-mark; the fine lines at the top and the bottom of a letter are the serifs; a projection over the body, as the top and the bottom of *f*, is a kern. Types are made of type-metal, a composition of which the principal ingredient is lead. The type-founders of the present day use alloys which are generally trade-secrets. The alloy most approved is composed of certain proportions of lead, antimony, tin, and copper, so that the metal shall be hard, yet not brittle; ductile, yet tough; flowing freely, yet hardening quickly. This composition on solidifying contracts but very slightly and insures the sharpness of the lines of the face; the antimony gives hardness, the tin toughness, and the copper tenacity. Different sizes of type are made of varying qualities of metal, designated ordinary metal, hard metal, and extra-hard metal. Comparatively soft metal is used for spaces and large type, while small type is composed of hard metal. Type is made more durable by a process which deposits a thin film of copper over the face. Roman and Italic type are most commonly employed in printing books in Europe and America, and these have undergone every change in form that taste or fancy could suggest, as may be noticed in the multitude of sizes, shades, and ornamentation exhibited in the display-lines of books, papers, circulars, and posters.

Wood Type.—The large letters used in handbills and posters are made of wood, usually maple or bay mahogany, which is prepared as for wood-engraving. By the old method the outline of the character was first carefully cut upon the face of the block, and this was afterward put under a revolving drill, which cut away the superfluous wood, when it was finished by an engraver. William Leavenworth, of Allentown, N. J., in 1834 applied the pantograph to the cutting of wood type. In this a tracing-point at one end follows the outline of a large model letter, and is repeated at the other end by a revolving cutter, which cuts the letter from a block of wood, after which it is dressed with a graver.

Sizes of Type.—The various sizes of type have grown gradually into use, as the requirements of books and newspapers have dictated, or the pride of punch-cutters has accomplished. The names given to them are arbitrary and

unmeaning. The following are the old names of the sizes most used in books and newspapers: 1. Brilliant; 2. Diamond; 3. Pearl; 4. Agate or ruby; 5. Nonpareil; 6. Minion; 7. Brevier; 8. Bourgeois; 9. Long primer; 10. Small pica; 11. Pica; 12. English; 13. Great primer.

The following is a specimen of the sizes of type up to great primer, the numbers corresponding to the numbers and names above.

- 1.—abcdefghijklmnopqrstuvwxyz
- 2.—abcdefghijklmnopqrstuvwxyz
- 3.—abcdefghijklmnopqrstuvwxyz
- 4.—abcdefghijklmnopqrstuvwxyz
- 5.—abcdefghijklmnopqrstuvwxyz
- 6.—abcdefghijklmnopqrstuvwxyz
- 7.—abcdefghijklmnopqrstuvwxyz
- 8.—abcdefghijklmnopqrstuvwxyz
- 9.—abcdefghijklmnopqrstuvwxyz
- 10.—abcdefghijklmnopqrstuvwxyz
- 11.—abcdefghijklmnopqrstuvwxyz
- 12.—abcdefghijklmnopqrstuvwxyz
- 13.—abcdefghijklmnopqrstuvwxyz

These alphabets show clearly the difference in the height of face and the thickness of the letters of the various fonts. Larger sizes, with a few exceptions, are named according to the number of pica lines in depth, as four-line pica, five-line pica, etc. Between nonpareil and minion there is a size in Great Britain known as emerald. Newspapers use minion, nonpareil, and agate extensively. Diamond is seldom used for entire works. The Oxford University Press issued in 1875 the "smallest Bible in the world," in English, printed on India paper, from diamond type; it contained 984 pages, each 72 lines long, including the head, and 37 ems wide. The bound volume is 2½ inches wide, 4½ inches long, and half an inch thick. The American Bible Society issued in 1857 a diamond Bible, containing 882 pages, each 72 lines long, and 41 ems wide, which has the usual thin paper and leather binding. If presented in the English dress, it would be about a quarter inch wider and longer, but 100 pages thinner. Brilliant is rarely employed, except for references or side-notes to Bibles, etc. Small as this type is, a type-cutter of Berlin has formed a type so minute as to be scarcely readable without a good magnifying-glass. More surprising still, as early as 1828 Henri Didot, of Paris, had cut characters of almost microscopic fineness, 25 lines to the English inch, with which he printed an elegant edition of Horace in 64mo.

The names here given to types are those of the old system, which is steadily falling into disuse in Europe and America. The U. S. Type Founders' Association in 1886 changed the names and dimensions of all bodies, as is shown in the following table:

New name.	Fraction of an inch.	Old name.
3-point	0 0415	Excelsior.
3½ "	0 0484	
4 "	0 0553	Brilliant.
4½ "	0 0622	Diamond.
5 "	0 0692	Pearl.
5½ "	0 0761	Agate.
6 "	0 083	Nonpareil.
7 "	0 0968	Minion.
8 "	0 1107	Brevier.
9 "	0 1245	Bourgeois.
10 "	0 1383	Long primer.
11 "	0 1522	Small pica.
12 "	0 166	Pica.

These numerical names define the size of each body and its relation to all other bodies. The French system of points, from which the American system was copied, has its point of larger size—0.376 + cm., which is too large for the nicer subdivisions of bodies made by type-founders in the U. S. Eleven points French are nearly as large as twelve points American. The French system has been adopted in Germany, Spain, Belgium, Switzerland, and Italy.

Height, Measurement, and Standard.—The height to paper, or the distance from the face to the feet of type, varies in the type made by the foundries of Europe and America. The standard English height is .9166 inch; the U. S. new

standard is .9133 inch; the French standard is higher; the Russian standard is more than 1 inch. There is no generally accepted standard of width for the alphabet of twenty-six letters, which must vary with the fashion of the face and the size of the body. As types decrease in size below bourgeois they must be made of steadily increasing width. Different fonts will vary from twelve ems to sixteen ems to the alphabet. Book-compositors require fonts from pica to bourgeois to measure not less than thirteen ems, and below bourgeois not less than fourteen ems; for smaller sizes a greater width is exacted. For very thin types that fall below the standard extra compensation is allowed. The earliest exact standard is the French, in general use on the Continent, which divides pica, one-sixth of an inch deep, into twelve parts, called points, and conforms each size to a certain number of these points. The standards vary in Great Britain and the U. S., though generally, a pica being about one-sixth of an inch, two nonpareils are equal to one pica, two pearls to one long primer, two diamonds to one bourgeois. The following table will give an idea of the proportions of types to space, etc., taking Bruce's standard of length, in which 201.58 lines of diamond are contained in a foot, and every size is made 12.2462 per cent. smaller than the size following it:

SIZE	Lines in a foot	Lines in a point	Square inches in 1,000 ems
Pearl	179.59	800	4.55
Agate	169	660	5.29
Nonpareil	142.54	520	6.34
Minion	129.39	460	10.00
Brevier	113.13	390	12.60
Bourgeois	100.79	270	13.86
Long primer	89.79	200	18.30
Small pica	80	160	21.16
Pica	71.37	130	25.72

Types made by the point system will show slight variations from the figures of this table.

One pound of composed type occupies 3.5 sq. inches. For the various processes in making type, see TYPE-FOUNDING.

Fonts.—A complete assortment of type of any one face or size is called a *font* or *fount*, which may be varied to any extent. Type-founders have a scheme for the proportional quantity of every letter required for a font, and a peculiar scale is necessary for every language. In Great Britain founders select a scale having 3,000 of the small letter *m* for its basis. In the U. S. the founders adopt nearly the same scheme by weight, and proportion all fonts, large or small, accordingly, a font of 500 lb. containing 20 lb. 8 oz. of *a* and 28 lb. 4 oz. of *e*. The following table shows the relative proportion of every character required in a font of 800 lb. of pica for ordinary work in the English language:

A FONT OF PLCA, WEIGHING 800 LB.

Small letters	P, etc.	Capitals.	Small capitals.
a	800	A	300
b	1,000	B	200
c	3,000	C	250
d	4,000	D	250
e	12,000	E	300
f	2,500	F	200
g	1,500	G	200
h	6,400	H	200
i	8,000	I	100
j	400	J	150
k	800	K	150
l	4,000	L	250
m	3,000	M	200
n	8,000	N	200
o	8,000	O	200
p	1,700	P	200
q	500	Q	90
r	6,200	R	200
s	8,000	S	250
t	9,000	T	325
u	3,400	U	150
v	1,200	V	150
w	2,000	W	200
x	400	X	90
y	2,000	Y	150
z	200	Z	40
&	200	E	20
ff	400	CE	15
ff	500		
ff	200		
ff	150		
ff	100		
ff	100		
ff	60		
ff	150		
ff	50		
ff	60		

This is the proportion for Roman letters, etc. An Italic font to accompany this would be in the proportion of one-tenth of the Roman, not including spaces and small capitals. To give an idea of the number of pages this will set, suppose the page of pica type to be 8 $\frac{1}{2}$ inches long by 5 $\frac{1}{2}$ inches wide, or 53 lines long by 35 lines or ems wide. This will give 1,855 ems in a page; there being 130 ems in a pound, this will make the page weigh nearly 14 $\frac{1}{2}$ lb., which, divided into 800 lb., gives about 56 pages. This calculation shows only how many pages could be set if every character were used, but copy always exhausts the characters unequally. Fonts of book-type vary from 50 lb. to 20,000 lb.

Arrangement of the Type in Cases.—The type when received from the founder are arranged in a case containing

* 1	† 2	‡ 3	§ 4	¶ 5	• 6	◊ 7	◊ 8	◊ 9	◊ 10	◊ 11	◊ 12	◊ 13	◊ 14	◊ 15	◊ 16	◊ 17	◊ 18	◊ 19	◊ 20	◊ 21	◊ 22	◊ 23	◊ 24	◊ 25	◊ 26	◊ 27	◊ 28	◊ 29	◊ 30	◊ 31	◊ 32	◊ 33	◊ 34	◊ 35	◊ 36	◊ 37	◊ 38	◊ 39	◊ 40	◊ 41	◊ 42	◊ 43	◊ 44	◊ 45	◊ 46	◊ 47	◊ 48	◊ 49	◊ 50	◊ 51	◊ 52	◊ 53	◊ 54	◊ 55	◊ 56	◊ 57	◊ 58	◊ 59	◊ 60	◊ 61	◊ 62	◊ 63	◊ 64	◊ 65	◊ 66	◊ 67	◊ 68	◊ 69	◊ 70	◊ 71	◊ 72	◊ 73	◊ 74	◊ 75	◊ 76	◊ 77	◊ 78	◊ 79	◊ 80	◊ 81	◊ 82	◊ 83	◊ 84	◊ 85	◊ 86	◊ 87	◊ 88	◊ 89	◊ 90	◊ 91	◊ 92	◊ 93	◊ 94	◊ 95	◊ 96	◊ 97	◊ 98	◊ 99	◊ 100	◊ 101	◊ 102	◊ 103	◊ 104	◊ 105	◊ 106	◊ 107	◊ 108	◊ 109	◊ 110	◊ 111	◊ 112	◊ 113	◊ 114	◊ 115	◊ 116	◊ 117	◊ 118	◊ 119	◊ 120	◊ 121	◊ 122	◊ 123	◊ 124	◊ 125	◊ 126	◊ 127	◊ 128	◊ 129	◊ 130	◊ 131	◊ 132	◊ 133	◊ 134	◊ 135	◊ 136	◊ 137	◊ 138	◊ 139	◊ 140	◊ 141	◊ 142	◊ 143	◊ 144	◊ 145	◊ 146	◊ 147	◊ 148	◊ 149	◊ 150	◊ 151	◊ 152	◊ 153	◊ 154	◊ 155	◊ 156	◊ 157	◊ 158	◊ 159	◊ 160	◊ 161	◊ 162	◊ 163	◊ 164	◊ 165	◊ 166	◊ 167	◊ 168	◊ 169	◊ 170	◊ 171	◊ 172	◊ 173	◊ 174	◊ 175	◊ 176	◊ 177	◊ 178	◊ 179	◊ 180	◊ 181	◊ 182	◊ 183	◊ 184	◊ 185	◊ 186	◊ 187	◊ 188	◊ 189	◊ 190	◊ 191	◊ 192	◊ 193	◊ 194	◊ 195	◊ 196	◊ 197	◊ 198	◊ 199	◊ 200	◊ 201	◊ 202	◊ 203	◊ 204	◊ 205	◊ 206	◊ 207	◊ 208	◊ 209	◊ 210	◊ 211	◊ 212	◊ 213	◊ 214	◊ 215	◊ 216	◊ 217	◊ 218	◊ 219	◊ 220	◊ 221	◊ 222	◊ 223	◊ 224	◊ 225	◊ 226	◊ 227	◊ 228	◊ 229	◊ 230	◊ 231	◊ 232	◊ 233	◊ 234	◊ 235	◊ 236	◊ 237	◊ 238	◊ 239	◊ 240	◊ 241	◊ 242	◊ 243	◊ 244	◊ 245	◊ 246	◊ 247	◊ 248	◊ 249	◊ 250	◊ 251	◊ 252	◊ 253	◊ 254	◊ 255	◊ 256	◊ 257	◊ 258	◊ 259	◊ 260	◊ 261	◊ 262	◊ 263	◊ 264	◊ 265	◊ 266	◊ 267	◊ 268	◊ 269	◊ 270	◊ 271	◊ 272	◊ 273	◊ 274	◊ 275	◊ 276	◊ 277	◊ 278	◊ 279	◊ 280	◊ 281	◊ 282	◊ 283	◊ 284	◊ 285	◊ 286	◊ 287	◊ 288	◊ 289	◊ 290	◊ 291	◊ 292	◊ 293	◊ 294	◊ 295	◊ 296	◊ 297	◊ 298	◊ 299	◊ 300	◊ 301	◊ 302	◊ 303	◊ 304	◊ 305	◊ 306	◊ 307	◊ 308	◊ 309	◊ 310	◊ 311	◊ 312	◊ 313	◊ 314	◊ 315	◊ 316	◊ 317	◊ 318	◊ 319	◊ 320	◊ 321	◊ 322	◊ 323	◊ 324	◊ 325	◊ 326	◊ 327	◊ 328	◊ 329	◊ 330	◊ 331	◊ 332	◊ 333	◊ 334	◊ 335	◊ 336	◊ 337	◊ 338	◊ 339	◊ 340	◊ 341	◊ 342	◊ 343	◊ 344	◊ 345	◊ 346	◊ 347	◊ 348	◊ 349	◊ 350	◊ 351	◊ 352	◊ 353	◊ 354	◊ 355	◊ 356	◊ 357	◊ 358	◊ 359	◊ 360	◊ 361	◊ 362	◊ 363	◊ 364	◊ 365	◊ 366	◊ 367	◊ 368	◊ 369	◊ 370	◊ 371	◊ 372	◊ 373	◊ 374	◊ 375	◊ 376	◊ 377	◊ 378	◊ 379	◊ 380	◊ 381	◊ 382	◊ 383	◊ 384	◊ 385	◊ 386	◊ 387	◊ 388	◊ 389	◊ 390	◊ 391	◊ 392	◊ 393	◊ 394	◊ 395	◊ 396	◊ 397	◊ 398	◊ 399	◊ 400	◊ 401	◊ 402	◊ 403	◊ 404	◊ 405	◊ 406	◊ 407	◊ 408	◊ 409	◊ 410	◊ 411	◊ 412	◊ 413	◊ 414	◊ 415	◊ 416	◊ 417	◊ 418	◊ 419	◊ 420	◊ 421	◊ 422	◊ 423	◊ 424	◊ 425	◊ 426	◊ 427	◊ 428	◊ 429	◊ 430	◊ 431	◊ 432	◊ 433	◊ 434	◊ 435	◊ 436	◊ 437	◊ 438	◊ 439	◊ 440	◊ 441	◊ 442	◊ 443	◊ 444	◊ 445	◊ 446	◊ 447	◊ 448	◊ 449	◊ 450	◊ 451	◊ 452	◊ 453	◊ 454	◊ 455	◊ 456	◊ 457	◊ 458	◊ 459	◊ 460	◊ 461	◊ 462	◊ 463	◊ 464	◊ 465	◊ 466	◊ 467	◊ 468	◊ 469	◊ 470	◊ 471	◊ 472	◊ 473	◊ 474	◊ 475	◊ 476	◊ 477	◊ 478	◊ 479	◊ 480	◊ 481	◊ 482	◊ 483	◊ 484	◊ 485	◊ 486	◊ 487	◊ 488	◊ 489	◊ 490	◊ 491	◊ 492	◊ 493	◊ 494	◊ 495	◊ 496	◊ 497	◊ 498	◊ 499	◊ 500	◊ 501	◊ 502	◊ 503	◊ 504	◊ 505	◊ 506	◊ 507	◊ 508	◊ 509	◊ 510	◊ 511	◊ 512	◊ 513	◊ 514	◊ 515	◊ 516	◊ 517	◊ 518	◊ 519	◊ 520	◊ 521	◊ 522	◊ 523	◊ 524	◊ 525	◊ 526	◊ 527	◊ 528	◊ 529	◊ 530	◊ 531	◊ 532	◊ 533	◊ 534	◊ 535	◊ 536	◊ 537	◊ 538	◊ 539	◊ 540	◊ 541	◊ 542	◊ 543	◊ 544	◊ 545	◊ 546	◊ 547	◊ 548	◊ 549	◊ 550	◊ 551	◊ 552	◊ 553	◊ 554	◊ 555	◊ 556	◊ 557	◊ 558	◊ 559	◊ 560	◊ 561	◊ 562	◊ 563	◊ 564	◊ 565	◊ 566	◊ 567	◊ 568	◊ 569	◊ 570	◊ 571	◊ 572	◊ 573	◊ 574	◊ 575	◊ 576	◊ 577	◊ 578	◊ 579	◊ 580	◊ 581	◊ 582	◊ 583	◊ 584	◊ 585	◊ 586	◊ 587	◊ 588	◊ 589	◊ 590	◊ 591	◊ 592	◊ 593	◊ 594	◊ 595	◊ 596	◊ 597	◊ 598	◊ 599	◊ 600	◊ 601	◊ 602	◊ 603	◊ 604	◊ 605	◊ 606	◊ 607	◊ 608	◊ 609	◊ 610	◊ 611	◊ 612	◊ 613	◊ 614	◊ 615	◊ 616	◊ 617	◊ 618	◊ 619	◊ 620	◊ 621	◊ 622	◊ 623	◊ 624	◊ 625	◊ 626	◊ 627	◊ 628	◊ 629	◊ 630	◊ 631	◊ 632	◊ 633	◊ 634	◊ 635	◊ 636	◊ 637	◊ 638	◊ 639	◊ 640	◊ 641	◊ 642	◊ 643	◊ 644	◊ 645	◊ 646	◊ 647	◊ 648	◊ 649	◊ 650	◊ 651	◊ 652	◊ 653	◊ 654	◊ 655	◊ 656	◊ 657	◊ 658	◊ 659	◊ 660	◊ 661	◊ 662	◊ 663	◊ 664	◊ 665	◊ 666	◊ 667	◊ 668	◊ 669	◊ 670	◊ 671	◊ 672	◊ 673	◊ 674	◊ 675	◊ 676	◊ 677	◊ 678	◊ 679	◊ 680	◊ 681	◊ 682	◊ 683	◊ 684	◊ 685	◊ 686	◊ 687	◊ 688	◊ 689	◊ 690	◊ 691	◊ 692	◊ 693	◊ 694	◊ 695	◊ 696	◊ 697	◊ 698	◊ 699	◊ 700	◊ 701	◊ 702	◊ 703	◊ 704	◊ 705	◊ 706	◊ 707	◊ 708	◊ 709	◊ 710	◊ 711	◊ 712	◊ 713	◊ 714	◊ 715	◊ 716	◊ 717	◊ 718	◊ 719	◊ 720	◊ 721	◊ 722	◊ 723	◊ 724	◊ 725	◊ 726	◊ 727	◊ 728	◊ 729	◊ 730	◊ 731	◊ 732	◊ 733	◊ 734	◊ 735	◊ 736	◊ 737	◊ 738	◊ 739	◊ 740	◊ 741	◊ 742	◊ 743	◊ 744	◊ 745	◊ 746	◊ 747	◊ 748	◊ 749	◊ 750	◊ 751	◊ 752	◊ 753	◊ 754	◊ 755	◊ 756	◊ 757	◊ 758	◊ 759	◊ 760	◊ 761	◊ 762	◊ 763	◊ 764	◊ 765	◊ 766	◊ 767	◊ 768	◊ 769	◊ 770	◊ 771	◊ 772	◊ 773	◊ 774	◊ 775	◊ 776	◊ 777	◊ 778	◊ 779	◊ 780	◊ 781	◊ 782	◊ 783	◊ 784	◊ 785	◊ 786	◊ 787	◊ 788	◊ 789	◊ 790	◊ 791	◊ 792	◊ 793	◊ 794	◊ 795	◊ 796	◊ 797	◊ 798	◊ 799	◊ 800	◊ 801	◊ 802	◊ 803	◊ 804	◊ 805	◊ 806	◊ 807	◊ 808	◊ 809	◊ 810	◊ 811	◊ 812	◊ 813	◊ 814	◊ 815	◊ 816	◊ 817	◊ 818	◊ 819	◊ 820	◊ 821	◊ 822	◊ 823	◊ 824	◊ 825	◊ 826	◊ 827	◊ 828	◊ 829	◊ 830	◊ 831	◊ 832	◊ 833	◊ 834	◊ 835	◊ 836	◊ 837	◊ 838	◊ 839	◊ 840	◊ 841	◊ 842	◊ 843	◊ 844	◊ 845	◊ 846	◊ 847	◊ 848	◊ 849	◊ 850	◊ 851	◊ 852	◊ 853	◊ 854	◊ 855	◊ 856	◊ 857	◊ 858	◊ 859	◊ 860	◊ 861	◊ 862	◊ 863	◊ 864	◊ 865	◊ 866	◊ 867	◊ 868	◊ 869	◊ 870	◊ 871	◊ 872	◊ 873	◊ 874	◊ 875	◊ 876	◊ 877	◊ 878	◊ 879	◊ 880	◊ 881	◊ 882	◊ 883	◊ 884	◊ 885	◊ 886	◊ 887	◊ 888	◊ 889	◊ 890	◊ 891	◊ 892	◊ 893	◊ 894	◊ 895	◊ 896	◊ 897	◊ 898	◊ 899	◊ 900	◊ 901	◊ 902	◊ 903	◊ 904	◊ 905	◊ 906	◊ 907	◊ 908	◊ 909	◊ 910	◊ 911	◊ 912	◊ 913	◊ 914	◊ 915	◊ 916	◊ 917	◊ 918	◊ 919	◊ 920	◊ 921	◊ 922	◊ 923	◊ 924	◊ 925	◊ 926	◊ 927	◊ 928	◊ 929	◊ 930	◊ 931	◊ 932	◊ 933	◊ 934	◊ 935	◊ 936	◊ 937	◊ 938	◊ 939	◊ 940	◊ 941	◊ 942	◊ 943	◊ 944	◊ 945	◊ 946	◊ 947	◊ 948	◊ 949	◊ 950	◊ 951	◊ 952	◊ 953	◊ 954	◊ 955	◊ 956	◊ 957	◊ 958	◊ 959	◊ 960	◊ 961	◊ 962	◊ 963	◊ 964	◊ 965	◊ 966	◊ 967	◊ 968	◊ 969	◊ 970	◊ 971	◊ 972	◊ 973	◊ 974	◊ 975	◊ 976	◊ 977	◊ 978	◊ 979	◊ 980	◊ 981	◊ 982	◊ 983	◊ 984	◊ 985	◊ 986	◊ 987	◊ 988	◊ 989	◊ 990	◊ 991	◊ 992	◊ 993	◊ 994	◊ 995	◊ 996	◊ 997	◊ 998	◊ 999	◊ 1000	◊ 1001	◊ 1002	◊ 1003	◊ 1004	◊ 1005	◊ 1006	◊ 1007	◊ 1008	◊ 1009	◊ 1010	◊ 1011	◊ 1012	◊ 1013	◊ 1014	◊ 1015	◊ 1016	◊ 1017	◊ 1018	◊ 1019	◊ 1020	◊ 1021	◊ 1022	◊ 1023	◊ 1024	◊ 1025	◊ 1026	◊ 1027	◊ 1028	◊ 1029	◊ 1030	◊ 1031	◊ 1032	◊ 1033	◊ 1034	◊ 1035	◊ 1036	◊ 1037	◊ 1038	◊ 1039	◊ 1040	◊ 1041	◊ 1042	◊ 1043	◊ 1044	◊ 1045	◊ 1046	◊ 1047	◊ 1048	◊ 1049	◊ 1050	◊ 1051	◊ 1052	◊ 1053	◊ 1054	◊ 1055	◊ 1056	◊ 1057	◊ 1058	◊ 1059	◊ 1060	◊ 1061	◊ 1062	◊ 1063	◊ 1064	◊ 1065	◊ 1066	◊ 1067	◊ 1068	◊ 1069	◊ 1070	◊ 1071	◊ 1072	◊ 1073	◊ 1074	◊ 1075	◊ 1076	◊ 1077	◊ 1078	◊ 1079	◊ 1080	◊ 1081	◊ 1082	◊ 1083	◊ 1084	◊ 1085	◊ 1086	◊ 1087	◊ 1088	◊ 1089	◊ 1090	◊ 1091	◊ 1092	◊ 1093	◊ 1094	◊ 1095	◊ 1096	◊ 1097	◊ 1098	◊ 1099	◊ 1100	◊ 1101	◊ 1102	◊ 1103	◊ 1104	◊ 1105	◊ 1106	◊ 1107	◊ 1108	◊ 1109	◊ 1110	◊ 1111	◊ 1112	◊ 1113	◊ 1114	◊ 1115	◊ 1116	◊ 1117	◊ 1118	◊ 1119	◊ 1120	◊ 1121	◊ 1122	◊ 1123	◊ 1124	◊
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FIG. 2.—Upper case.

boxes of various sizes for the different characters. The lower case has remained nearly the same as it was 200 years ago. It is a tray of wood, about $1\frac{1}{2}$ inches deep, $32\frac{1}{2}$ inches long, and $16\frac{1}{2}$ inches wide. Cases go in pairs, the upper case (Fig. 2) containing 98 boxes for capitals, etc., and the lower case (Fig. 3) containing 54 boxes for small letters, figures, and

f	i	s m	m sp		k								
j	b	e	d	e	i	s	f	g	t	o			
:	l	m	n	h	o	y	p	w	en qd.	em qd.			
x	v	u	t	3m spaces.	a	r	:	:	2 and 4 m quadrats.				

FIG. 3—Lower case.

spaces. Fig. 2 shows the case adopted by the book-compositors of the U. S., having the capitals on the left side and the small capitals on the right. Newspaper compositors prefer the capitals on the right side and the small capitals on the left. The lower case is so arranged that the letters most frequently used are placed in large boxes toward the middle and in front of the compositor. These cases are placed on a frame or stand about the height of the breast, and in a sloping position from the top to the bottom of the case, the capital case on the upper part of the frame, whence called upper case, and the case containing the small letters on the lower part of the frame, hence called lower case. These cases contain only Roman letters. Italics and all other varieties are kept separately in similar cases. The spaces noticed in the cases are of different widths, so made to equalize the spacing. The *em* is a square space; *em*, 2 to an *em*; 3-*em*, 3 to an *em*; 4-*em*, 4 to an *em*; 5-*em*, 5 to an *em*; and hair-spaces, 6 to 13 to an *em*; 2- and 3-*em* quadrats are double or triple *ems*.

Composition or Typesetting.—The compositor in setting up type uses a small frame of steel, having three sides and a bottom, called the composing-stick (Fig. 4). It is usually from 6 to 12 inches long, 2 inches wide, and $\frac{5}{8}$ inch deep, and will hold about 20 lines of minion.




FIG. 4. Composing stick.



FIG. 4. Composing steps.

Larger sizes are occasionally used for wide measures. Two sides are immovable, the third side being movable to be adjusted to the width of the page, and then clasped, as in the Grover patent (Fig. 4), or secured with a screw. A setting-rule, type high, and of the required measure, is also used with the stick; it is made of a strip of steel or brass, having a short pointed projection at the top of the right end or on both

of the duodecimo, Fig. 6, will illustrate the principle, the folio at one end of the page representing the head.

The pages are adjusted to the required distance apart according to the size of the paper, an iron "chase" or frame is placed around them, and wood or metal furniture, half an inch high, of various thicknesses, is placed, some at the head of the pages, called "head-sticks," some between the pages,

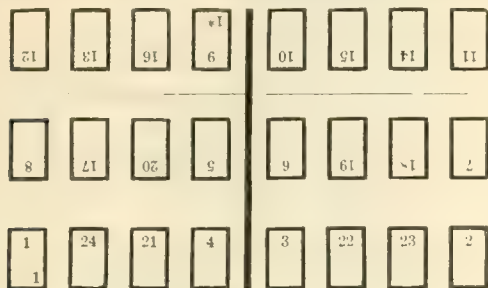


FIG. 6. —Imposition of the duodecimo.

called "gutters," and others at the sides and feet, called "side" and "foot sticks." The latter are larger at one end than the other, so that small wedges of wood or metal, called "quoins," may be driven tightly between them and the sides of the chase, locking the type firmly, making it like a solid piece, which may be lifted and placed on the press. The general practice up to recent date was to place the pages which would appear on the outside of a sheet in a single chase, and the inside pages in another chase, requiring every sheet to be printed from two forms for one copy. All the pages of a single sheet are now usually placed in one chase, and the paper turned over on the press, making two copies at two impressions. The chase is crossed by two iron bars, represented by the long lines across Fig. 5 and Fig. 6, which support and keep the chase from springing.

Signatures.—The signature is a figure or a letter of the alphabet placed at the foot of the first page of every form, or a section or sub-section of a form, to denote the order of the sheets, and serves as a guide to the binder. In an edition of *Terence*, printed by Antonio Zarot at Milan in 1470, signatures were used, and it is the first printed book known to have them. Catch-words were once extensively used, placed at the foot of the page, to show the connecting word on the next page, and are said to have been first used by Vindelius de Spira in Venice; but the Assyrians used catch-words. The English generally use for signatures the alphabetical letters, omitting J, V, W, which were not used in the Gothic letters of the early printers; and if the sheets extend beyond Z, the letters are doubled or preceded by a figure. The practice in the U. S., and in most European nations, is to use figures, a section to be inset being distinguished by a star after the signature figure. The star shows that that part of the sheet is cut off and placed inside the first part when folded. This is the simplest and readiest for the binder.

Sizes of Books.—The descriptive names of the sizes of books refer to the size of the leaves, and originated from the number of leaves into which a sheet of paper was folded after printing. The facility of paper manufacture has placed within the reach of printers any size of sheet, so that the size of the page of a book now depends only on the wish of the publisher. The book when bound is termed according to the nearest size of the regular sheets.

SIZE OF BOOK.	Pages in a sheet	Size of leaf, on transverse, inches.
Royal 4to.	8	11 x 14
Medium 4to.	8	9 x 12
Imperial 8vo.	16	8 x 11½
Super royal 8vo.	16	7 x 10½
Medium 8vo.	16	6 x 9
Crown 8vo.	16	5 x 8
Medium 12mo.	24	5½ x 7½
" 16mo.	32	4 x 6½
" 18mo.	36	4 x 6
" 24mo.	48	3½ x 5½
" 32mo.	64	3 x 4½

The size of paper called medium, 19 by 24 inches, is the standard by which all sizes of books, not otherwise specifically described, are classified; and quarto, octavo, duodecimo, etc., mean that the leaves of books of these sizes are nearly the fourth, eighth, twelfth, etc., of the medium sheet.

Printing-ink is a mechanical mixture of prepared oil and smoke-black or other coloring-matter. News ink has more of oil, and book ink more of black. When properly made it "distributes" or freely spreads out in a very thin film on the inking rollers and the types, is readily transferred to paper by impression, and adheres to it when dry without smearing or fading.

Printing-rollers.—In the early days of printing the ink was applied to the type by large leather-coated balls. Each ball was fitted to a handle of wood. The interior of the ball was stuffed with wool or hair to make it elastic. One of these the pressman took in each hand, and, applying them to the ink-table, daubed and knocked them together to distribute the ink equally, and then blacked the form by beating the balls upon the face of the type. Rollers wound with cloth and covered with soft leather were next introduced, but to B. Forster, of England, is due the invention (about 1820) of the present roller. These rollers consist of a composition of glue and molasses, boiled together, and moulded upon a cylinder of wood encasing an iron rod, which works in a handle or in a proper frame for large presses. This cylindrical inking roller is rolled over the type, and applies the ink in a quick and even manner. Other compositions have been tried for rollers, but this was preferred for many years on account of its peculiar softness, even retention of the ink, and cheapness. The composition now most approved for its greater durability is a combination of glue, glycerin, and sugar.

Paper.—The paper used in newspaper-printing is always dampened before use, as wet paper takes the ink better than dry, and is now generally wet by a wetting-press. Paper is usually supplied by the ream of 20 quires of 24 sheets, or 480 sheets per ream. For the perfecting press paper is supplied from 3 to 5 miles long, a single web containing from 5,000 to 10,000 sheets. After printing, for book-work the sheets are hung up to dry, placed between sheets of thin smooth mill-board, placed in an hydraulic press, and subjected to great pressure, which smooths and restores the brilliant appearance of the paper. The sheets are afterward forwarded by the binder. See BOOKBINDING.

BIBLIOGRAPHY.—The bibliography of printing is voluminous; but a few of the prominent treatises are mentioned below. The origin of typography has been treated by Dr. A. Van der Linde in *The Haarlem Legend* (translated by J. H. Hessels, London, 1871) and in *Gutenberg* (Stuttgart, 1878); by J. H. Hessels in *Gutenberg* (London, 1882); A. F. Didot, *Essai sur la Typographie* (Paris, 1851); A. Bernard, *De l'origine et des débuts de l'imprimerie en Europe* (2 vols., Paris, 1853); Karl Faulman, *Geschichte der Buchdruckerkunst* (Leipzig, 1882); T. L. De Vinne, *The Invention of Printing* (New York, 1878). The development of typography among English-speaking peoples has been treated of by Ames in his *Typographical Antiquities* of various editions, of which Herbert's is best; C. H. Timperley, *Dictionary of Printers and Printing* (London, 1839); W. Blades, *William Caxton* (London, 1861-63); Talbot B. Reed, *Old English Letter Foundries* (London, 1887); Isaiah Thomas, *History of Printing in America* (2 vols., Worcester, 1810). The practice of typography has been explained by T. C. Hansard, *Typographia* (London, 1825); Ringwalt, *Encyclopædia of Printing* (Philadelphia, 1871); A. Marahrens, *Handbuch der Typographie* (Leipzig, 1870); T. Lefèvre, *Guide Pratique du Compositeur* (Paris, 1855); and *The Dictionary of Printing and Bookmaking* (New York, 1893). Good facsimile plates of early books have been published by Sotheby, *Principia Typographica* (3 vols., London, 1858); J. W. Holtrop, *Monuments Typographiques* (The Hague, 1868); Weigel and Zosteremann, *Die Anfänge der Druckerkunst in Bild und Schrift* (2 vols., Leipzig, 1866). Bigmore and Wymans's *Bibliography of Printing* (3 vols., London, 1880) is a useful catalogue of all the authorities.

Revised by THEODORE L. DE VINNE.

Printing-presses: machines for taking impressions from an inked surface upon paper, used for books, newspapers, handbills, etc.

The Earliest Form.—Gutenberg's printing-press consisted of two upright timbers with crosspieces of wood to stay them together at the top and bottom, and two intermediate cross-timbers. On one of these the type was supported, and through the other a wooden screw passed, its lower point resting on the center of a wooden "platen," which was thus screwed down upon the type after it had been inked and the paper spread over it. The mechanical principle embodied

in this machine is found in the old cheese and linen presses.

This simple form of press continued in use for about 150 years, or until the early part of the seventeenth century, without any material change. The forms of type were placed upon wood or stone beds, incased in frames called "coffins," moved in and out laboriously by hand, and after each impression the platen had to be screwed up with the bar, so that the paper which had been printed might be removed and hung up to dry.

Blaeuw's Press.—The first recorded improvements in this press were made by William Janson Blaeuw, a printer of Amsterdam, about 1620.

He passed the spindle of the screw through a square block which was guided in the wooden frame, and suspended the platen from this block. He also placed a device upon the press for rolling the bed in and out, and added a new form of iron hand-lever for turning the screw. Blaeuw's press was introduced into England, and used there as well as on the Continent, being substantially the same as that Benjamin Franklin worked upon when in London in 1725.

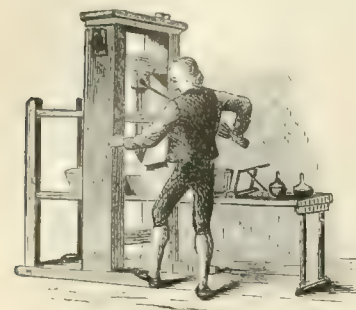


FIG 1.—The Franklin screw-lever press.

Intially the same as that Benjamin Franklin worked upon when in London in 1725.

Introduction of Iron Printing-presses.—Little further improvement was made in the printing-press before the year 1798, when the Earl of Stanhope caused one to be made, the frame of which, instead of being of wood, was one piece of cast iron. A necessity had arisen for greater power in giving the impression, especially in the printing of wood-cuts, and the tendency was naturally toward larger forms of type, requiring greater exertion on the part of the printer. The Earl of Stanhope retained the screw, but added a combination of levers to assist the pressman in gaining greater power with less expenditure of energy. These machines, although very heavy and cumbersome, came into use to some extent.

The next practical improvement was made by George Clymer, of Philadelphia, who, about 1816, devised an iron machine, entirely dispensing with the screw. A long, heavy cast-iron lever was placed over the platen, one end attached to one of the uprights of the cast-iron frame and the other capable of being raised and lowered by a combination of smaller levers, worked by the pressman after the manner of the ordinary hand-press. The impression was given and the platen raised and lowered by a spindle or pin attached to the center of the large cross lever at the top. Clymer carried his invention to England, where it was introduced to some extent, and was known as the Columbian press. In England Rutheven, Brown, and others made iron hand-presses, all improving upon the Stanhope. In 1822 Peter Smith devised a machine with a cast-iron frame, in which a toggle-joint, at once simple and effective, took the place of the screw with levers.

The Washington Press.—In 1827 Samuel Rust, of New York, perfected an invention which was a great improvement on the Smith press. The frame, instead of being all of cast iron, had the uprights at the sides hollowed for the admission of wrought-iron bars, which were securely riveted at the top and bottom of the casting. This gave not only additional strength, but greatly diminished the amount of metal used in the construction. The toggle motion was also a great improvement over that in the Smith press. This patent was purchased by R. Hoe & Co., who improved upon it. The new invention was known as the Washington press, and in principle and construction has never been surpassed by any hand printing-machine.

The bed slides on a track and is run in and out from under the platen by turning a crank which has belts attached to a pulley upon its shaft. The impression of the platen is given by means of a bent lever acting on a toggle-joint, and the platen is lifted by springs on either side. Attached to the bed is a tympan-frame covered with cloth, and standing inclined to receive the sheet to be printed. Another frame, called the frisket, is attached to the tympan, and

covered with a sheet of paper, having the parts that would be printed upon cut away, so as to prevent the chase and furniture from blacking or soiling the sheet. The frisket

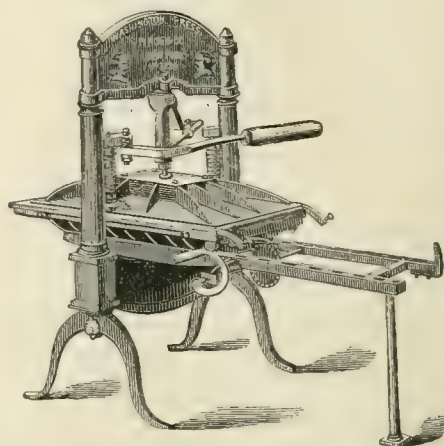


FIG. 2.—The Washington hand-press.

is turned down over the sheet and tympan and all are folded down when the impression is taken. Automatic inking-rollers were attached to this machine.

The bed-and-platen system of printing was up to the middle of the nineteenth century the favorite method for fine books and illustrations, and it is still used to a great extent. The first "power" or steam press upon this principle was made by Daniel Treadwell, of Boston, in 1822. The frames were of wood, but probably only three or four were ever constructed. The best press of this description is that devised and patented by Isaac Adams, of Boston, in 1830 and 1836,

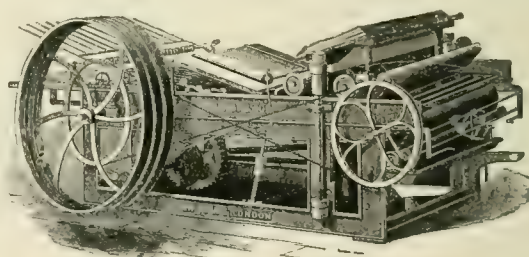


FIG. 3.—The Adams bed-and-platen press.

and by Otis Tufts, of the same place, in 1834. This was first made with a wooden and afterward with an iron frame. In 1858 Adams's business became the property of Hoe & Co., who continued to manufacture these presses, with added improvements. In these machines the type is placed upon an iron bed, after the usual manner of the hand-press, and this bed is raised and lowered by straightening a toggle-joint by means of cams, thus giving the impression upon the iron platen fixed above it, and firmly held in position by upright iron rods secured to the foundation of the machine. The ink-fountain is at one end of the press; the inking-rollers travel twice over the form, in a movable frisket-frame, while the bed is down; the paper is taken in by grippers on the frisket and carried over the form, when the bed rises and the impression is given; finally, the sheets pass forward from the frisket by tapes to a sheet-flier, which delivers them on the fly-board. One thousand sheets per hour is the maximum speed of the larger sizes of the Adams press.

Job-presses.—Many different kinds of small presses on the bed-and-platen principle are made; a typical one is the Gordon, illustrated on the next page. This can print over 1,000 cards or small sheets per hour. Special presses are also made for printing cards or tickets and numbering or lettering them consecutively.

Cylinder Presses.—The method of printing from plates or forms carried upon a flat bed backward and forward beneath a cylinder had been employed in a rude form by printers of copperplate engravings in the fifteenth century. With the re-introduction of this system began an entirely new era in the history of the printing-press. It should be understood,

however, that the vast number of patents granted for printing-machines in which the cylinder is connected with the bed, or by the operation of two cylinders together, one holding the form and the other giving the impression, are almost all

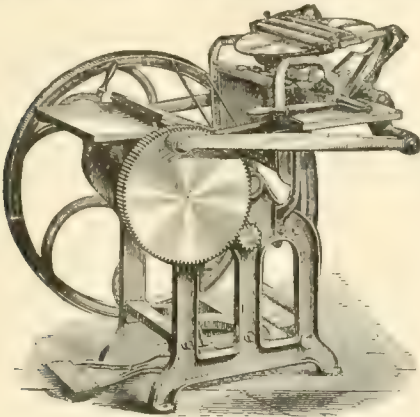


FIG. 4 The Gordon press.

for improvements and devices of detail, the radical principles upon which they are founded remaining the same. There will be here described only those presses which have been in use as practical improvements.

The Flat-bed Cylinder Press.—The credit of actually introducing into use a flat-bed cylinder press is due to a Saxon named Friederich Koenig, who visited England in 1806, and through the assistance of Thomas Bensley, a printer in London, devised a machine which in 1812–13 was used by him, and printed, among other publications, a part of Clarkson's *Life of William Penn*. Koenig was assisted also by a mechanic named Andrew Bauer, a fellow countryman. The form of type was placed on a flat bed, the cylinder above it having a threefold motion, or stopping three times, the first third of the turn receiving the sheet upon one of the tympan and securing it by the frisket; the second giving the impression, and allowing the sheet to be removed by hand; and the third returning the tympan empty to receive another sheet. He also devised what has proved, even to this day, to be the best mechanism for producing reciprocating motion of the type-bed. This consists of a pinion carried on the inner end of a long shaft which is turned by gearing from the side of the press-frame, and has in its length a universal joint, allowing an up-and-down motion of the pinion. Underneath the bed and fastened to it is a "rack," or double row of teeth set back to back, with a crescent-shaped segment of hard metal at each end. The shaft being set in motion revolves the pinion, which moves the bed by engaging the teeth in this rack. On reaching the end of the rack, the pinion turns around over a pin or stud against the segment at the end of the rack, and immediately re-engages its teeth in the opposite side, so carrying the bed back again. This motion is repeated at the opposite end of the rack, and the bed again stopped and returned.

The Continuously Revolving Cylinder Press.—In 1814 Koenig patented a continuously revolving cylinder press. The part of the periphery of the cylinder not used for giving the impression is slightly reduced in diameter, so as to allow the form to return under it freely after giving an impression. He showed designs adapting it for use as a single-cylinder press, and also as a two-cylinder press, both for printing one side of the paper at a time; likewise a two-cylinder press for printing both sides of the paper at one operation. In this latter press the two forms were placed one at each end of a long bed, and the paper after being printed on one side by one cylinder was carried by tapes over a registering roller to the other cylinder, where it was printed upon the opposite side. This press, termed a "perfecting" press, was afterward improved by Applegath and Cowper, so as to be considered at the time a very efficient machine.

Koenig erected in the office of the London *Times* in 1814 two of the two-cylinder presses mentioned above, which printed on one side of the paper only, at the rate of 800 sheets per hour. He was not alone in his efforts to perfect a cylinder press. Various patents were gotten out by Bacon and Donkin in 1813; by Cowper in 1816, and again in 1818; and by Applegath in 1818.

Napier's Improvements.—The most ingenious and practical device in connection with the movements of a flat bed and a cylinder for printing-machines was patented by Napier in 1828 and 1830. He was the first who introduced "grippers" or "fingers" for the conveyance of the sheets around the cylinder during the impression, and for delivering them after printing. Tapes or strings had previously been used. He was also the first to construct presses in which the impression-cylinders are of small size, and make two or more revolutions to each sheet printed; and he devised the toggles for bringing the cylinders down to print on the form and then raising them to let the form run back without touching.

The Single Large Cylinder Press.—About 1832 Robert Hoe made the first cylinder press ever used in the U. S. It was the pattern known as the single large cylinder, the cylinder making one revolution for each impression in print-

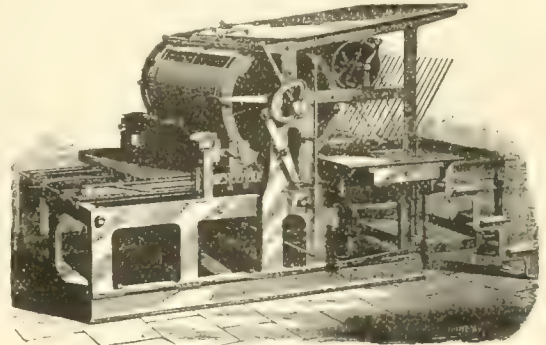


FIG. 5.—The single large cylinder press

ing, and never stopping. Only a portion of the cylinder was employed to take the impression, the remainder of its circumference being turned down small enough to allow the type on the bed to pass back under it without touching. Similar presses were made later by other manufacturers, and this form of press is still in use, with patented automatic sheet-fliers, and other improvements.

The Stop Cylinder Press.—The press upon which the finest letterpress and wood-cut work is turned off is known as the Stop Cylinder. This was devised and patented by a Frenchman named Dutartre in 1852, and was later introduced into the U. S., and improved in many respects. The type is secured upon an iron bed, which moves back and forth upon friction-rollers of steel by a simple crank motion,

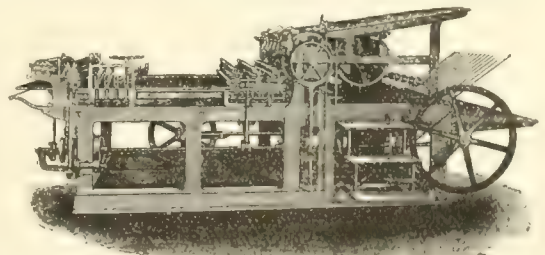


FIG. 6. The stop cylinder press

stopping and starting without noise or jar. The cylinder is stopped and started by a cam motion pending the backward travel of the bed, and during the interval of rest the sheet is fed down against the guides and the grippers close upon it before the cylinder starts, thus insuring the utmost accuracy of register. After the impression the sheet is transferred to a skeleton cylinder, also containing grippers, which receive and deliver it over fine cords upon the sheet-flier, which in turn deposits it upon the table. The distribution of the ink is effected partly by a vibrating polished steel cylinder, and partly upon a flat table at the end of the traveling bed, the number of inking-rollers varying from four to six. The average output of one of these presses with a bed 36 by 54 inches is from 1,000 to 1,500 impressions per hour. The very finest engraving, or cut-work, such as would be done with the greatest deliberation upon the Washington hand-press, is printed upon it at a speed of 700 impressions per hour.

Up to 1847 American newspapers were printed upon single small-cylinder and double-cylinder machines. The output of one of the single-cylinder presses reached 2,000 impressions per hour, or about as fast as the feeder could lay down the sheets. With the double-cylinder press the travel of the bed was of such length that the form of type passed backward and forward under both cylinders. Two feeders accordingly put in the sheets, the maximum speed obtained from each cylinder being about 2,000, or 4,000 per hour for the two cylinders, printed upon one side. The growing demand for papers containing the latest news, however, necessitated faster machines. The presses of Middleton, Dryden & Ford, and others in England failed to meet the requirements there, as did the single cylinder and double cylinder in the U. S.

The Type-revolving Machine.—Experiments made in 1845 and 1846 resulted in the construction of a press known as the Hoe type-revolving machine. The first of these machines was placed in *The Public Ledger* office in Philadelphia in 1846. The basis of these inventions consisted in an apparatus for securely fastening the forms of type on a central cylinder placed in a horizontal position. This was accomplished by the construction of cast-iron or brass beds, one for each page of the newspaper. The column rules were made "V"-shaped, i. e. tapering toward the feet of the type. It was found that, with proper arrangement for locking up or securing the type upon these beds, it could be held firmly in position, the surface forming a true circle, and the cylinder revolved at any speed required without danger of the type falling out. Around this central cylinder from four to ten impression-cylinders, according to the output required, were grouped. The sheets were fed in by boys, and taken from the feed-board by automatic grippers, or fingers, operated by cams in the impression-cylinders, which conveyed them

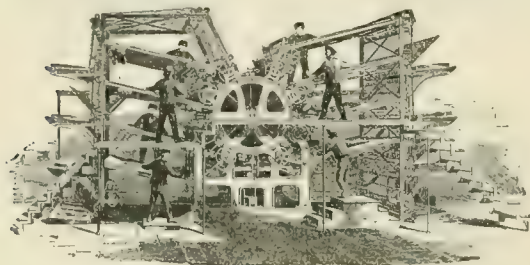


FIG. 7.—Eight-cylinder type-revolving machine.

around against the revolving form of the central cylinder. Here, again, a great advantage was gained by the use of the patented sheet-flier, consisting of a row of long wooden fingers fastened to a shaft, and operated by a cam and springs, the sheet after printing being conducted out underneath each feed-board by means of tapes to the sheet-fliers, which laid them in piles on tables, the number of fliers and tables corresponding to the number of impression-cylinders. The inking was accomplished by the use of composition-rollers placed between each of the impression-cylinders, the fountain being below, underneath the main type-cylinder. The portion of the surface of this type-cylinder not occupied by the type itself was utilized as a distributing-table, its surface being lower than that of the type, and the inking-rollers rising and falling alternately to place the ink on the type and receive a new supply from the distributing-surface. The speed obtained was about 2,000 sheets to each feeder per hour, thus giving, with what was called a four-feeder or four-cylinder machine, a running capacity of about 8,000 papers per hour printed upon one side. As the demands of the newspapers increased more impression-cylinders were added, until these machines were made with as many as ten grouped around the central cylinder, giving an aggregate speed of about 20,000 papers per hour printed upon one side. A revolution in newspaper-printing took place. Journals which before had been limited in their circulation by their inability to furnish the papers rapidly increased their issues, and many new ones were started. The first one put up abroad was erected in 1848, in the office of *La Patrie* in Paris. In 1856 Edward Lloyd, of *Lloyd's Weekly London Newspaper*, ordered a six-cylinder machine, and later the *London Times* ordered two ten-cylinder presses to replace an Applegath machine.

In the meantime experiments had demonstrated the possibility of casting stereotype plates on a curve. The process was brought to perfection by the use of flexible paper ma-

trices, upon which the metal was cast in curved moulds to any circle desired, and these plates were placed upon the type-revolving machine upon beds adapted to receive them instead of the type-forms. The newspaper publishers were thus enabled to duplicate the forms, and run several machines at the same time.

Improvements by Applegath and Cowper.—After the return of Koenig to Germany an Englishman named Applegath, in connection with a machinist named Cowper, made various improvements, mostly in the way of simplifying Koenig's presses, and in 1848 constructed for the *London Times* an elaborate machine, entirely upon the cylindrical principle. All of the cylinders of this machine were vertical. The type was placed upon a large upright central cylinder, but the circumference, instead of presenting a complete circle, represented as many flat surfaces as there were columns in the newspaper, the forms thus being polygonal. Around this central or form cylinder were placed eight smaller vertical cylinders for taking the impression, rollers being introduced to ink the type as it passed alternately from one of these impression-cylinders to another. The sheets were fed down by hand from eight flat horizontal feed-boards through tapes, then grasped by another set of tapes and passed sideways between the impression-cylinder and the type-cylinder, thus obtaining sheets printed upon one side. The impression-cylinder delivered them, still in a vertical position, into the hands of boys, one stationed at each cylinder to receive them. The results obtained from this machine were in a measure satisfactory, as the number of papers printed per hour upon one side, from one form of type, was increased to 8,000. The press used in the *London Times* office was the only one of this kind ever made.

Use of a Continuous Web.—In 1835 Sir Rowland Hill suggested the possibilities of a machine which should print both sides at once from a roll of paper. Cotton cloths had long been printed in this way, the cylinders being engraved and the cloth after printing being reeled up again. William

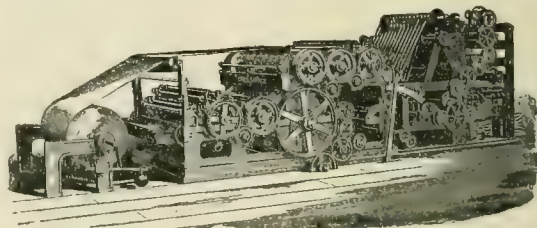


FIG. 8.—The Bullock stereotype perfecting press.

Bullock, of Philadelphia, constructed in 1865 the first machine to print from a continuous web or roll of paper. It consisted of two pairs of cylinders—i. e. two form or plate cylinders and two impression-cylinders. The second impression-cylinder was made of large size to provide additional tympan-surface, to lessen the offset from the first printed side of the paper. The stereotype plates were not made to fill the whole circumference of each of the form-cylinders, since by means of knives in cylinders the sheets were cut before printing. The sheets were carried through the press by tapes and fingers, and delivery sought to be accomplished by means of a series of automatic metal nippers placed upon endless leather belts at such distance apart as to grasp each sheet successively as it came from the last printing-cylinders. This machine was unreliable, especially in the delivery of the papers, but it was finally so far perfected that it came into use to a considerable extent.

Introduction of the Rotary Perfecting Press.—Meanwhile the proprietors of the *London Times* had begun experiments with the view of making a rotary perfecting press, and started the first one in their office about 1868. It was similar in construction to the Bullock press so far as the printing apparatus was concerned, excepting that the cylinders were all of one size and placed one above the other. The sheets were severed after printing, brought up by tapes, and carried down to a sheet-flier which moved back and forth and "flirted" the sheets alternately into the hands of two boys seated opposite one another on either side of the sheet-flier.

Marinoni, of Paris, also devised a machine on a similar principle, making the impression and the form cylinders of one size and placed them one above the other, but having separate fly-boards for the delivery of the sheets.

In 1871 R. Hoe & Co. also turned their attention to the construction of a rotary perfecting press to print from a continuous web of paper. The greatest difficulties were—1. The set-off of the first side. Devices were used to overcome this, and the ink-makers were induced to pay special attention to the manufacture of rapid-drying inks. 2. The need of paper in the roll of uniform perfection and strength. The paper-makers were led to produce large rolls of paper meeting these requirements. 3. The necessity of a rapid severing of the sheets after printing. 4. The need of a reliable and accurate delivery.

These last two operations were not accomplished satisfactorily until the appearance of the Hoe machine. In this press the sheets were not entirely severed by the cutters, but simply perforated after the printing. They were then drawn on by accelerating tapes, which completely separated them, to a gathering cylinder so constructed that six perfect papers, or any other desired number, could be gathered one over the other. These, by means of a switch, were at the proper moment turned off to one sheet-flier which deposited them on the receiving-board. The first of these machines was placed in the office of *Lloyd's Weekly London Newspaper*, and the first one used in the U. S. in the *Tribune* office in New York. There was no limit to their capacity for printing excepting the ability of the paper to stand the strain of passing through the press, which could produce from a single set of stereotype plates 18,000 perfect papers an hour, delivered accurately on one feed-board. The average speed, however, in printing-offices was 12,000 per hour.

The Walter press, made by the London *Times*, was used by it, and also by the London *Daily News* and by *The New York Times*. Further than that it made no progress. Meantime the Hoe machine was adopted by most of the large newspapers in the U. S. and Great Britain. These new methods of course entirely superseded the type-revolving machine, which had held the field in the newspaper world for over twenty years and of which 175 had been made.

Introduction of Automatic Folders.—It was desirable that the presses should deliver the papers folded. The first apparatus to accomplish this was similar in design to the hand folding-machines in common use in printing-offices. The sheets, fed by hand into these machines, were carried by tapes running upon pulleys under striking blades, which forced them between pairs of folding rollers. After the first fold they were again carried in a similar manner under striking blades, placed at right angles to the first, and again struck down between rollers to receive a second fold. This action was continued until the desired number of folds had been secured. Folders of this description were attached to the fast presses, but none made could be worked faster than about 8,000 per hour, until in 1875 Hoe & Co. patented a rotating folding cylinder which folded the papers at the rate of 15,000 per hour. The first of these folding-machines were put upon presses made for the *Philadelphia Times*, and operated in the Centennial Exhibition in 1876.

Striking blade folders were used in the Bullock press, and in machines made by C. Potter, Jr., & Co., and others. Andrew Campbell, a printing-press manufacturer, also constructed a rotary perfecting press, but his devices were not original. Four or five machines were made by him, and these soon went out of use.

Further Advances in Fast Printing.—About 1876 Messrs. Anthony and Taylor, of England, took out patents for devices by which the webs of paper could be turned over after printing on one side and the opposite or reverse side presented to the printing cylinder. Edward L. Ford, engaged in the publication of a newspaper in New York, patented the uniting of the product of two or more printing mechanisms, thus producing (in restricted form) a multiple number of pages at one time. He was unable, however, to develop his plans to any practical result, but deserves the credit of being the first to patent, if not to conceive, the idea of the association of printed sheets for this purpose.

The Double-supplement Press.—Further experiments upon the manipulation of webs of paper resulted in the production of the Hoe double-supplement press, the first specimen of which was purchased by James Gordon Bennett, of *The New York Herald*. For a third time a complete revolution of the methods of fast newspaper printing took place. The most remarkable features of this machine are its extreme simplicity, considering the work it performs, and its great speed, accuracy, and efficiency. It turns out either four, six, eight, ten, or twelve page papers at 24,000 per hour, and sixteen-page papers at 12,000 per hour, the odd pages being

in every case accurately inserted and pasted in, and the papers cut at the top and delivered folded. This machine is constructed in two parts, in one portion the cylinders being twice the length of those in the other, the shortest cylinders being used for the supplements of the paper when it is desired to print more than eight pages. The plates being secured on the cylinders, the paper enters from the two rolls into the two portions of the machine, through each of which it is carried between the two pairs of type and impression cylinders, and printed on both sides, after which the two broad ribbons or "webs" pass over turning-bars and other devices, by which they are laid evenly one over the other, and pasted together. The webs of paper then pass down upon a triangular "former," which folds them along the center margin. They are then taken over a cylinder, from which they receive the final folds, a revolving blade within this cylinder projecting and thrusting the paper between folding rollers, while at the same moment a knife in the same cylinder severs the sheet, and a rapidly revolving mechanism, resembling in its motion human fingers, causes their accurate disposal upon traveling belts, conveying them on for final removal.

Previous to the introduction of the double-supplement press, Hoe & Co. had made what is known as their double perfecting machine. This embraces substantially the printing and folding devices embodied in the double-supplement machine, and is the connecting link between it and the ordinary "single" or two-page-wide press.

The Quadruple Newspaper Press.—The next improvement in fast presses was the construction of the quadruple newspaper press. The first one was constructed by R. Hoe & Co. in 1887 and placed in the office of *The New York World*. The same principles were embraced in this as

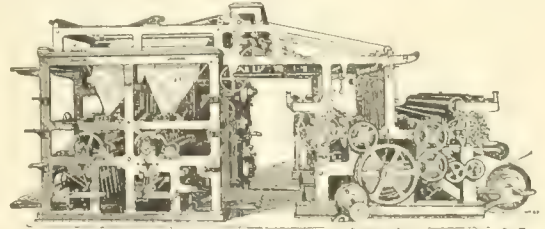


FIG. 9.—The Hoe "quadruple" newspaper perfecting press and folders

in the double supplement, but developed to a greater extent. The supplement portion of the press was increased in width. By means of ingenious arrangements of the turning-bars and manipulation of the webs of paper this press was made to produce eight-page papers at a running speed of 48,000 per hour; also 24,000 per hour of either ten, twelve, fourteen, or sixteen page papers, all delivered in perfect form, cut at the top, pasted, and folded ready for the carrier or the mails. This press, together with the double-supplement press, superseded almost all others in the large offices of the U. S., as well as in Great Britain and Australia.

The Sextuple Press.—In 1889 the same firm undertook the task of constructing a machine for *The New York Herald*, which would even eclipse the quadruple machine. It is known as the sextuple machine, and occupied about eighteen months in construction. It is composed of about 16,000 pieces, and weighs about 58 tons. The form and impression cylinders are all placed parallel, instead of any being at right angles, as in the quadruple and double-supplement presses. The press is fed from three rolls, and can print, cut, paste, fold, count, and deliver complete in an hour 24,000 *Heralds* of fourteen, twenty, or twenty-four pages each, 36,000 of sixteen pages each, 48,000 of ten or twelve pages each, or 72,000 (20 per second) of eight pages each. It has six plate-cylinders, each carrying eight stereotype plates a page in size, and making at full speed 200 revolutions per minute.

Type-revolving Perfecting Presses.—About 1871 a machine called the Prestonian was made by Foster, a machinist of Preston, England, and several were set to work, but did not enjoy any great degree of favor. They embodied a combination of the Hoe type-revolving machine with the endless sheet perfecting press. The form of type for one side of the paper was placed upon one cylinder, with impression-cylinders around it, in the manner of the Hoe press, and the form for the other side on another cylinder, and the paper passed from one set of impression-cylinders to the

other. The objection to this machine was its lack of speed. The same principle, however, had been developed years before in the type-revolving perfecting presses, having two sets of type-forms on separate large cylinders, and feeding

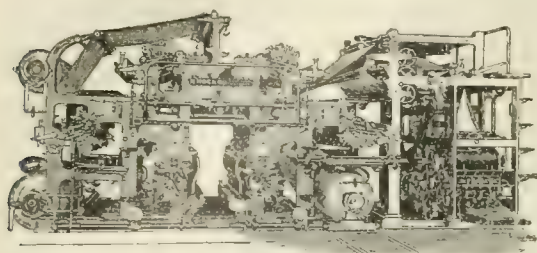


FIG. 10 The Hoe "sextuple" newspaper perfecting press and folders.

the sheets in by hand, conveying them from one impression-cylinder to the other and against the forms by means of fingers or grippers. The sheets were then delivered on a sheet-flier. These presses were especially designed for printing books of which large numbers were required, such as text-books and spelling-books. The contents of a whole book could be placed on these cylinders and printed and delivered at one impression. One of these machines, built in 1852, is still (1895) in operation at Messrs. D. Appleton & Co.'s printing-office in Brooklyn.

The Rotary Type Endless Sheet Perfecting Press.—In 1881 Hoe & Co. turned their attention to the making of a machine which should print from one form of type at a greater speed than had ever yet been attained. The result was the rotary type endless sheet perfecting press. The principle of this machine was in a measure that of their type-revolving press. The forms of type for both sides of the paper were placed on a central cylinder, which was surrounded by impression-cylinders and inking-rollers. The roll of paper was placed at the end of the press, passed around the impression-cylinders arranged at one side of the form cylinder, and then turned upside down at the lower part of the machine, thence being carried upward. The opposite or unprinted side was presented in turn between each impression-cylinder and the forms. If four impression-cylinders were placed around the central cylinder, then at each revolution of the latter four perfect papers were printed. If eight impression-cylinders were placed around the central cylinder, then eight perfect papers were printed at one revolution of the main or form cylinder. The speed attained by this machine with four impression-cylinders was about 12,000 per hour, and from machines with eight impression-cylinders 24,000 copies per hour were printed all folded.

The Prudential Perfecting Machine.—In 1889 a patented perfecting machine called the Prudential was made, in which the plates, or forms, for both sides are placed upon one cylinder, one side of the form of matter being placed upon one end, or half, of the cylinder, and the other side upon the opposite portion of the cylinder. One impression-cylinder only is used, and the inking apparatus is greatly extended. This machine is remarkable for the great variety of work it will do. At a high rate of speed, sheets of 8, 16, 24, and so on up to 96 or 128 pages may be printed and delivered folded in either 12mo, 8vo, 4to, or folio sizes, ready for the binder. The press does the work of ten flat-bed cylinder presses and ten hand-feed folding-machines. Curved electrotypes are now made successfully, and this press is the first to bring the printing of the average book and catalogue within the range of web-press work. While in general principles the press is similar to the large newspaper perfecting presses, though very much smaller in bulk, it has increased facilities for distribution, and finer adjustments throughout. The plates admit of underlays and overlays the same as on a flat-bed press. There are no tapes, the folding being done on rollers and small cylinders without smutting the printing. In the folding-machine there are knives which cut the sheet into the right size for folding, after which they are automatically delivered counted in lots of fifty each. The speed on a thirty-two-page form is about 16,000 copies per hour.

The Century Magazine's Press.—In 1886 Hoe & Co. made an advance toward perfection in the rotary system of printing, and constructed for Theodore L. De Vinne, the printer

of *The Century Magazine*, a perfecting press to do the plain forms of that periodical.

This press prints from curved electrotype plates, and the product at every revolution of the cylinder is sixty-four pages, neatly printed, truly cut, and accurately registered and folded, ready for the binder. This web press is not so fast as the web press of daily newspapers, but it performs more operations and does more accurate work. It is not large or noisy, but the paper goes through the cylinders at the rate of nearly 200 feet a minute. It does the work of ten presses of the stop cylinder or two-revolution type.

The Rotary Art Press.—The success of this perfecting press induced the makers to devise a machine on the rotary principle adapted for the finest kind of illustrations; in short, to make a press which should do work as fine as it was possible to do on the hand-press, or the stop cylinder. The result was the setting up, in 1890, at the De Vinne Press, of a machine known as the rotary art press. This machine is described in the *Century* of Nov., 1890, as follows: "Sixty-four plates of the *Century*, truly bent to the proper curve, are firmly fastened on one cylinder 60 inches long and about 30 inches in diameter; sixteen inking-rollers, supplied with ink from two fountains, successfully ink these sixty-four plates with a delicacy and yet with a fullness of color never before attained. The shafts of the impression-cylinder and the plate-cylinders, $4\frac{1}{2}$ inches in diameter, do not give or spring under the strongest impression. Although rigid in every part, in the hands of an expert pressman it can be made responsive to the slightest overlay. This machine is fed by four feeders from single sheets in the usual manner, and does the work of four stop cylinders in superior style."

The Once-a-Week Press.—Another rotary perfecting machine for fine cut-work was made in 1891 by the same manufacturers, and is known as the Once-a-Week press. In this machine the apparatus for printing the first side is placed at right angles with that for the second side. The paper, after being taken from the roll through the first pair of cylinders, printing the inside or type side of the periodical, takes a half turn over obliquely placed turning-bars, passing the paper reversed into the other portion of the printing apparatus. This second portion of the machine, being intended to do the finest quality of cut-work, is supplied with a more elaborate inking apparatus, and eight form-rollers, which distribute the ink in thin layers over the plates. In the folding apparatus tapes are entirely dispensed with, and the sheets of heavy cut-work are folded and delivered fresh from the press, without any smutting or set-off of the ink.

Ingenuous devices are found in a machine which was constructed in 1892, and put up in the office of the Hartford, Conn., *Courant*. From a single set of stereotype plates this machine produces either four, six, eight, ten, twelve, fourteen, or sixteen page papers at a speed of 12,000 per hour, all cut at the top, pasted and folded, and the supplements inserted in their proper places. With duplicate sets of plates it will print four, six, or eight page papers at 24,000 per hour. Two narrow rolls are placed nearly end to end at the back of the machine. The paper from one of these goes through the machine and is printed, then over the "former," and on to the final cutting cylinders without interruption. The peculiarity of the invention consists in taking the paper from the other roll, which is run at half the speed of the first, conveying it into the printing mechanism of the cylinders by accelerating its motion, and presenting the small sheet which has been severed for the two-page supplement between the cylinders in such a way that it receives the impression from the two supplement plates. This machine covers a floor-space of only 18 feet by $8\frac{1}{2}$ feet, and is 8 feet high.

Color-printing.—It has been found that a combination of three primary colors properly printed will produce any picture required. To these black is sometimes added, making four printings for a complete colored picture. Taking advantage of this the daily newspapers have attempted to meet the popular taste for colored pictures, and to that end presses have been constructed for some of the leading New York newspapers. In the presses for printing in colors the forms for the different colors are placed upon separate cylinders, opposite to each of which are attached impression-cylinders. The paper passing through this series of cylinders receives in perfect register the different colors, having first been printed in black upon one side. These colored supplements are delivered from the machines folded, without smutting. The art of simultaneous color-printing on the rotary principle is still in its infancy.

ROBERT HOE.

Prior, MATTHEW: poet and diplomatist; b. at Wimborne-Minster, Dorsetshire, England, July 21, 1664. He was educated at St. John's College, Cambridge, where he formed an intimacy with Charles Montagu, afterward Earl of Halifax, and with him wrote a poem, *The City Mouse and Country Mouse* (1687), intended as a travesty upon Dryden's *Hind and Panther*. Introduced at court by his patron, Prior became a favorite with William III.; was secretary of the commissioners who concluded the Treaty of Ryswick 1697; secretary of embassy at Paris 1698; Under-Secretary of State 1699; commissioner of trade 1700, in which year he published his *Carmen Seculare*, in praise of King William; entered Parliament 1701; became soon afterward a vehement Tory; was sent to Paris with Bolingbroke 1711 to make private proposals for peace; was charged with treason for his conduct in this negotiation on the accession of the Whigs to power in 1714; and was imprisoned two years in his own house, during which time he wrote *Alma, or the Progress of the Mind*. D. at Wimpole, Cambridgeshire, Sept. 18, 1721, and was buried in Westminster Abbey. His collected poems were first published in 1709, and in a sumptuous folio in 1718, a subscription edition which brought him £4,000. He excelled in epigram, society verse, and the short humorous fable. A selection of his poetry was edited by Austin Dobson in 1889.

Revised by H. A. BEERS.

Priscian, surnamed CÆSARIENSIS, probably because he was born at Caesarea: the most celebrated Latin grammarian; flourished about 500 A. D., and was a teacher of Latin at Constantinople, where he received a salary from the court. His *Commentariorum Grammaticorum Libri XVIII.*, of which the first sixteen books treat upon the eight parts of speech recognized by the ancient grammarians, and the last two on syntax, were edited by Krehl (Leipzig, 1819) and Hertz (Leipzig, 1855-59, 2 vols.). Other works extant are a grammatical catechism on parts of the *Æneid*, a treatise on the symbols used to denote numbers and weights, an essay on accents, another on the meters of Terence, etc., edited by Lindemann (Leyden, 1818) and by Keil (Leipzig, 1860). Two poems, *De Laude Anastasii imperatoris*, written about 512, and *Periegesis*, both in hexameters, are printed in Baehrens's *Poete Lat. Minores* (vol. v., pp. 264-312).

Revised by M. WARREN.

Priscianus, THEODORUS: physician; a pupil of Vindicianus. He lived at the court of Constantinople in the fourth century A. D., and is the author of a work, *Rerum Medicarum Libri Quatuor*, first printed in 1532 at Strassburg, in which he tries to combine the ideas of the methodical and dogmatical schools with those of the empirical.

Priscillian: Bishop of Avila, in Spain; belonged to a noble Spanish family; founded a sect whose doctrines were a blending of Manichæism and Gnosticism. In 379 the existence of the sect became known, and in 380 the Council of Saragossa condemned its doctrines and excommunicated its founder. The influence of Priscillian was too powerful, however, and his most zealous adversary, Bishop Ithacius of Ossonoba, was compelled to fly. He sought refuge with the usurper Maximus, who had Priscillian brought to trial before the Council of Treves, condemned, and put to death in 385. It was the first instance of a Christian being put to death for heresy, and it aroused the indignation of St. Martin of Tours, St. Ambrose, and others. The sect spread subsequently from Northern Spain to Languedoc, and even into Northern Italy, but disappeared entirely in the sixth century, after the second synod of Braga in 563. See Lübker, *De Hæresi Priscilliani* (Copenhagen, 1840), and Mandernach, *Geschichte des Priscillianismus* (Treves, 1851). Up to 1885 it was supposed that no works of Priscillian had been preserved, but in that year G. Schepss discovered in a Würzburg MS. eleven tractates, which he proved to be by Priscillian, and edited in the *Corpus Eccl. Lat.*, vol. xviii. (Vienna, 1889). See also by the same writer *Archiv. für Lat. Lexicographie* (iii., 309-328), and *Priscillian ein neu aufgefundener Lat. Schriftsteller* (Würzburg, 1886).

Revised by M. WARREN.

Prism [from Lat. *pris'ma* = Gr. *πρίσμα*, prism, liter., something sawed out, deriv. of *πρίν*, *πρίσσειν*, saw]: a polyhedron two of whose faces are equal polygons, having their sides parallel and all the remaining faces parallelograms. The first-named faces are called bases, and the remaining ones make up what is called the lateral surface of the prism. The distance between the bases is the altitude of the prism. For the Nicol prism, see POLARIZATION.

Prismoid [Gr. *πρίσμα*, prism + *οἶκος* -oid, having the form of, Gr. *οἶκος*, form]: a polyhedron resembling a prism. It is a frustum of a wedge. The volume of a prismoid is equal to the sum of its parallel bases plus four times the section midway between the bases multiplied by one-sixth of the altitude.

Prismoidal Formula: a formula for computing the volumes of certain solids, mainly used by civil engineers for earthwork calculations. Let *L* be the length of any prism, *A* the area of one end, *B* the area of the other, and *M* the area of a section half way between the two ends. Then the volume of the prism is

$$V = \frac{1}{6} L(A + 4M + B).$$

This formula applies not only to prisms, pyramids, and solids bounded by planes, but also to those bounded by warped surfaces, and to those inclosed by surfaces which are generated by conic sections.

The two-term prismoidal formula, due to Halsted, is

$$V = \frac{1}{4} L(A + 3N).$$

in which *N* is the area of a section at two-thirds the altitude from the base *A*. MANSFIELD MERRIMAN.

Prison [from O. Fr. *prison*: Ital. *prigione*: Span. *prisión* < Lat. *prēnsio*, -ōnis (or *prehensio*), seizure, confinement, deriv. of *prendere* (*prehendere*), seize]: primarily, a place of detention for debtors or persons charged with political or other crimes until they were tried or adjudged guilty or innocent of the offenses for which they were committed; later, the prison has become, to some extent, the place and instrument of punishment. The idea of punishment by imprisonment itself does not seem to have entered into the minds of the rulers of ancient times, though the prison was often, from its crowded and filthy condition, its want of ventilation, the foul fevers and plagues engendered there, and the starvation inflicted on its hapless inmates, a place of cruel torture and often of speedy death; but the ancient idea of punishment was embodied in the stocks, scourging, beating with rods, the bastinado, the knout, the wheel, the rack, the thumb-screw, the iron boot, mutilation of the eye, the ear, the nose, the hand, the foot, etc.; the crown of thorns, walking over hot irons or coals, branding, whipping at the whipping-post or the tail of a cart, the pillory, the ball and chain, the treadmill, or the galleys; or, where the punishment was intended to be death, the stake, the terrible death by crucifixion, beheading, stoning, the administration of poison, or, in more modern times, hanging, the guillotine, or the garrote.

Prisons of Egypt and Palestine.—Detention of debtors and of political and other offenders was very early an admitted necessity. The earliest instances of its use are found among the Egyptians, whose superior civilization led them to devise measures of police of which other nations, less advanced, had not yet felt the want. Thus we find in Gen. xxxix. 20 that "Joseph's master took him and put him into the prison, a place where the king's prisoners were bound; and he was there in the prison." This was primarily a place of confinement for political prisoners. There are numerous references to prisons in the Old Testament, as well as among profane writers contemporary with its later books, but always as a place of detention simply, though in the case of Jeremiah the dungeon connected with the prison (Jer. xxxviii. 6), from the depth of its miry bottom and its filthiness, seems to have been intended for the destruction of the prisoners who were cast into it. All the Oriental monarchies had their prisons; but though these were, as they are still, wretched, ill-ventilated, and filthy dens, in which it would seem to be impossible to support life, and where the poor culprit who had no money or friends was welcome to die of starvation and foul air as soon as he liked, yet the only theory of the prison was that it was simply a place of detention, and no length of endurance of its horrors was allowed to mitigate in any way the severity of the physical tortures or punishments inflicted on him if he was found guilty of the offense with which he was charged.

Greek and Roman Prisons.—Among the Greeks and Romans the prison, though more cleanly, was generally only a place of detention, though the "inner prison," low, close, and hardly ventilated at all, was occasionally made a place of temporary torture. By the laws of Rome, a Roman citizen could not be cast into prison except by the direct command of the emperor and for some very grave offense; and the violation of this law was severely punished. The usual method of detention for a Roman citizen was to chain his right arm

to the left arm of a soldier, who was made responsible for his safe-keeping; sometimes each arm was chained to a soldier: this guard was changed every twelve hours. In the first century after Christ there was at Rome one prison, and possibly more, intended for the confinement of prisoners condemned to death or awaiting a final hearing before the emperor. This was the Mamertine prison, consisting of two (possibly three) distinct vaults, one below the other. The upper was 16 feet in height, 30 in length, and 22 in breadth; the lower was smaller and lower, and the only access to it was by a hole in the middle of the ceiling, through which the prisoners were let down. This was originally the case also with the upper vault, called the dungeon of Ancus Martius. There were houses of detention in Rome which were used for the safe keeping of slaves. Even at a later period the Code Justinian has very little to say of prisons; its penalties were scourgings, tortures, mutilations, and death.

Mediæval Prisons.—With the downfall of the Roman empire, and the assumption of power over small districts of territory by the feudal barons, there came a change. The great tower of every castle, the *donjon*, had its *keep* or strong-room, often underground, to which foe or rival was forthwith consigned. They were utterly unfit for the confinement of human beings, and the names *oubliettes* (little places of the forgotten) or *vade-in-pace* (go in peace) by which they were designated in grim jest by their builders or owners indicated but too truly their murderous purpose. Of a somewhat better character, though still cheerless and almost hopeless prisons, were those isolated fortresses where chiefs, nobles, and kings in the Middle Ages were often incarcerated. The Tower of London belonged to the same class.

Prisons of the Inquisition.—The prisons of the Inquisition in Italy, Spain, Portugal, France, Belgium, and Austria, though not in the main intended so much for punishment as for detention—the punishment (often within the prison-walls) consisting mainly in the racks, wheels, boots, thumb-screws, and other instruments of torture which a fiendish ingenuity exhausted itself in contriving, and in the *autos-de-fé* and other modes of inflicting the death-penalty—were yet, in some cases, places of protracted and cruel punishment, in which every idea of horror and apprehension which could torture the mind of the victim was suggested, to aggravate the distress of confinement. Even during the nineteenth century the victims of this cruel imprisonment have died by slow torture.

Prisons of the Eighteenth Century.—On the Continent, and even in Great Britain, the idea that imprisonment, except in the case of political offenders, constitutes any part of the punishment of crime does not seem to have dawned upon the minds of statesmen, political economists, or penologists—if the latter class could be said to have existed—until well into the eighteenth century. There were jails, houses of detention, prisons—if they might be called such—both in Great Britain and on the Continent, but they were filled with debtors, persons arrested for crime and awaiting trial, and those who had been sentenced to banishment or transportation, to slavery, to the galleys, or to execution. The jails and prisons were so filthy and ill-ventilated that deadly fevers, the plague, and the black death would occur in them, and frequently spread over the adjacent country. At what was known as the “Black Assize” in England, in the seventeenth century, over 300 persons, including judges, jury, lawyers, and spectators, fell victims to a malignant jail-fever which was communicated by the prisoners brought out of the jail for trial. The moral pollution of these jails was as great as the physical: the grossest intemperance and licentiousness prevailed in all of them, and the fee for the prostitution of the female prisoners was a recognized perquisite of the keepers.

John Howard and his Associates.—Attempts were made to reform and improve the jails in England, as well as on the Continent, by John Howard in the latter part of the eighteenth century; they were attended with some success, though not so great as his philanthropic efforts and the final sacrifice of his life to the cause warranted. Beccaria in Italy, and Sir William Blackstone, Jeremy Bentham, and Mr. Eden (afterward Lord Auckland) in Great Britain, took up the work and went forward with it. At this time, however, Great Britain was largely engaged in schemes of transportation, which her statesmen believed would rid them of her vicious population, and they were not inclined to give much heed to measures of prison reform. They had sent convicts

to Virginia from 1619 to 1770, until they would no longer be received, and, after the beginning of settlements in Australia and the adjacent islands, had forwarded thousands to Botany Bay, Sydney, Tasmania, North and West Australia, and to British Guiana, till about 1850; but, contrary to their expectations, the number of criminals at home did not decrease. Most of the continental states had tried the same experiment of transportation, and with about the same success. France, while sending off large numbers of criminals, consigned very many to the galleys, where they learned only evil, and at their discharge became leaders in crime. Russia sent the greater part of her criminals, as well as her political offenders, to the mines in Siberia, and most of the other powers rid themselves of their criminals by transportation wherever they could find the opportunity, sometimes sending them to the territories of the U. S., to Mexico, and to South America. These efforts did not lessen the number of actual criminals. As yet the possibility of the reformation of criminals was not conceded.

Prison Reform in Great Britain.—All efforts to keep down the number by transportation having failed, and the benevolent labors of John Howard, of Mrs. Elizabeth Fry, and of the aldermanic committee of London having proved ineffectual to remedy the evil, Sir T. Fowell Buxton, a member of Parliament, published in 1818 an *Inquiry whether Crime and Misery are produced or prevented by the Present System of Discipline*. After a conflict of nearly thirty years the prisons and prison-systems of Great Britain and Ireland were very thoroughly reformed; transportation ceased, and the convict prisons, though more expensive than they should be, are well managed, and many of their prisoners are reformed. Many of the convicts are employed in the great naval shipyards at Dartmouth and Portsmouth. The jails are cleanly, well-ventilated, and for the most part have some employment for the prisoners, which keeps them from mischief and contributes a small sum toward the expense of their support. The reformatories for young offenders have, by reforming the young criminals, prevented the increase of the criminal class, and greatly diminished the number and magnitude of crimes in the kingdom. In Scotland and Ireland, by a different application of the same principles, a still greater measure of success has been attained. What is known as the Crofton or Irish system of prison discipline has proved very successful in Ireland.

Prisons in the United States.—In the U. S. transportation has never been attempted as a means of ridding the community of the dangerous classes. Before the Revolutionary war the criminal code was very severe; death was the penalty of a great number of crimes; in one of the States 115 crimes punishable by death were enumerated; in other States the number was from 80 to 100. Burglary, horse-stealing, highway robbery, and even grand larceny, as well as forgery, counterfeiting, and many other crimes now punishable by a moderate term of imprisonment, subjected the criminal to the death-penalty. At the same time the prisons were in a wretched condition, hardly better than those of Great Britain. In 1786 Pennsylvania made the first effort at improvement of her prisons by the adoption of the *solitary* plan of discipline. Reforms were accomplished in Boston by the Prison Discipline Society, which existed from 1824 to 1844. The Prison Association of New York was organized in 1844. The “separate plan” in operation at the Eastern penitentiary at Philadelphia is very expensive; the work is unprofitable, the proceeds of it not defraying more than one-sixth of the expenses of the prison; and, though there is not so much insanity or fatuity as under the solitary system, the prisoners fail in self-reliance, and are very seldom of any service to the community after their discharge. In 1821-23 the “congregated or silent system” (now known as the Auburn system), was adopted at Auburn, N. Y., and soon attained such a reputation that it was adopted by other States, and with various modifications is now the prevalent system in the U. S. See PRISON DISCIPLINE.

In many of the congregated prisons the labor of the prisoners is let to contractors at a given sum per day; in several of the States the whole expenses of the prison are thus defrayed, and in some a surplus is paid into the State treasury. In some cases the State employs the convicts and disposes of the products of their labor, but these generally fail to defray the entire expenses. Many objections have been made to the contracting of the labor of prisoners, and in several States it has been superseded by what is known as the “piece price,” and “State account” systems.

County Jails.—Of all the prisons in the U. S., county jails

are the most unsatisfactory. With rare exceptions, prisoners of all grades and of all ages are herded together in a common hall, and the contaminating influences of association are so injurious that all penologists are agreed in the conclusion that no large progress can be made in reducing crime until this evil is corrected. The remedy clearly consists in such a separation of prisoners awaiting trial as will not permit any prisoner to associate with any other prisoner. This rule has been enforced in England for many years, and its violation by any jailer is made a penal offense by act of Parliament. In the U. S. this system was first adopted in Massachusetts, in the Suffolk County jail in Boston about 1860, and the results have been so satisfactory that it has been extended to all other jails in the State where the construction of the jail will permit. In Ohio a similar requirement has been made by legislative enactment, and in several Western States new jails have been constructed with a view to confining prisoners in separate cells. See IMPRISONMENT.

Revised by R. BRINKERHOFF.

Prison Discipline: the proper care and regulation of persons suffering detention or punishment by incarceration. Three systems of prison discipline divide the study and the suffrages of the civilized world—viz., the Auburn, or congregate silent system; the Philadelphia, or separate cell system; and the system of progressive classification—sometimes called the Irish system, because first applied in Ireland—sometimes the Crofton system, from the name of the man who devised and applied it in the form it has there, although Capt. Alexander Maconochie, of the British navy, was the real author of the system. The essential principle of the Auburn system is that of absolute separation of the prisoners by night and associated silent labor by day. This system is almost universal in the U. S., and has also a foothold in various European countries, where, too, the old system of common dormitories has far too wide a prevalence, though it has no defenders. Some of the convict prisons of the U. S. do not even claim to conduct their discipline upon the strictly silent principle; in others, where the claim is made, the rule of silence has but a partial enforcement, while in comparatively few is the rigidity of the old discipline of absolute non-intercourse maintained in full force. The essential principle of the separate-cell system is that of a complete bodily separation of the prisoners in labor, recreation, and rest. The Eastern penitentiary at Philadelphia is the only State prison in the U. S. conducted upon the separate system. There are, however, two local prisons in Pennsylvania, at Chester and Media, where the system is still in operation. This system, known throughout the world as the Pennsylvania system, has been adopted with some modifications in several European countries, notably in Belgium, where it is in operation in all convict prisons, apparently with good results. In the U. S. it has not proved satisfactory. Isolation lies at the foundation of both these systems. The difference between them is one of application rather than of principle.

The System of Progressive Classification.—Capt. Alexander Maconochie was, on his own application in 1840, invested with the governorship of the British penal colony of Norfolk island, at that time containing a criminal population of 1,500, made up of the worst convicts ever sent out by the mother-country. He there became the originator and founder of the system of progressive classification as an agent in prison discipline and the reformation of prisoners. The discipline inaugurated by him was called by its author the "social system of prison treatment," because of the play therein given to the social instincts of humanity; but it is commonly known among penologists as the "mark" system, because of the use which it makes of marks in recording the progress of the prisoner in industry, education, order, and virtue. Capt. Maconochie sought to make prison life an image of free life. He treated the convict as a laborer, with marks for wages. His marks were made to play the part of money, for with them the prisoner was required to purchase his food, clothes, schooling, etc., while only the surplus of these earnings counted toward his liberation. Under this system the prisoner is not to be sentenced to a certain number of months or years, but to earn a certain number of marks over and above his keep. Maconochie fixed on ten marks as a fair day's wages, the men being paid by piece-work, and not by time, and for every ten marks saved the convict shortened his imprisonment by a day. At the stores he purchased his daily supplies, paying for them in marks. The rations were served out at three rates. The coarsest cost three marks

per day, the next four, and the best five. The self-denying prisoner might thus save seven and the self-indulgent five marks each day for the purchase of his liberty. As extra marks were allowed for overwork, it was possible to hoard at the rate of eight or ten a day as the fruit of diligence and self-denial. Moreover, the marks furnished the means of disciplinary punishment, a proportionate fine in marks being the penalty for every act of disobedience or failure in duty. While, by this machinery of marks, Capt. Maconochie trained his convicts to habits of industry and frugality, he adopted different means to accomplish his other objects. He divided the convicts' sentences into three periods. During the first or penal stage the men worked under a sharp and stringent discipline. At the conclusion of this they were allowed to form themselves into companies of six each—the members of each company being left to choose their own companions—and then they entered into the second or social stage. In this stage the six prisoners forming a company had a common fund of marks, into which common stock the daily earnings of each member were paid, and from which the supplies and fines for the whole company were deducted. They were thus made responsible for each other's conduct, and naturally became watchful both over themselves and their companions. In the last or individualized stage the companies were broken up, and, though every man was still kept at work to earn his daily tale of marks, he was in other respects comparatively free. He had his own hut and garden, his own piggery and poultry-yard, the products of which he might sell to the officers of the colony or the ships that touched at the island. By thus giving the probationer property and rights of his own, Maconochie hoped to teach him respect for those of other people. He was four years on Norfolk island. His success was wonderful, though he was never allowed by the British Government to bring all the principles of his system into play, and so give it a full and fair trial.

A few years after Maconochie's retirement from Norfolk island, Capt. (later Sir) Walter Crofton, following in his footsteps, devised and established a new system of convict prisons for Ireland. He adopted the mark system of Maconochie, with modifications which improved it in many important respects. The Crofton system consists of three stages: A penal stage of separate imprisonment, continuing eight months; a reformatory stage, longer or shorter according to the length of the sentence, with separation at night and associated labor by day, in which the principle of progressive classification is applied with a gradual lifting of restraint and enlargement of privilege, including an increased share in his earnings as the prisoner advances from class to class; and a testing stage, designed to verify the reformatory power of the preceding discipline, and also to serve as a period of natural training which shall gradually prepare the prisoner for full liberty. The Crofton system may be shortly defined as an adult reformatory, in which the will of the prisoner is brought into accord with the will of the prison-keeper, and held there for so long a time that virtue becomes a habit, and where the object is to teach and train the prisoner, during his detention, in such manner that on his discharge he may be able to resist temptation and inclined to lead an upright, worthy life. This must be done by placing the prisoner's fate, as far as possible, in his own hands, and by enabling him, through industry and good conduct, to raise himself, step by step, to positions of increased freedom and privilege; while idleness and bad conduct, on the other hand, keep him in a condition of coercion and restraint.

CROFTON SYSTEM IN THE UNITED STATES.

In the U. S., reformatories for adult criminals upon the general principles of the Crofton system have been established in New York, Massachusetts, Pennsylvania, Ohio, Michigan, and Minnesota.

The Elmira Reformatory.—The first of these, the Elmira Reformatory, upon which the others are mainly patterned, was opened in 1876 at Elmira, N. Y., and is known as the New York State Reformatory. Prisoners received at Elmira are such as are convicted of their first offense for felony, and are held under what is known as the indefinite or indeterminate sentence; that is, they are not sentenced for any specific period of time, but may be held for the maximum period for which they might have been sentenced for the crime committed, and can not be discharged until they have served the minimum period provided by statute for such offense; but having served such minimum period they

may be allowed, under regulations established by the board of managers, to go upon parole outside of the buildings and inclosures, but to remain, while on parole, in the legal custody and under the control of the board, and subject at any time to be taken back to the institution.

Classification of Inmates.—The reformatory plan includes the dividing of prisoners into three grades, viz., the upper first, the lower first, and the second; and all enter the lower first, to rise or fall according to compliance with reformatory requirements. The measure of every man's career in the reformatory is the record appearing upon the pages bearing his name in the conduct, labor, and school ledgers. By maintaining a good record for six successive months prisoners in this grade may advance to the upper-first grade, from which alone they may secure release prior to the expiration of the maximum time for which they could have been imprisoned. In this they wear a uniform of sky-blue, their cells are more commodious, and they have more privileges in many ways. If their records continue perfect another six months they become candidates for conditional release, provided satisfactory employment can be secured for them. The downward step from the lower-first grade leads to the second or convict grade. Into this drop the lower-first grade men whose conduct, school, or labor records are imperfect for two or three months in succession. Those who are reduced to this class forfeit all credit marks, and may secure readmission to the next higher grade only by earning a perfect marking for three successive months. Those who fall to the second grade a second time may not emerge from it for six months, and the third degradation is not followed by advancement for a year. The uniform of the convict grade is a bright red. Its wearers are quartered in the smallest cells, are deprived of all room furniture not essential to health and cleanliness, have no sheets on their beds, receive no tea or coffee with their rations, lose the privilege of drawing literature of any kind from the library, and lose their right to receive trade instructions as such.

While men of the upper-first grade are allowed to write one letter each month, and those of the lower first one in every two months to known relatives, second-grade men are not permitted to have any communication whatever with the outside world.

In the cell blocks, on the drill-ground, and at general assemblages the members of the different grades are grouped and kept separate one from another; but it is impossible, of course, to maintain this separation in the shops and trade-schools. The engagements of each inmate are intended to absorb his thoughts completely during the most of his waking moments, and they are sufficiently varied, though systematized, to prevent any of the noxious effects upon the mind that are often the effect of monotonous habits. Their engagements are work in the shops, trade-schools, and other occupations, and the day is closed with military drill and dress parade. In the evening are class meetings in school studies and other educational opportunities.

The results of reformatory treatment under these conditions have been very satisfactory, and the records show that of the graduates of Elmira over 80 per cent. have reinstated themselves in society, and are earning an honest living.

Other Reformatories.—The reformatory at Concord, Mass., was opened in 1884. Like Elmira it has three grades, and a marking system by which the prisoner rises or falls, but unlike Elmira it receives misdemeanants as well as felons, and there is no limit as to age or number of offenses, and only a part of the prisoners are subject to the indeterminate sentence. The prison for women at Sherborn, Mass., established in 1877, is also conducted on a system similar to that of Elmira, although it has four grades instead of three. It is wholly under the management of women, and as a prison for women it has no superior.

Corporal Punishments.—In the U. S., in the best-regulated prisons, corporal punishments are no longer considered a necessity for the maintenance of discipline, and in many they are entirely abolished. In the Western penitentiary of Pennsylvania, at Allegheny, no form of physical torture has been tolerated since about 1870, and so also at the great prisons at Joliet, Ill., and the military prison at Leavenworth, Kan., and better discipline is reported than in previous years when the lash or its equivalents were in use.

In New Jersey, Minnesota, Kansas, and other States, corporal punishments are prohibited by law, and a majority of the most enlightened prison-wardens in the U. S. regard them as a relic of barbarism, and worse than useless in the maintenance of order in prison.

Prison Associations.—Among the agencies in the U. S. which have been largely instrumental in educating the public mind to the requirements of better methods in dealing with the criminal classes are the various prison associations, State and national, and State boards of charity and correction. The most important of these is the National Prison Congress, which was organized in 1870 and brings together annually, for the discussion of prison questions, prison officials and others interested in prison management. The annual reports of these various associations constitute a library upon prison subjects, and as knowledge accumulates penology is more and more becoming an exact science.

Among the principles already established sufficiently to be considered axioms by penologists in the U. S. are—

1. County jails should be solely places for the detention of prisoners awaiting trial, and in them no prisoner should be permitted to associate with any other prisoner.
2. Prisoners convicted of misdemeanors should be sent to district work-houses and employed at productive labor.
3. Prisoners convicted of felony should be sent to penitentiaries, of which there should be at least two in each State—one a reformatory for young men, and the other for life-prisoners and incorrigibles.
4. All sentences, except for life, should be indefinite, subject to parole and police supervision within a minimum and maximum limit.
5. All able-bodied prisoners should be kept at productive labor, but those in reformatories should receive such educational and industrial training as will enable them to earn an honest living after discharge.
6. All prisoners upon discharge should be systematically aided to obtain employment.
7. Prisoners convicted more than twice for felony should be adjudged incorrigible and sentenced for life, or at least for long periods, with the privilege of parole for good conduct at the maximum limit of a first conviction.
8. Prison officers should be as thoroughly trained for their duties as are army and navy officers, and their tenure of office should be as secure and their compensation as liberal.
9. Prisoners convicted of violations of Federal laws should be confined in prisons owned and controlled by the general Government.
10. In all prisons moral and religious culture should be the leading reformatory influences, and a prison school, with competent instructors, should be an indispensable requirement.

Revised by R. BRINKERHOFF.

Prisoners of War: See WAR.

Pris'tidæ [Mod. Lat., named from *Pristis*, the typical genus, from Gr. *πρίστις*, assumed to mean sawfish (deriv. of *πρίειν*, saw), properly *πρήστις*, a kind of whale, liter., blower, spouter, deriv. of *πρήθειν*, blow, spout]: a family of selachians of the order *Raie*, represented by the sawfishes. The body combines peculiarities of the sharks and rays, being elongated like the former, but with the pectoral fins developed and the branchial apertures inferior, as in the latter; the shagreen is very fine; the snout produced into a very long, flat, dagger-like appendage, which is armed on each edge with a row of strong, compressed, straight teeth. The nostrils are inferior; mouth small and transverse; teeth on the jaws minute; branchial apertures inward from the base of the pectoral fins; spiracles large, behind the eyes; dorsal fins two, unarmed, the first more or less behind the ventrals; pectorals with the front margins free, and not extending on the head. The teeth which are on the margin of the saw are of peculiar development, and must not be confounded with the true teeth of the jaws; the skeleton of the saw-like appendage has from three to five hollow sub-cylindrical tubes which taper toward the end, and are incrustated with a grain-like osseous deposit. The sawfishes are found in all tropical seas, and one species (*Pristis antiquorum*) occurs on both coasts of the U. S., especially in the more southern waters. An East Indian species lives in part in fresh water.

Revised by F. A. LUCAS.

Privateering: the act or practice of cruising in a privateer for the purpose of preying upon the merchant vessels of a hostile power.

As there may be legalized land forces of an irregular character to supplement a regular army, on the condition of their conforming to the rules and usages of war, so upon the high seas the war navy of a belligerent may be assisted in certain of its duties by private armed vessels.

These vessels, with their crews, might be hired by the governments, or impressed into the sovereign's service, whether owned by natives or by foreigners—the latter called the *jus angaria* or *droit d'angarie*; or they might be vessels owned and manned by private persons but kept up at the public

expense; or public vessels with a crew and outfit provided for by private persons; or, finally, private vessels officered and sent to sea at the charges and risk of private persons under a government commission. Of these four ways of sending vessels out to sea, the last-named only has been in vogue in the most modern times. In commercial states this has been a favorite way of employing sailors and merchant ships when trade was crippled by war; and to a nation with a small navy but with a large seafaring class it offered the prospect of something like equality on the sea with a nation possessing a good-sized fleet.

Although sometimes bounties have been offered to privateers for the capture of the men-of-war of an enemy, this can hardly be considered a usual part of their duty or be reasonably expected of them. They are neither built, armed, nor manned with such service in view, but rather to prey upon the commerce of an enemy, being entitled to a share in their captures.

In commissioning privateers it is usual for a government to put their owners and captains under bonds. A letter of marque is given, which alone entitles a vessel to any share in a capture made from the enemy, after adjudication by a prize court, and the absence of which exposes a vessel calling itself a privateer, with its crew, to harsh treatment, as having almost a piratical character. Any great irregularity or lawlessness will involve forfeiture of vessels and other penalties, including by English usage damages from the owners; but, in truth, lawlessness and harsh treatment of the enemy could never be prevented. The motive of the expedition being plunder, the captain and officers having no professional honor, the crews being often a motley collection of adventurers, privateering was long felt to be a great evil, and earnest voices were raised against it, especially by enlightened men in the U. S. Thus Franklin inserted a provision forbidding reciprocally the issue of letters of marque in the treaty between the U. S. and Prussia negotiated by him in 1785. At length, in 1856, the parties to the Declaration of Paris brought about a new era in international law by the four rules relating to warfare on the sea, one of which was that "privateering is and remains abolished." Other nations were invited to give their assent to these rules on the condition of accepting all or none, and nearly all Christian states accepted them. Several of them were such as the U. S. had always contended for, but adhesion was refused on the ground that the republic would have no adequate force, if it abandoned privateering, to cope with nations possessing a large navy, as its own policy was to have a small one. The offer, however, was made—but without effect—to adopt the rules, provided that the signers of the Declaration of Paris would go further and exempt all innocent traffic of enemies on the sea from capture. This was called the Marey amendment. In 1861 Mr. Seward, being Secretary of State, made offer to two of the principal European powers, on the part of the U. S., to come under the operation of the four rules; but as it was understood that the stipulation would be for the entire republic, including the Confederate States, and as thus these powers would be parties in imposing a rule of warfare on the Confederate States, as, in short, it was a scheme to prevent them from using privateers by the aid of international law, the offer was declined. See DECLARATION OF PARIS.

The abandonment of the use of privateers by so large a number of states, and the provision for the safety of enemies' goods on neutral vessels in the same document, put a new face on maritime warfare. At the outbreak of a war, if the risk of capture is great enough, neutral vessels henceforth will take the place of belligerent ones for commercial purposes, and the motive of capture is greatly diminished for public cruisers, the only ones now remaining. Thus it can be no very great concession that belligerents may safely use their own merchant ships, unless neutrals regard it of importance for them to get the business of times of contest into their hands. The parties to the four rules, however, may still legitimately employ privateers against the U. S. and other non-signers of the rules, the obligation to observe them being only a reciprocal one between the signers.

Subjects of the U. S. are, by statute, forbidden to accept letters of marque from powers at peace with it, and this, apart from the Declaration of Paris, is a common rule. Privateers were not employed by either North or South in the civil war in the U. S., the Confederate ships commonly called privateers being really commissioned men-of-war, though in some cases illegally fitted out.

Revised by T. S. WOOLSEY.

Privet [other Eng. names for the same are *primprint*, *primet*, Scotch *privie*. The introduction of the *v* is unexplained; *primet* is probably connected with *prime*, to trim]: the *Legostemon vulgare*, an oleaceous plant of Europe, now naturalized to some extent in the U. S.; chiefly used as a hedge-plant, both in the Old and New Worlds. It makes a close, handsome hedge, though it is not thorny. Its wood, though small, is saved for turners' use in Europe, and its berries yield a pink coloring-matter used by map-colorers. There are several rather ornamental allied species, one of which, *L. japonicum*, is known popularly as the California privet. Revised by L. H. BAILEY.

Privilege [from Lat. *privilegium*, an ordinance in favor of an individual; *privus*, private + *lex*, *legis*, law]: a benefit or immunity which is not enjoyed by all. Some forms of privilege are considered in the articles on LIBEL AND SLANDER and on MONOPOLIES (qq. v.). The present discussion will be confined to the privileges of legislators, and to those of citizens under the U. S. Constitution.

Privileges of Legislators.—Members of the British House of Commons are not liable to be sued for any words uttered in the House, however injurious they may be to others; nor can they be detained by the civil process of any court during a session of Parliament, nor during a convenient time before and after the close of a session. The U. S. Constitution provides that the Senators and Representatives "shall in all cases, except treason, felony, and breach of the peace, be privileged from arrest during their attendance at the sessions of their respective houses, and in going to and returning from the same; and for any speech or debate in either house they shall not be questioned in any other place." (Art. I., § 6.) Similar privileges are secured to State legislators by the State constitutions.

Privileges and Immunities of Citizens.—Article IV., § 2, of the U. S. Constitution declares: "The citizens of each State shall be entitled to all privileges and immunities of citizens in the several States." This guaranty is confined, it will be noticed, to those privileges which belong to citizenship. It does not extend to the privilege of taking fish in the public waters of another State. Public fisheries are the property of the State, and its inhabitants have a right in them by virtue of citizenship and domicile, and not by virtue of citizenship only. Nor does it secure to the citizen of one State that community interest in property owned by his wife in another State which is accorded by the laws of the latter to its resident citizens. (*Conner vs. Elliott*, 18 Howard 591.) Nor does it apply to artificial persons—corporations—which possess only such attributes as are bestowed by the State creating them. Many political rights, such as the right of suffrage and the right to hold office, are not within this constitutional guaranty, for these do not pertain to citizenship necessarily. In every State large numbers of citizens do not possess them. The provision in question applies to "those privileges and immunities which are fundamental, which belong to the citizens of all free governments, and which have at all times been enjoyed by citizens of the several States which compose this Union, from the time of their becoming free, independent, and sovereign; . . . protection by the Government, with the right to acquire and possess property of every kind, and to pursue and obtain happiness and safety, subject, nevertheless, to such restraints as the Government may prescribe for the general good of the whole." (*Coryfield vs. Coryell*, 4 Washington Circuit Court 371.) Hence a statute which makes it unlawful for any person to appoint a non-resident trustee in a deed or other instrument is unconstitutional. *Shook vs. La Fayette*, 52 Federal Reporter 857.

The Fourteenth Amendment to the Constitution prohibits the States from making or enforcing "any law which shall abridge the privileges or immunities of citizens of the United States." This provision recognizes a citizenship of the U. S. which is distinct from that of a State, and it guards only the privileges and immunities that pertain to the former; "those which arise out of the nature and essential character of the national Government, the provisions of the Constitution or its laws and treaties made in pursuance thereof." (*Butchers' Association vs. Crescent City Company*, 16 Wallace 36.) In the decision just mentioned the following were named as such privileges: "To come to the seat of government to assert any claim upon that Government, to transact any business with it, to seek its protection, to share its offices, to engage in administering its functions. Free access to its seaports; . . . to the sub-treasuries, land-offices,

and courts of justice in the several States. To demand the care and protection of the Federal Government over life, liberty, and property when on the high seas or within the jurisdiction of a foreign government. To peaceably assemble and petition for redress of grievances. The writ of *habeas corpus*. To use the navigable waters of the United States however they may penetrate the territory of the several States. To become a citizen of any one of the several States by a *bona fide* residence therein." Freedom from State discrimination against citizens of other States in respect of commercial transactions is an immunity of U. S. citizenship, unless such discrimination is a valid exercise of the police power.

The amendment under consideration applies only to State action, and not to that of individuals. Congress, therefore, is not authorized to declare it a crime for individuals to conspire to deprive any person of his privileges and immunities as a citizen of the U. S. *Civil Rights Cases*, 109 U. S. 3.

FRANCIS M. BURDICK.

Privy Council: "This is a most noble, honorable, and reverend assembly of the king . . . in the king's court or palace; with this council the king himself doth sit at his pleasure. These councilors, like good sentinels and watchmen, consult of and for the public good, and the honor, defense, safety, and profit of the realm. . . . They are called *concilium regis privatum, concilium secretum, et continuum concilium regis*. . . . To these councilors all due honor and reverence is to be given, for they are incorporated to the king himself, and bear part of his cares; they are his true treasurers, and the profitable instruments of the state." (4 Coke's *Institutes* 53.) Such was the privy council for centuries—a council within the great council; a small body selected by the king to be in constant attendance upon him, and to aid him in the performance of legislative and judicial as well as administrative duties.

Its name dates from the reign of Henry VI., while it attained its greatest importance under the Tudors and the first two Stuarts. During this period its judicial functions were so grossly abused in its court of the star chamber that they were "clearly and absolutely dissolved, taken away, and determined" by the Long Parliament in 1640. With the Restoration the privy council revived, but not its court of the star chamber. However, "the king in council was still the resort of the suitor who could not obtain justice in one of the dependencies, and the act which took away the original jurisdiction of the king in council at home did not touch petitions from the adjacent islands or plantations." Anson's *Law of the Constitution*, pt. ii., p. 442.

Its *judicial functions* remained somewhat uncertain until 1833, when they were defined by statute (3 and 4 William IV., c. 41). They are exercised by the judicial committee of the privy council, consisting of the lord-president, those members of the council holding or having held high judicial office, the lord justices of appeal, two other persons being privy councilors whom the crown may appoint, and one or two paid members who have held the office of judge in the East Indies. A quorum consists of four members, and only those members attend who have been summoned. This judicial committee does not give formal judgment in a case, but humbly advises the Queen to give effect to the conclusions it has reached. Its report, when approved by the Queen at a meeting of the privy council, is adopted by an "order in council" as the judgment of the Queen in council. It is a rule of this committee, having its origin in the secret and consultative character of the ancient council, that after a case has been decided "no publication is afterward to be made by any man how the particular voices or opinions went." (*Order in Council*, 1878.) The jurisdiction of this committee embraces all appeals made to the crown in council, the most important of which are appeals from the colonial courts, and such other matters as the crown may choose to refer to it.

Its *legislative functions* are exercised by means of orders in council, which are made under authority bestowed by statute or which issues from the royal prerogative. In the former case it is acting simply as a delegate of Parliament, and in subordination to the national legislature. Even in the latter case, according to some authorities, the crown in council is not legislating, is not enacting law, but is enforcing it. Dicey declares that "the only instances where, in modern times, proclamations or orders in council are of any effect are cases either where at common law a proclamation is the regular mode, not of legislation, but of announcing

the executive will of the king, as when Parliament is summoned by proclamation, or else where orders in council have authority given to them by act of Parliament." (*The Law of the Constitution*, p. 50.) The better view seems to be that the crown still retains a fragment of its ancient power to legislate without the assistance of Parliament; that, especially in matters connected with the colonies, where Parliament has neither legislated nor vested the exclusive power of legislation in some other body nor forbidden the crown to legislate, it may enact new laws by means of orders in council. Burgess, *Political Science*, vol. ii., p. 199; Cox, *The Institutions of English Government*, 27-30.

Its *administrative functions* are exercised at present by committees or boards. The most powerful of these, as it is the one that has absorbed all of the most important privileges of the ancient privy council, is the CABINET (*q. v.*). Other committees are those for trade and plantations, for education, for local government, for corporations, for the Channel islands. When a petition is addressed to the crown touching matters within the administrative jurisdiction of the council, it is referred to the appropriate committee for advice. Many matters are brought before the council as a body. Modern legislation has created new boards and transferred to them much of the business which belonged formerly to the council.

Appointment, Oath, and Dismissal.—A person becomes a privy councilor by royal nomination, upon taking the oaths of office and allegiance at a council meeting. "The members composing the privy council may be said to fall into three groups. Members of the cabinet must necessarily be made members, as the confidential advisers of the crown. Beyond these there are great offices which, though unconnected with politics, are usually associated with a place on the council board. Beyond these, again, is a group of persons eminent in political life or in the service of the crown, upon whom the rank of privy councilor is conferred as a complimentary distinction." (Anson's *Law of the Constitution*, pt. ii., p. 135.) At present the number of privy councilors is about 200. The tenure of office is for life, subject to dismissal at the pleasure of the crown. The oath binds the councilor to be a true and faithful servant of the crown; to resist to his uttermost any affront to the monarch and to report the same; to truly declare his opinion upon all matters before the council; to keep secret all matters treated of in the council; to bear faith and allegiance unto the crown, and in all things to do as a faithful and true servant ought to do to the crown. See Nicolas, *Proceedings and Ordinances of the Privy Council*; Dicey, *The Privy Council*; Palgrave's *Original Authority of the King's Council*; and Finlason's *Judicial Committee of the Privy Council*.

FRANCIS M. BURDICK.

Privy Seal: the minor seal of the British Government, affixed to papers of minor importance, and also to important documents preparatory to the affixing of the great seal. The privy seal is in the care of a great officer of state, usually one of the cabinet, called the lord privy seal.

Prize [from O. Fr. *prise*, a taking or seizing, something taken or seized, deriv. of *prendre* (perf. partic. *pris*), take]; something taken on the sea, as belonging to an enemy in war or to a neutral—i. e. to a person resident in a neutral state who is identified with such enemy. A vessel of a nation taken by its own cruisers, if engaged in illegal trade, may also be called a prize. A prize can become the property of the captor only after trial and condemnation by a competent court. This will be the prize-court of the state to which the captor belongs. In Great Britain questions of prize are decided by her Majesty's high court of justice, which is one division of the Supreme Court of Judicature, in which the old admiralty and other courts were merged by act of 1873. A corresponding court in France is the council of prizes, subject to appeal. In the U. S. admiralty cases are tried by the U. S. district courts, with appeal to the Supreme Court.

Revised by T. S. WOOLSEY.

Prjeval'sky, or Prejevalsky, NICOLAI MICHAELOVITCH: explorer; b. on the family estate of Otradny, government of Smolensk, Russia, Mar. 31, 1839; descendant of a Cossack of the Zaporog, whose heroism gave him the surname of Prjevalsky (from the Polish *Prze*, very, and *valit*, to make war), and who was ennobled by Stephen Bathory, King of Poland. He was educated in the civil gymnasium of Smolensk, where he was noted for an extraordinary memory. In 1855 he entered the military profession, and five years later the Military Academy, where he showed

stronger predilections for history and natural science than for military subjects. In 1863 he rejoined his regiment as adjutant, but remained with it only a year. He then obtained the post of lecturer on history and geography in the cadet school at Warsaw. In 1867 he received an assignment as geographical explorer, and was sent to the Ussuri country in Eastern Siberia, where he remained two years. His results were published in Russian in 1870. From the maritime province he traveled southward to the Yang-tse river, thence northward through the desert of Gobi to Irkutsk, reaching the latter place in 1873. In 1876-77 he explored Lob-Nor and the Altyn-Tag Mountains. He crossed into Tibet in 1879, but was turned back before Lhasa was reached, and returned to Russia through great dangers and hardships. In 1883-85 he again explored the desert of Gobi, the sources of the Hwang-ho and the Lob-Nor district, and again unsuccessfully attempted to reach Lhasa. Later he was placed in command of a large force and instructed to reach Lhasa at all hazards, but he died on Nov. 1, 1888, of typhus fever, before the expedition had been fully organized.

Though of Polish descent, he was an intensely patriotic Russian. His geographical work was recognized by many honors received from geographical societies and others throughout the world. His explorations after the first were described in numerous publications, which have been translated from Russian into the other European languages. A sketch of his life was published in St. Petersburg in 1890, by N. T. Dubrovin.

MARK W. HARRINGTON.

Pro'a, or **Pro'hu** [from Malay *prāu*, *prāhū*]: a canoe-like sailing vessel of the Malays, Ladrone islands, etc. The lee side is straight and flat from stem to stern, the other rounded. Both ends are alike. The vessel carries a lug-sail of matting. A framework projects to windward, and counterbalances the effect of the wind upon the sail, which would otherwise upset the craft. Proas are commonly some 30 feet long and very rapid sailers. They were once much used by pirates. The name is often applied to Malay vessels of other kinds, some propelled by oars and paddles, and some by sails also.

Proach, Lucky: See FATHER LASHER.

Probability, Theory of, or (more usually) **Calculus of Probabilities** [*probability* is from Lat. *probabilis*, deriv. of *probabilis*, probable, liter., provable, deriv. of *proba're*, try, approve, prove]: the application of mathematical reasoning to the art of judging in cases where only probable evidence can be obtained. The mode in which the judgment may be thus assisted can be best seen by beginning with some simple examples before laying down any general principles. Suppose a die to have two of its six sides painted black, the remaining four being left white, and a person to be required to judge whether, upon the die being thrown, a white or a black side will be uppermost. Common sense will teach him to guess the white side, not because he can certainly say it will be thrown, but because it will be more likely to be thrown. In common language it would be said that the chances were two to one in favor of white. In mathematical language a slightly different expression is used, the probability of an event being a proper fraction, of which the denominator is the entire possible number of chances or cases, while the numerator is the number of those cases which favor the proposed event. In the case just supposed, for instance, there are six sides to the die, of which one and one only must be thrown. Four of these sides being white, the probability of white being thrown is $\frac{4}{6} = \frac{2}{3}$, and that of black is $\frac{2}{6} = \frac{1}{3}$. If one of the four white sides were painted yellow, the probabilities would be white $\frac{3}{6}$, black $\frac{1}{6}$, yellow $\frac{2}{6}$. If the event is impossible, there are no cases which favor it, and in the notation just indicated its probability is 0. If all the cases favor it, and its occurrence is therefore certain, the probability is 1. As no degree of probability can exceed certainty, all degrees of probability are somewhere between the limits 0 and 1.

The mathematical solution of problems in probabilities consists, first, in dividing the possible processes or results into elementary and equally probable cases; and, secondly, in finding how many of these cases favor the proposed event. In the case just supposed of a single die this is very simple, and no one could mistake the mode of arriving at a solution; but when the result depends on the concurrence of a number of circumstances, the reasoning becomes much more complex. Suppose, for instance, that two dice are thrown. Then any one of the six sides of one die may be

combined with any side of the other, making, in all, thirty-six combinations. To find the probability of any result from the throw of such a pair, we must find how many of these combinations will give rise to the combination in question, and divide the number by 36. In making this calculation there is great room for mistakes; indeed, the subject of probabilities is by far the most slippery one with which the mathematician or logician has to deal. Suppose, for instance, that a sharper should offer to a countryman to give him three cents every time two ones were thrown with two dice, provided the other would give him two cents every time a one and a two were thrown. At first sight the countryman might consider the two results equally probable, and therefore feel sure, in the long run, of gaining; but he would be sure to lose, because two different numbers are twice as likely to be thrown as a pair of the same number. To have two ones each die must fall with one uppermost; but to have a one and a two, one may be a one and the other a two, or the first may be two and the second one; so that for this result there are two cases out of thirty-six, while in the first there is but one. It can not be doubted that an understanding of this calculus would afford a very material aid to the judgment in weighing and estimating the probabilities of events in the affairs of life; for, although these events, or the causes which give rise to them, can not generally be made the subject of mathematical calculation, yet the examination and enumeration of the various combinations of circumstances which may give rise to an event affords our only means of judging of its probability. The longer a man's experience of worldly affairs and the sounder his judgment, the more nearly he will conform to the rules and methods of the mathematical calculus in estimating probabilities. An eminent writer happily described the calculus of probabilities as common sense expressed in numbers.

One of the most generally useful rules of this calculus is that although an event may be extremely improbable if it has but one opportunity to happen, yet if we increase the numbers of opportunities indefinitely it will be sure to happen in the long run. By the same principle, if the concurrence of a large number of circumstances is necessary to the production of an event, each of these circumstances may be, in itself, very probable, and yet their concurrence, and consequently the event itself, very improbable. The mathematical rule for determining probability in such a case is that the probability of the concurrence of all the events is equal to the continued product of the probabilities of all the separate events. As one example, suppose that a law requiring the concurrence of the two houses of Congress and the President were as likely as not to be rejected by any one of them, and that each one of the three authorities formed his own opinion independently of the other two. Then the probability of each authority approving the law being $\frac{1}{2}$, the probability of its passing all three would be $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$. We can get at the same result in this way: Out of 8 laws introduced into the House only 4 would pass and go to the Senate. Out of these 4 the Senate would pass 2, and of these 2 the President would approve 1. On this principle an event which has to pass the ordeal of a great number of small dangers is sure to fail at last, though each separate danger may itself be small. Suppose, for instance, that a bridge has 100 holes in it, and that a person passing over this bridge has 9 chances out of 10 of going safely past each individual hole. Notwithstanding so many chances in his favor for any particular hole, the chance that he would escape them all is only 1 in 37,650. That is, if we take the fraction $\frac{1}{10}$, which expresses the probability of passing any one hole safely, and multiply it by itself 100 times, the result will be about equal to $\frac{1}{37,650}$. One of the principal marks of the practical wisdom of age and experience is the ability to recognize this principle, and there are plenty of proverbs which are really founded on it.

One of the most curious and important results of this calculus is seen in what is termed the law of averages, or the tendency of chance events which occur in great numbers to follow regular laws. The life of an individual is proverbially one of the most uncertain things in human affairs; but when we take large bodies, like the population of a state or a great city, the deaths follow a law so exact that mathematical tables of their probable number can be formed, and on these tables life-insurance companies can arrange their rates of premium with the moral certainty that the death-rate will not vary seriously from that calculated. Not only the total number of deaths, but the proportion of deaths from the most fortuitous causes follow

nearly their regular law. No doubt if we could learn how many men are killed by falling from houses, we should find it wonderfully constant from year to year. In cases like this the constancy of the result is the consequence of some widespread underlying cause, hidden by other accidental causes acting in different ways in individual cases. Thus a table of mortality is the combined expression of a certain law of the human constitution and certain conditions of the climate. The number of deaths by falling from scaffolding expresses the degree of general carefulness or carelessness which characterizes men engaged in building. The general rule is that in order that a law of averages may be closely followed it is necessary that the seemingly accidental events enumerated should be the result of two sets of causes, of which one is invariable throughout the whole period of time, while the other is entirely accidental in each individual case. When the variable or chance causes are not purely accidental, but affect large masses or vary from year to year, there is no longer any such exact law. For instance, if a large fraction of the population died from occasional epidemics, there could no longer be an exact law of mortality. The great classic treatise on this subject is Laplace, *Théorie Analytique des Probabilités*, which involves much profound mathematics. Bertrand's *Calcul des Probabilités* (Paris, 1889) is most interesting, philosophical, and amusing, using only elementary mathematics; De Morgan's *Theory of Probabilities* is the best-known book in English.

S. NEWCOMB.

Probate Courts: See WILL.

Proboscidea [Mod. Lat., from Lat. *proboscis*, *proboscis* + Gr. *προβοσκis*, *προβοσκιδος*, *proboscis*; *πρό*, in front, before + *βοσκειν*, feed, graze]: an order of mammals distinguished by the extension of the nose into a proboscis and the columnar form of the legs and feet, and typified by the elephants of the present epoch. The placenta is deciduate and zonary; the incisors variable in number— $\frac{3}{2}$, or in extinct forms $\frac{3}{2}$ or $\frac{2}{2}$ —but always with persistent pulps, and developed as long tusks curved outward; the feet have the palmar and plantar surfaces invested in extended pad-like integuments, which also underlie the toes; the carpal bones are in two regular (not interlocking) rows, and are broad and short; the toes are in all the known forms five to each foot, and incased in shallow hoofs. The order is represented by one living family (*Elephantidae*), to which belong the extinct mastodons, and to it by almost all authors an extinct family (*Dinotheriidae*) has been also referred; these are distinguished from each other by great differences in the structure of the skull, as well as in the development of the teeth, the peculiar dentition of the elephants not being shared by the dinotheriids. See ELEPHANT, DINOTHERIUM, MAMMOTH, and MASTODON. Revised by F. A. LUCAS.

Proboscis Monkey: See KAHUA.

Probus: Roman emperor from 276 to 282 A. D. He was put to death in the latter year by his own soldiers, after a very efficient administration of six years, chiefly occupied with the defense of the northern frontier. G. L. H.

Probus, MARCUS VALERIUS: the most distinguished of Roman grammarians bearing the name of Probus. Coming from Berytus (now Beyrouth), he taught in Rome in the latter half of the first century A. D., and edited, after the manner of the Alexandrine grammarians, the text of Horace, Vergil, Lucretius, Terence, Persius, and probably other writers. The *Commentary* to the *Eclogues* and *Georgics* of Vergil, still extant, under his name is of later date, as are several grammatical treatises bearing the name of Probus. See especially Teuffel, *Gesch. der Röm. Lit.* (§ 300), where the abundant literature on the subject is cited. M. WARREN.

Procedure [from O. Fr. *procedure*, deriv. of *procedere*, proceed < Lat. *procedere*; *pro*, forward + *cedere*, go]: in the usage of modern legal writers, all the formal steps and proceedings in the conduct of a judicial controversy as established by the legal rules which control their use.

Development of Procedure in General.—Certain uniform principles seem to have determined the nature and moulded the history of procedure in every national jurisprudence that has made a complete progress from rude beginnings to a condition of comparative philosophical and equitable perfection. The earliest stages are always characterized by an intense formalism; the remedies which the law affords are restricted almost wholly to such as can be pursued by the use of arbitrary technical forms, each appropriate to a particular wrong or remedy, which must be followed with

scrupulous exactness; and the defenses which can be interposed are likewise restricted by forms equally arbitrary and technical. The growth of the jurisprudence for a considerable period consists in the modification of these forms and their extension to new facts and relations; in time the dominion of forms is relaxed, the technical and arbitrary features gradually disappear, and at last the methods of administering justice become simple, and are based upon equitable notions. The state of legal procedure and the judicial remedies of a nation closely reflect the condition of its civilization; and the number and scope of remedies, and the methods of enforcing them, must keep pace with the culture of the nation and provide for its wants. The necessities, however, arise first, and the law afterward responds to them. This course of development marks an entire progress of the ROMAN LAW (*q. v.*), and has been exhibited no less clearly in the development of the jurisprudence of England and the U. S.

Development of Procedure in English Law.—The most striking feature of the procedure originally prevailing in England is the separation into two distinct and widely differing systems, the common law and the equitable—the former exclusively used by the courts of law for the enforcement of legal rights in connection with the jury trial; the latter employed by the courts of equity for the enforcement of equitable rights alone without the jury.

Of the two, the common-law methods were much the elder. From the earliest periods rights were enforced in the law courts by means of different actions, the most important of which, denominated "real actions," were solely used for the recovery of lands. Prior to Edward I. there existed but three actions for the recovery of money—debt, covenant, and trespass. By virtue of a statute passed in the reign of that king (13 Edw. I., c. 24) other forms were afterward invented. The highly technical real actions were subsequently abandoned, with a few occasional exceptions, and the following actions became established as the ordinary means of enforcing legal rights: "ejectment," to recover possession and to try the title of lands; "detinue" and "replevin," to recover possession of chattels; "covenant," to recover damages for the breach of a sealed agreement; "debt," to recover a fixed and certain sum of money owed by the defendant, not as damages; "assumpsit," to recover damages for the breach of a contract not under seal, whether written or verbal, express or implied; "trespass," to recover damages for a wrongful act of violence to person or property; "case," to recover damages for a wrong to person or property unaccompanied with violence, or when the injury was consequential; "trover," to recover damages for the wrongful detention and conversion of chattels. The rules which governed these actions were technical and formal, and the courts were more often employed in deciding whether the proper kind of action had been brought, or whether the correct formulas of words had been used, than in adjudicating upon the actual merits of causes and determining the real rights of the parties. Inseparably connected with this diversity of actions was the common-law system of pleading; the two reacted upon and supported each other, and the technicalities of the one brought out and strengthened the formalism of the other.

The procedure in equity was based upon more simple and natural notions, and, however much it may have become encumbered by dilatory and unnecessary practices, these were not inherent and essential. No forms of actions existed, but a single method sufficed for all kinds of claims, defenses, and reliefs. The complainant stated his case with great minuteness of detail in a "bill," the defendant set forth his version in an "answer"; and upon these pleadings and the proofs the chancellor rendered his decree. In this judgment the rights, claims, and liabilities of all the parties were adjusted, and relief could be granted alike to defendants or to complainants. It was therefore a cardinal principle of the equity procedure that all persons interested in the controversy and who could be affected by the decree should be made parties to a suit.

All these principles, methods, and rules of the common-law and the equity procedure were incorporated into the jurisprudence of the U. S., and although they have been modified in many of the commonwealths, in others they are retained substantially as they existed at the time when Blackstone wrote his *Commentaries*.

The Codes.—A revolution has finally been effected in the U. S. and in England in every respect identical with that which took place in the Roman law when the prætor's ex-

traordinary jurisdiction was extended to all kinds and classes of litigations. In 1848 the Legislature of New York adopted a code of civil procedure—chiefly planned and created by David Dudley Field—which entirely abandoned all former existing methods, and inaugurated a new system for the enforcement of rights and the recovery of remedies. Its central principle is the abolition of all distinction between actions at law and suits in equity, and of all forms of action, and the establishment of a single judicial instrument called the “civil action,” by which all rights are maintained, duties enforced, and reliefs obtained. Legal and equitable claims, defenses, and remedies may be combined, and the single judgment of the court may determine and establish the final sum of all the rights and interests belonging to the litigant parties. With the common-law forms of action the common-law forms of pleading are also abandoned, and in their stead is substituted one simple and natural mode which only requires the parties to state in ordinary language the actual facts which constitute their causes of action or defenses. The system has been accepted—sometimes with unimportant modifications, but often without any change from the original type—in most of the States and Territories, and may be styled the “reformed American procedure.” Passing beyond the limits of the U. S., it prevails in several of the British colonies, and has been adopted in all its essential principles in England itself. The first step in England was made by the Common Law Procedure Act of 1854, but it was not fully adopted until, by the Judicature Acts of 1873 and 1875, all law and equity courts were consolidated into one tribunal, and all distinctions abolished between legal and equitable forms of actions and procedure. The history of procedure does not present another so remarkable instance of legislation. See Bigelow's *History of Procedure in England*; Stephen's *History of the Criminal Law of England*, and the general treatises on pleading and practice.

Revised by F. STURGES ALLEN.

Procellar'idæ [Mod. Lat., named from *Procella'ria*, the typical genus, from Lat. *procel'la*, storm]: a family of birds of the order *Tubinæres*, including the petrels and albatrosses. These have a gull-like body; the neck rather short; the bill moderate, and composed of several pieces, and in some species, if not in all, the bill is shed and renewed as well as the plumage; the nostrils at the end of tubular processes, which are more or less immersed in grooves; the wings are generally elongated and pointed, rarely (as in *Pelecanoides*) short; front toes connected by a web, posterior rudimentary or wanting; the skull is schizognathous, and in most respects agrees with that of the gulls and loons, but exhibits some distinctive characters, and has been regarded by Streets as indicating a peculiar superfamily (*Nectriomorphæ*). The family is generally divided into three subfamilies: (1) *Procellarinæ*, including most of the small species; (2) *Diomedeinæ*, comprising the albatrosses; and (3) *Pelecanoidinæ*, represented by the single aberrant genus *Pelecanoides*. See ALBATROSS, FULMAR, MOTHER CAREY'S CHICKEN, and PETREL.

Revised by F. A. LUCAS.

Process [viâ O. Fr. from Lat. *proces'sus*, a going forward, advance, progress, process, deriv. of *proce'dere*, go forward; *pro*, forward + *ce'dere*, go]: in law, a generic term primarily used to designate all the means by which a defendant is compelled to appear and answer to an action brought against him (*original process*), the means of enforcing the judgment recovered therein against him, and also the means by which his property is secured or taken in satisfaction of such judgment (*final process*); and also various other judicial writs or orders issued pending the suit or action upon collateral or interlocutory matter, as to summon witnesses, juries, etc. (*mesne process*). In the criminal procedure it denotes the warrants or other writings authorizing and directing the arrest of persons charged with offenses. In a more general sense it embraces all judicial writs commanding public officers or private individuals to do a specified act; and, finally, it is used, although not technically, as synonymous with “proceeding.” Actions at law were formerly begun in England by a process called the “original writ,” which was issued in the king's name, contained a statement of the complaint, and was addressed to the sheriff, commanding him to summon the defendant. This writ was practically abolished in the reign of William IV., when it was enacted that all personal actions should be commenced by the writ of *CAPIAS* (*q. v.*), directing the sheriff to arrest the defendant; or if he was not to be arrested by the writ of *SUMMONS* (*q. v.*), directing the defendant to appear. The

corresponding process in chancery suits was the “writ of subpoena,” while that in the ecclesiastical and admiralty courts was termed a “citation”; both were, like the summons, personal orders to the defendant. At present all actions are commenced in England by a process in the nature of a summons. In the U. S., wherever the reformed procedure has been adopted, all actions in the superior courts are begun by a summons or notice to the defendant directing him to appear and answer within a specified number of days; in several of the States it is issued directly by the plaintiff or his attorney, in others by the clerk of the court in which the suit is brought. In those commonwealths which retain the common-law methods different forms of preliminary process are used, but, under whatever names, they are generally analogous to the writ of summons. A peculiar local practice prevails, however, in New England, of beginning legal actions by attaching the defendant's property. (See ATTACHMENT.) Final process is of two kinds—that against the property and that against the person. Final process is now commonly called *EXECUTION* (*q. v.*). In addition to these preliminary and final steps, there may be, under certain circumstances and in a special class of actions, intermediate (*mesne*) proceedings in the nature of process against the defendant—namely, an order or warrant of arrest, by virtue of which he is taken and held to bail or detained, and a warrant or order of attachment, by virtue of which his property is seized and held to wait the final judgment.

Revised by F. STURGES ALLEN.

Procession of the Holy Spirit [*procession* is from Lat. *proces'sio*, deriv. of *proce'dere*, *proces'sum*, go forth; *pro*, forward, forth + *ce'dere*, go]: a term based on John xv. 26, where Christ says of the Spirit whom he will send from the Father that “he *proceedeth* from the Father” (παρὰ τοῦ πατρὸς ἐκπορεύεται, hence ἐκπορεύσις, *procession*). It designates in the orthodox theology the characteristic individuality (ἰδιότης, *proprietās*, *character hypostaticus*) of the third Person of the Holy Trinity, as the eternal generation (γεννήσις, *generatio*) is the characteristic property of the Son, and the unbegotten paternity (ἀγεννησία, *paternitas*) the exclusive peculiarity of the Father. There is an old difference between the Greek and Latin Churches about the *single procession* (from the Father alone) and the *double procession* (from the Father and the Son). The Nicene Creed as enlarged at Constantinople (381) asserts only the procession from the Father (*Sp. S. qui ex Patre procedit*), in verbal adherence to the passage in John, and the Greek Church understands this in an exclusive sense (from the Father alone). The Latin Church, after Augustine, taught the double procession, and afterward embodied it, without asking the consent of the Greeks, in the Nicene Creed by the insertion of *filioque* (“and from the Son”). This famous clause first appeared in 589, at a synod of Toledo in Spain (in strong opposition to Arianism), and in spite of the protest of Pope Leo III. (809) it was gradually adopted in the Latin Church, from which it passed into the Protestant churches. This difference has caused a great deal of bitter controversy since the days of Photius, Patriarch of Constantinople (d. 891). The councils of Lyons (1274) and of Florence (1439) endeavored to settle it, but in vain. The Greek divines plead in favor of the single procession the letter of the Scripture, the original text of the Nicene Creed, and the dignity or monarchy (μοναρχία) of the Father as the sole fountain, cause, and root of the Deity; they also make a sharp distinction between the eternal metaphysical *procession* of the Spirit from the Father alone, and the historical *mission* of the Spirit from the Father and from the Son (John xiv. 26; xvi. 7). The former belongs to the Trinity of essence, the latter to the Trinity of revelation, and begins with the day of Pentecost. The Latin divines infer the double procession (taking this term in a wider sense) from the double mission and from the essential unity (or *homousia*) of the Son with the Father, so that if the Spirit proceeds from the essence of the Father he must proceed also from the essence of the Son, both being the same. A compromise was suggested by the formula that the Spirit proceeds from the Father *through the Son* (διὰ τοῦ υἱοῦ). When Pius IX. invited the Eastern patriarchs to the Vatican Council in 1870, they renewed the old protest against the heretical *Filioque*. The Döllinger Union Conference between Old Catholics, Orientals, and Anglo-Catholics discussed this controversy at Bonn in Aug., 1875, and came to an agreement which surrenders the *Filioque* as an unauthorized interpolation to the Creed, and indorses the single procession of

the Spirit from the Father alone, but through the Son, as taught by John of Damascus, the last of the Greek Fathers. See HOLY GHOST.

PHILIP SCHAFF.

Procida, prō'chēe-dă (anc. *Prochyta*): island; in the province of Naples, Italy, lying between Ischia and Cape Miseno. It is not more than $8\frac{1}{2}$ miles in circumference, and is composed of volcanic tufa; the town of Procida, on the east side, stands on a high and rugged rock which is almost surrounded by water. The principal edifice, besides the churches, is the royal palace of the Bourbons, who frequently came here for health or amusement. Procida was originally a Greek settlement, and in spite of the long Roman domination, of the devastations of the Saracens, of Spanish and British occupations, the inhabitants still claim to be of Greek descent. They are occupied in agriculture, in tunny-fishing, and in the search for coral. Pop. 13,131.

Proclamation of Emancipation: See EMANCIPATION, PROCLAMATION OF.

Pro'clus: philosopher; b. at Byzantium, Feb. 8, 412 A. D.; educated at Xanthus in Lycia, from which his family descended; studied at Alexandria and Athens, and became a celebrated teacher in the latter city, where he died Apr. 17, 485. He was the last member of the Neoplatonic school who acquired any celebrity. He labored hard to make converts from Christianity. There is no complete edition of his works which are still extant. That by Cousin (6 vols., Paris, 1820-27) contains the treatises on *Providence and Fate*, the *Ten Doubts about Providence*, the *Nature of Evil*, and the commentaries on the *Alcibiades* and *Parmenides*. There are translations in English by Thomas Taylor of the *Commentaries on the Timæus*, the *Theology of Plato*, the *Commentary on Euclid*, and of *Five Hymns* (London, 1816).

Proc'ne: See PHILOMELE.

Proconsul [= Lat.; *pro*, for + *consul*]: a magistrate in the ancient Roman government who exercised consular authority over a province or an army, but not over Rome. In many cases he was a consul, who after the expiration of his term of service was sent to control a province, but sometimes the proconsul was not even of consular rank.

Proco'pius: author; b. at Cæsarea, Palestine, in the beginning of the sixth century A. D.; studied at Constantinople; accompanied Belisarius as his secretary on his campaigns in Asia, Africa, and Italy, and held after his return to Constantinople the highest dignities in the civil service of the Byzantine government. His extant works include *Historia*, a representation of the history of his own time, clear, trustworthy, and interesting, translated into English by Henry Holcroft (London, 1653); *Ktismata*, a work on the public buildings erected during the reign of Justinian; and *Anecdota*, translated into English under the title of *The Secret History of the Court of the Emperor Justinian* (1674). The Procopian authorship of the *Anecdota* has been questioned, but recent investigation seems to be decidedly in favor of the genuineness of the work. See Krumbacher, *Geschichte der byzantinischen Litteratur*, p. 43; Teuffel, *Studien und Charakteristiken*, p. 267. A complete edition of his works was published by W. Dindorf (3 vols., Bonn, 1833-38).

Revised by B. L. GILDERSLEEVE.

Procopius the Great: soldier; b. about 1380; was ordained a priest, but on the outbreak of the Hussite war he joined the army and distinguished himself so greatly that after Ziska's death in 1424 he was chosen commander-in-chief by the Taborites. On the approach of the German armies of crusaders the different Hussite parties, among which were the Orphans under Procopius the Less, united under the leadership of Procopius the Great, and a war ensued (1527-32), remarkable at once for the valor and cruelty which the Hussites evinced. They made successful campaigns in Saxony, Silesia, Moravia, Hungary, Austria, and Bavaria. In 1433 the Hussites consented to send eight delegates to the Council of Basel. Procopius was one of them, and he took part with great energy in the debate, but after the lapse of fifty days the Bohemian delegates grew tired and returned to Prague. Papal commissioners followed them, and at last a compromise was brought about between the Roman Catholics and the Calixtines. The Taborites, however, refused to have anything to do with the pope, and thus arose a controversy between them and the Calixtines which soon grew into open warfare. At the battle of Bömischbrod (May 30, 1434) a sudden panic seized the Taborite army; it was utterly defeated, and both Procopius the Great and Procopius the Less fell.

Procrus'tes [in Gr. Προκρούστης, the stretcher]: a surname commonly given to the famous robber Polypemon or Damastes, who used to place all persons that fell into his hands on an iron bed, and cut off or stretch out their limbs until they fitted the bed. He was slain by Theseus near the Cephissus in Attica.

Procter, BRYAN WALLER: poet; familiarly known under his pseudonym of *Barry Cornwall*; b. in London Nov. 21, 1787; educated at Harrow; studied law in Wiltshire; removed to London, where he was admitted to the bar in 1831, but did not attain prominence as a counsel. The lucrative position of commissioner of lunacy, however, which he held for many years, supplied the means as well as sufficient leisure for the culture of his literary and poetic tastes. In 1819 he published a volume entitled *Dramatic Scenes and Other Poems*, which was the beginning of his literary career. In 1821 his tragedy of *Mirandola* was produced at the Covent Garden theater with much success. It is as a writer of refined, melodious, and inspiring songs that he is best remembered and esteemed. D. Oct. 5, 1874. His *Poetical Works* have had wide circulation in Great Britain and the U. S.—His daughter, ADELAIDE ANNE PROCTER, b. in London Oct. 30, 1825, wrote two volumes of verse, *Legends and Lyrics* (1858 and 1860). D. Feb. 2, 1864. Her works were reissued in 1865 with an introduction by Charles Dickens.

Revised by H. A. BEERS.

Proctor [M. Eng. *proketour*, viâ O. Fr. from Lat. *procurator*, manager, agent, deriv. of *procura're*, take care of, manage; *pro*, for + *cura're*, to care, deriv. of *cura*, care]: in law, an officer of the admiralty and ecclesiastical courts in England, empowered to bring and conduct proceedings therein on behalf of suitors, corresponding to the attorney and the solicitor of the ordinary tribunals. From an early day a body of men were attached to these ecclesiastical and admiralty courts who had the exclusive authority to appear therein, and to bring or defend all causes in the same manner that actions at law and suits in equity are brought and managed by attorneys and solicitors. Admission to the body was obtained, after a long clerkship, by means of a commission issued in the name of the Archbishop of Canterbury. The class of professional men who actually tried or argued the causes, or performed other duties, before the court itself—whose functions, in other words, were similar to those of the barristers or counsel—were termed "advocates." The title of proctor is still used, but the distinction between proctors and the other members of the legal profession has been abolished. The jurisdiction of the ecclesiastical courts in matrimonial and testamentary causes having been taken away (see COURTS), compensation to the proctors, whose practice was in these courts, was made by admitting them to practice not only in the probate and divorce courts, but in the courts of equity and common law also. (See 20 and 21 Vict., c. 77, §§ 43, 105, 106, and c. 85, § 69; 21 and 22 Vict., c. 95, § 9, and c. 108, § 13; also 23 and 24 Vict., c. 27.) By the Solicitors' Act of 1877 (40 and 41 Vict., c. 25, § 17) solicitors are allowed to practice as proctors, and the Legal Practitioners' Act of 1876 (39 and 40 Vict., c. 66) allows solicitors to appear in the provincial courts of Canterbury and York.

There are no proctors, as a separate order or class, in the legal profession of the U. S., although the designation is often assumed by attorneys in admiralty cases, or when practicing before surrogates or courts of probate.

"Proctors of the clergy" in the English ecclesiastical law are the delegates or representatives of cathedral and other collegiate churches, and also of the common clergy in every diocese, appointed to sit in the convocation of the Church, that is, the assembly of the clergy held during the session of parliament, but which has long since ceased to exercise any legislative powers. Revised by F. STURGES ALLEN.

Proctor, REDFIELD: U. S. Senator; b. at Proctorsville, Vt., in 1831; graduated at Dartmouth College in 1851; studied at the Albany Law School; when the civil war broke out was practicing law. He enlisted in 1861 in the Third Vermont Regiment; became major of the Fifth, and afterward colonel of the Fifteenth Vermont, but returned home, after the battle of Gettysburg, in broken health; served in Vermont Senate and as Lieutenant-Governor; was Governor 1878-80; chairman of the Vermont delegation in the Republican National Convention of 1888, and became Secretary of War in 1889; resigned in 1891 and was appointed U. S. Senator to fill the vacancy caused by the resignation of Senator Edmunds, and in 1893 was elected Senator for a full term.

Proctor, Richard Anthony: writer on astronomy; b. in London, England, Mar. 23, 1837; entered King's College, London, in 1855, and St. John's College, Cambridge, in 1857, and graduated in 1860. His first literary effort was an article on *Double Stars* in *The Cornhill Magazine* for Dec., 1863. In 1865 he published his first book, *Saturn and its System*, which was soon followed by his *Giannone Star Atlas*, and in 1866 by his *Handbook of the Stars*. In 1867 he published *Constellation Seasons*; in 1868, *Half Hours with the Telescope*; in 1869, *Half Hours with the Stars*; in 1870, his most celebrated work, *Other Worlds than Ours, The Plurality of Worlds Studied under the Light of Recent Scientific Researches*; in 1871, *The Sun, Elementary Lessons in Astronomy*, and the first series of *Light Science for Leisure Hours*; in 1872, *The School Atlas of Astronomy, Essays on Astronomy, Orbs around Us, and Elementary Lessons on Physical Geography*; in 1873, *Light and Science, The Moon, The Border-land of Science, The Expanse of Heaven, The Universe and the Coming Transits*; in 1874, *Transits of Venus* (3d ed. 1878); in 1878, *A Treatise on the Cycloid and all Forms of Cycloid Curves, and on the Use of Cycloid Curves in dealing with the Motions of Planets, Comets, etc., and of Matter projected from the Sun*; in 1887, *Easy Lessons in Differential Calculus*; in 1888-90, *Old and New Astronomy*. In 1881 he founded the science periodical *Knowledge*. He several times visited the U. S., and lectured in the larger cities. He also lectured in Australasia. D. in New York, Sept. 12, 1888. Revised by S. NEWCOMB.

Procurator: the designation of a Roman administrative officer, charged with the management of the revenues and business affairs of a province. Although not of military rank troops were assigned to him for the administration of his office, and he was recognized as second in authority to the governor. He might therefore, in the absence of his superior, or during temporary vacancy of the governorship, assume entire charge of a province, or he might be put at the head of a whole district in a province too large to be governed by one person. G. L. HENDRICKSON.

Procyon'idæ [Mod. Lat., deriv. of *Procyon*, the typical genus; Lat. *Procyon* = Gr. *πρόκυων*, a constellation rising before the Dog Star, *πρό*, before + *κύων*, dog. The word has been, however, falsely used here, as if signifying "instead of or like a dog"]; a family of carnivorous mammals represented by the raccoons and the coatis. The teeth are in number 40 (M. $\frac{3}{2}$, P. M. $\frac{3}{2}$, C. $\frac{1}{2}$, I. $\frac{3}{2} \times 2$); the last molar of the upper jaw is more or less transverse and compressed forward; of the two molars in the lower jaw, the first is broadest; the last premolar of the upper jaw and the first molar of the lower are tubercular. The snout is more or less slender; the feet elongated, and with separated digits capable of grasping in a hand-like manner. The family includes two sub-families: (1) *Procyonina*, with the genus *Procyon*, or the raccoons, and (2) *Nasutina*, with the genus *Nasua*, or the coatis. They are peculiar to America, and naturally to the warmer regions, although a species of raccoon ascends far to the northward in the U. S. See COAT and RACCOON.

Revised by F. A. LUCAS.

Profert: See OYER.

Profit à Prendre: See HEREDITAMENTS.

Profits [Fr., from Lat. *proficio*, *profectus*, to progress]: an excess of earnings above expenses. In order to ascertain the real profit of an enterprise, we must take care to count depreciation of capital as an expense. Thus if the gross earnings of a business are \$10,000 a year, and the current expenses \$6,000, the apparent profit is \$4,000, but if the invested capital is worth \$1,000 less at the end of the year than it was at the beginning, the real profit is only \$3,000. It is a disputed question whether taxes should be deducted from earnings before estimating profits. There is another and narrower sense of the word under which interest is deducted before estimating profits. Thus, in the case supposed, if the capital invested is \$20,000 and the current rate of interest 5 per cent., there is an interest account, actual or nominal, of \$1,000 a year, and the net profit on this basis of reckoning is only \$2,000 instead of \$3,000. Profits in this sense represent the earnings of management as distinct from those of capital, and will vary according to the business ability of the man in control. It is hard to make an accurate distinction between profits and rent. In general, the former term is applied to income from personal property and the latter to income from real estate. See POLITICAL ECONOMY and HEREDITAMENTS (*Incorporated*).

A. T. HADLEY.

Profit-sharing: the name generally given to a modification of the wages system under which a share in the realized profits of the year's business is given to the employee, in addition to his wages already received. This bonus may be definitely determined at the beginning of the year, as when a firm promises to give 10 per cent. of its net profits to its men, or the percentage may be left to be determined at the end of the twelve months. The essential features of any such scheme are that the firm shall make known its intention at the beginning of the period, and that the sum allotted to each employee, usually on the basis of his wages, shall not be trifling. The principle of the admission of the workmen to this species of partnership (strictly limited, according to the wishes of the employer, who, in fact, has the whole matter in his own hands) is the application to modern conditions of the product-sharing common in agriculture and the fisheries. Its advocates claim for it that it tends to advance "the prosperity of an establishment by increasing the quantity of the product, by improving its quality, by promoting care of implements and economy of materials, and by diminishing labor difficulties and the cost of superintendence." In a very large majority of cases where the system has been thoroughly applied and time given for its educating effects, one or more of these results have followed, with no diminution of the employer's average profits.

In comparison with plans of co-operative production proper, profit-sharing, often styled "industrial partnership" in England, has had a much larger percentage of success in practice, as well as the general indorsement of the economists from Mill and Fawcett to Marshall and Walker. It is obviously most applicable to occupations such as handicrafts, where the extra interest naturally awakened in the workmen by the prospect of a bonus can produce an immediate and visible effect, and less adapted to manufactures where labor bears a lower proportion to the cost of material and plant. Nevertheless, some of the most prosperous trials of profit-sharing have been made in cotton and woolen mills in France and the U. S. "The father of profit-sharing" was the well-known Edme Jean Leclaire, the Parisian house-painter and decorator, whom J. S. Mill first brought to the notice of English readers. He introduced the system in 1842, and the celebrated Maison Leclaire has since been the standard example of "participation"; in the years 1870-86 the number of its employees varied from 710 to 1,129, and the ratio of bonus to wages from 12 to 24 per cent. The Laroche-Joubert paper-works at Angoulême, the noted Bon Marché, and the Maison Chaix, a very large printing-house at Paris, are other prominent instances of long and successful application of the principle of profit-sharing in France. That country counts over 100 establishments successfully conducted on this system. In England the abandonment of the Briggs Colliery Industrial Partnership in 1875 caused a cessation of effort in this direction for several years, but there has since been a notable revival of interest and faith in the plan, and there are (1894) over 100 instances of British profit-sharing firms. In the U. S. fully 100 business houses in a great variety of occupations practice the system.

Profit-sharing is not put forth by its wiser advocates as a panacea for industrial troubles, but as a modification of the wages system, applicable in many quarters with good results to both parties to the labor contract. The details of its application to any special occupation require care, but it is based on human nature and the wages system as they are; and the larger part of the failures in practice have been due to insufficient preparation and haste for results.

There are two societies devoted to the extension of profit-sharing. The French society, the head of which is Charles Robert, is composed entirely of men of business who practice the system; the American association has for its president the U. S. commissioner of labor. Both societies issue quarterly periodicals devoted to the cause.

The standard work on the subject in English is *Profit Sharing between Employer and Employee*, by N. P. Gilman (Boston, 1889; 3d ed. 1891; translated and adapted into German by L. Katscher). Later information may be found in two chapters of another work by the same writer, *Socialism and the American Spirit* (Boston, 1892). See also the *Report to the Board of Trade* by D. F. Schloss (London, 1894) and his *Methods of Industrial Remuneration* (London, 1892).

NICHOLAS P. GILMAN.

Prognathism [from Gr. *πρό*, before + *γνάθος*, jaw]: the condition of having projecting jaws or a large craniofacial angle, as in Negroes. See FACE.

Progression [from Lat. *progres'sio*, a going forward, progress, progression, deriv. of *pro'gredi*, go forward; *pro*, forward + *gru'di*, step, go]: in mathematics, a series in which each term is derived from the preceding by a uniform law.

An *arithmetical progression* is a series in which each term is formed from the preceding one by the addition of a constant quantity called the *common difference*. If the common difference is *positive*, each term is greater than the preceding one, and the progression is said to be *increasing*; if the common difference is *negative*, each term is less than the preceding one, and the progression is said to be *decreasing*. From these definitions we see that every increasing progression when taken in a reverse order becomes a decreasing progression, and that every decreasing progression when taken in a reverse order becomes an increasing progression. An arithmetical progression is said to be *given* when we know one term and the common difference: thus if one term is 9 and the common difference 5, we have, by the continued addition of 5, the series 9, 14, 19, 24, etc.; in like manner, by the continued subtraction of 5, we have the series 9, 4, -1, -6, etc. These two series written in proper order form a single progression, as follows:

$$\dots, -6, -1, 4, 9, 14, 19, 24, \dots$$

If the series has a beginning and end it is called *limited*; otherwise it is infinite or *unlimited*. Any term of a limited arithmetical progression, whether increasing or decreasing, is equal to the first term plus the product of the common difference by the number of terms that precede the term in question. The sum of all the terms of such a progression is equal to half the sum of its extremes multiplied by the number of terms.

A *geometrical progression* is a series in which each term is equal to the preceding term multiplied by a constant quantity called the *ratio of the progression*. If the ratio is *positive* and greater than 1, each term is greater than the preceding one, and the progression is said to be *increasing*; if the ratio is *positive* and less than 1, each term is less than the preceding one, and the progression is said to be *decreasing*; if the ratio is negative, the terms of the progression are alternately positive and negative. In all cases if two consecutive terms are given, we can find the ratio by dividing the second by the first. The following series, extending to an infinite number of terms in both directions, is an example of a geometrical progression:

$$\dots, \frac{1}{4}, \frac{1}{2}, 1, 2, 4, 8, 16, \dots$$

In this progression the ratio is 2, and this being given, together with any term of the series, the progression may be extended to any desired limit. If we consider a finite number of terms as constituting a *limited* geometrical progression, the n th term of the series, n being any positive whole number, is equal to the first term multiplied by the $(n-1)$ th power of the ratio; the sum of all the terms is equal to $\frac{l-r}{r-1}$, in which l is the last term, a the first term, and r the ratio.

An *harmonical progression* is a series such that of any three consecutive terms the first is to the third as the difference between the first and second is to the difference between the second and third. The reciprocals of the terms of an arithmetical progression form an harmonical progression; thus from the arithmetical progression, 2, 4, 6, 8, etc., we form the harmonical progression—

$$\dots, \frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \dots$$

Taking the first three terms, we see that

$$\frac{1}{2} : \frac{1}{4} :: \frac{1}{4} - \frac{1}{6} : \frac{1}{6} - \frac{1}{8} \quad \text{or} \quad \frac{1}{2} : \frac{1}{4} :: \frac{1}{4} : \frac{1}{6}$$

Revised by S. NEWCOMB.

Prohibition: the suppression, by law, of the manufacture, importation, and sale, for beverage purposes, of all alcoholic liquors.

Principles.—The advocates of prohibition base their demands on the following facts: (1) Scientific. Science has demonstrated that alcohol is a deadly poison, not a food, and neither necessary nor beneficial, but positively injurious, to healthy persons. Its sale for beverage purposes should therefore be entirely prohibited, and for other purposes should be regulated by the strict laws governing the sale of

other poisons, such as strychnine, arsenic, opium, etc. (2) Social. Alcoholic liquors affect not only the drinker, but transmit to his descendants the seeds of epilepsy, insanity, and the worst diseases that afflict mankind. The use of alcoholic liquors breaks down moral restraints, excites the basest passions, and instigates to crimes through which the innocent are sufferers. The effect is not only to destroy social order, disrupt families, and ruin the home life, but to deteriorate the race and mortgage future generations. (3) Economic. The raw material consumed, the labor performed, and the money spent in the manufacture and purchase of alcoholic liquor as a beverage constitute a waste of wealth. Furthermore, the public expense incurred in caring for the pauper, insane, diseased, and criminal products of the alcoholic habit comprises a very large part of the government expenditure, and is an unnecessary and unjust public burden. (4) Political. The deterioration and degradation of the citizen is a national injury, and the organized liquor-trade has become an active and damaging factor in government, defying legal restraint, thwarting justice, dominating politics, and corrupting elections and officials.

Legality.—Legally, the prohibitive principle is the basis of all restrictive legislation; but liquor license falls short of the logical procedure just to the extent that partial permission falls short of absolute prohibition. The constitutionality of liquor license is denied by many able jurists, but the constitutionality of prohibition has been established by the highest courts of the U. S. and Great Britain. "There is no inherent right in a citizen to sell intoxicating liquors by retail; it is not a privilege of a citizen of a State, nor of a citizen of the United States." (137 U. S. 86.) "No Legislature can bargain away the public health or the public morals; the people themselves can not do it, much less their servants." (101 U. S. 816, reaffirmed in decision in Kansas cases.) "We can not shut out of view . . . the fact, established by statistics accessible to every one, that the idleness, disorder, pauperism, and crime existing in this country, in some degree at least, are traceable to the evil. . . . That legislation by a State prohibiting the manufacture within her limits of intoxicating liquors, to be sold or bartered for general use as a beverage, does not necessarily infringe any right, privilege, or immunity secured by the Constitution of the United States, is made clear by the decisions of this court rendered before and after the adoption of the Fourteenth Amendment." (123 U. S. 623.) The court has declared in fact that the constitutionality of prohibition is no longer an open question.

The Prohibition Movement.—The agitation for prohibition began with the republic. The first Colonial Congress in 1774 passed the following: "*Resolved*, That it be recommended to the several legislatures of the united colonies immediately to pass laws the more effectually to put a stop to the pernicious practice of distilling, by which the most extensive evils are likely to be derived if not quickly prevented." From 1829 the movement was pushed, and some local prohibition laws were enacted, but between 1850 and 1860 a number of State laws were secured, beginning with the "Maine law," enacted in 1851.

The civil war (1861-65) interfered with the movement, and gave the liquor-trade an opportunity to organize a powerful financial and political opposition which secured the repeal of prohibition in many States. With the woman's crusade, 1873-74, and the organization of its successor the Women's Christian Temperance Union, 1874-75, the agitation took on a wider and more systematic sweep, and not satisfied with evanescent and perfunctorily enforced statutory prohibition, constitutional amendments were demanded, and since the year 1881 the States of Kansas, Maine, Rhode Island, North Dakota, and South Dakota have adopted constitutional prohibition, though Rhode Island within two years rescinded her action. Many cities, towns, and counties in all parts of the U. S. are under prohibition by virtue of local laws.

The prohibition movement is worldwide, is spreading rapidly into Australasia, and gaining adherents in Europe and the East. It has a strong press and platform propaganda, and many organizations are committed to prohibition, among them the Women's Christian Temperance Union, the British Women's Temperance Association, the Good Templars, Sons of Temperance, United Kingdom Alliance, Prohibition party, etc. The evangelical churches generally in English-speaking countries have declared themselves in sympathy with the prohibition cause, and most of the leaders of the movement are members of religious bodies.

FRANCES E. WILLARD.

Prohibition Party: a political party organized in the U. S., pledged to the election of officers committed to certain political reforms, among which prohibition of the alcoholic drink traffic is an essential element.

Soon after the adoption of prohibition laws in many States it became apparent to some that such laws were in danger of non-enforcement by the officers of the law. As early as 1857 the Independent Order of Good Templars, an organization committed to prohibition, declared it to be one of its cardinal purposes to secure the election of good, honorable men to administer the laws. During the civil war in the U. S. the liquor-trade organized for the expressed purpose of preventing the enforcement and securing the repeal of existing prohibition laws, and preventing further prohibitory legislation. In 1867 the seventh beer-brewers' congress declared that they would "sustain no candidate, of whatever party, in any election, who is in any way disposed toward the total abstinence cause." This was more than two years before the Prohibition party was organized.

During the session of the Right Worthy Grand Lodge of the Independent Order of Good Templars at Oswego, N. Y., May 27, 1869, a meeting of those favoring independent political party action was held, and a committee named to issue a call for a national convention for the purpose of organizing a National Prohibition party. Pursuant to this call nearly 500 delegates from twenty States met in Farwell Hall, Chicago, Sept. 1, 1869, adopted a platform, and assumed the name of the National Prohibition party.

The first national nominating convention of the party was held in Columbus, O., Feb. 22, 1872. The platform adopted strongly arraigned the liquor-traffic and the complicity of the Republican and Democratic parties therewith, and declared for entire prohibition. There were also emphatic declarations on the questions of public service, finance, interstate commerce, tariff, labor, education, immigration, and favoring equal suffrage for women. Hon. James Black was nominated for President, and Rev. John Russell for Vice-President. Electoral tickets were nominated in only six States, and received 5,607 votes. The second national nominating convention was held in Cleveland, O., May 17, 1876. Hon. Green Clay Smith, of Kentucky, was nominated for President, and Hon. Gideon T. Stewart, of Ohio, for Vice-President, and at the ensuing election they received 9,737 votes in eighteen States. At the third national convention, held in Cleveland, June 17, 1880, Hon. Neal Dow, of Maine, and Rev. H. A. Thompson, of Ohio, were nominated for President and Vice-President, respectively, and received 10,366 votes in eighteen States.

Since 1882, when a convention was held in Farwell Hall, Chicago, and a reorganization effected, the National Prohibition party has been actively engaged in the work of organizing. The national committee, of which Hon. Gideon T. Stewart was chairman and Rev. A. J. Jutkins secretary, issued an open call for a national convention, which met in Pittsburg, July 23, 1884. There were present 465 delegates from thirty-one States and Territories. A platform of political principles, advocating prohibition, equal suffrage, and reforms in finance, tariff, civil service, etc., was adopted, and Hon. John P. St. John, of Kansas, to whom, as Governor of that State, was largely due the adoption of State constitutional prohibition, was nominated for President, and Hon. William Daniel, of Maryland, for Vice-President. Hon. John B. Finch, of Nebraska, head of the Order of Good Templars, was made chairman of the national committee, and a vigorous organizing campaign was conducted. At the presidential election in 1888 the National Prohibition party ticket received 150,626 votes in thirty-four States. Immediately after the election the national committee issued an address which was widely circulated.

The party work was strengthened by a national lecture bureau, organized by W. Jennings Demorest and Horace Waters, of New York. The convention of 1888 was held in Indianapolis, and Hon. Clinton B. Fisk, of New Jersey, and Rev. John A. Brooks, of Missouri, were nominated for President and Vice-President, respectively. They received 249,945 votes. In 1892 the national convention was held in Cincinnati, June 30, and Gen. John Bidwell, of California, and Rev. James B. Cranfill, of Texas, were nominated. The vote cast for them at the ensuing election was 270,813. The National Prohibition party is (1894) organized in every State, nominates tickets at all elections, has elected members of the Legislature in a number of States, has several good newspaper organs, and is indorsed by many temperance organizations, notably by the Women's Christian Temperance

Union. Its chairman is Prof. Samuel Dickie, of Michigan, and its leading journal *The Voice*, published weekly in New York.

J. THOMAS L. WILKARD.

Projectiles [from Lat. *proji cere* (*proi cere*), *projec tum*, hurl forth or forward; *pro*, forth, forward + *ja cere*, throw, hurl]: bodies projected forward by a force. Generally speaking, they are missiles to be used in warfare, and to be fired from a gun by means of an explosive substance. They are divided into two classes—spherical and oblong. The former are used in smooth-bore guns, and are obsolete; oblong projectiles are used in rifled guns. In each class are found three varieties—solid shot, shell, and case-shot. Other varieties, now also obsolete, were formerly used in smooth-bore guns. These were: *Chain-shot*, two projectiles connected by a short chain; *bar-shot*, two projectiles connected by a bar; *carcass*, a shell filled with an inflammable composition used for incendiary purposes; *light ball*, a combustible shell used to illuminate an enemy's works. A *hand-grenade* is a shell intended to be thrown by hand at an assaulting party.

Spherical projectiles were the first projectiles used, and were made of stone, lead, wrought and cast iron. *Solid spherical shot* was used against masonry and armored vessels. A *shell* is a hollow projectile containing a bursting charge which at some point of its flight is ignited by means of a fuze. Its effect is therefore not as local as is that of a solid shot. A shell is used against earth-works, unarmored vessels, and against such armor as it can penetrate. *Case-shot* is used against animate objects on account of the greater number of fragments resulting from the separation of its cluster. Case-shot comprise grape-shot, canister, and shrapnel. *Grape-shot* (Fig. 1) consists usually of nine spherical shot arranged in three tiers of three balls each, all being held together by two rings and a top and bottom plate connected by a central bolt. *Canister* (Fig. 2) consists of a number of small balls inclosed in a tin or malleable iron case. The shock of discharge of the piece causes grape-shot and canister to break up at the muzzle of the piece; they are used for firing at short ranges. *Shrapnel* consists of an envelope containing a number of small balls and a bursting charge, which, by means of a fuze, is exploded at any desired distance from the muzzle of the gun. During the U. S. civil war a form of shrapnel known as *spherical case-shot* was used. It consisted of a shell (Fig. 3) filled with lead balls, between the interstices of which was poured a matrix of melted resin or sulphur; when the matrix had hardened a cylindrical hole was bored through the center to hold the bursting charge. To the side of the shot diametrically opposite the fuze-hole was strapped a wooden sabot. This sabot is used with all spherical fuzed shot to keep the fuze away from the powder charge.

Oblong projectiles possess many advantages over spherical projectiles, among which may be mentioned greater ranges for equal muzzle velocities, greater penetrations for equal striking velocities, capacity for a given caliber, and greater accuracy. In order to cause an oblong projectile to travel with its longest axis in the direction of its motion it is necessary to impart to the projectile a motion of rotation about its longest axis sufficient to overcome the tendency of the projectile to revolve about its shortest axis, or, technically speaking, to "tumble." Many attempts have been made to fire oblong projectiles from smooth-bore guns by means of wings or spiral channels intended to give rotation to the projectiles, but none of the attempts have proved successful. The use of oblong projectiles is therefore confined to rifled guns. In order to cause an oblong projectile to take the rifling it must be fitted with a rotating device, which differs for muzzle-loading and breech-loading guns.



Fig. 1.—Stand of grape.

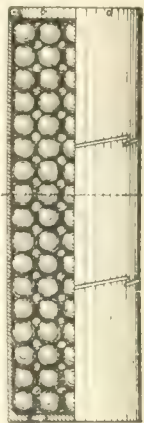


Fig. 2.—Sawyer canister.



Fig. 3.—Shell.

Muzzle-loading projectiles may be caused to rotate in two ways—by the use of studs, and by the use of some device which the pressure of the powder gas expands into the rifling. In the studded system the studs are pressed into under-cut holes on the projectile. These studs fit in the rifle grooves in the gun, and cause the projectile to rotate as it moves down the bore (Fig. 4). The Butler projectile is one of the best examples of the expansive system. The rotating device (Fig. 5) consists of a brass or copper ring screwed or cast on the projectile. The ring is divided by a deep, annular groove into an outer and inner flange or lip. On firing, the powder gas enters this groove, presses the inner lip against the projectile, thereby assisting to prevent the stripping of the ring, and forces the outer lip into the rifling. Other projectiles of this class are the Eureka, Parrott, and others. Muzzle-loading oblong projectiles are fast becoming obsolete, as all guns now made are breech-loaders.

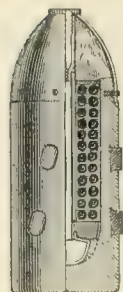


Fig. 4.—British shrapnel, muzzle-loading.

Breech-loading projectiles, since they are loaded through the breech of the piece, are fitted with a device which, being larger than the bore of the gun, is compressed into the rifling when the projectile is fired. This device at first consisted of a lead jacket cast on the body of the projectile (Fig. 6). Two copper bands were next substituted for this jacket, one band being near the head and the other near the base of the projectile. With the increasing twist of the rifling two bands were objectionable, and one band near the base was found to be all that was necessary. When one band is used the head of the projectile, where it joins the body, is slightly enlarged so as to fit the bore accurately and thus steady the projectile. The bands are made of copper or brass rings pressed into under-cut grooves. The compressive system of rotation is superior to the others, as it increases the accuracy of the projectile and decreases the bore by the rush of gases past the projectile.



Fig. 5.—U. S. cored shot, muzzle-loading.

erosion of the
Oblong projectiles consist of a cylindrical body and an



Fig. 6.—Prussian cored shot, breech-loading.



Fig. 7.—Cored shot. For U. S. 12-inch breech-loading rifle.

The tempering of a projectile is a very important step in its manufacture. At the St.-Chaumont works, in France,

to temper a projectile it is first heated to a cherry red and then cooled in oil. When cold it is again heated to a cherry red and the head only is then plunged in water and allowed to remain eight or ten minutes, and then the whole projectile is plunged in oil and left until cold. In this way a very hard head and tough body are secured. In casting both solid shot and shell the point is generally cast down to secure a denser head. For armor-piercing projectiles the heads are cast in iron moulds to increase their hardness by quick cooling. Oblong solid shot have a limited use, since shells can be made which will pierce almost the same thickness of armor, and with more destructive effect.

Oblong shells are of two kinds—battering or armor-piercing shells and common shells. The first kind are made of forged steel, and the second kind are made of cast steel and cast iron. Shells are also made by ELECTRIC WELDING (*q. v.*). The head and base are stamped out in dies; the body is made by rolling or drawing a tube. The three parts are then placed in a welding-machine, and a current of electricity of enormous quantity and low intensity is passed through them while they are pressed firmly together. The operation is completed in about three and a half minutes. Some of the modern shrapnel for the U. S. 3.2-inch field breech-loading rifle are manufactured in this way (Fig. 8). The base and body are welded together, then the steel diaphragm and tube are dropped in place and the head is welded on. Holes are drilled in the head connecting with the interior cavity, and through these holes the shrapnel is filled with bullets; a matrix of plaster-of-Paris is then poured in, and the holes are closed by screwing in small plugs. The bursting charge is placed in the cavity in rear through the central tube. A time-fuze is screwed in the point, and at the proper distance it ignites the charge and the cluster is swept out to the front by the diaphragm.

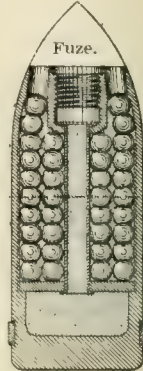


Fig. 8.—Shrapnel. For U. S. 3.2-inch breech-loading rifle.

Oblong projectiles vary in length from 3 to 5 calibers, and are fired with a muzzle velocity which ranges from 1,800 to 2,500 feet per second; a velocity of 3,300 feet has been attained. Against earthworks very long shells are used. Some of these are 6 to 8 calibers in length.

The bursting charges used in projectiles are generally composed of gunpowder, though the high explosives are sometimes desirable, particularly in armor-piercing shells. The charges are generally ignited by means of time or impact fuzes. In the case of armor-piercing shell the heat developed in piercing the armor is usually sufficient to explode the charge. The projectiles used in the small-arms are generally made of lead, and being of a slightly larger caliber than that of the gun, the lead is forced into the rifling, thus causing the projectile to rotate. In the small-caliber rifles, which are about 0.3 inch in diameter of bore, a much more rapid twist is required for the rifling, and lead would be too soft to take the grooves, consequently the projectile is made with a lead body and covered with a jacket of a harder material, such as copper, German silver, or steel (Fig. 9). For detailed descriptions and history, see Holley, *Ordnance and Armor*; Meigs and Ingersoll, *Ordnance and Gunnery*; Morgan, *Handbook of Artillery Material*; Reports of the Chief of Ordnance; Mackinlay, *Text-book of Gunnery*; *Journal of the United States Artillery*, etc. See GUNNERY, ARTILLERY, BALLISTICS, etc.

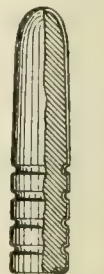


Fig. 9.—0.3-inch bullet.

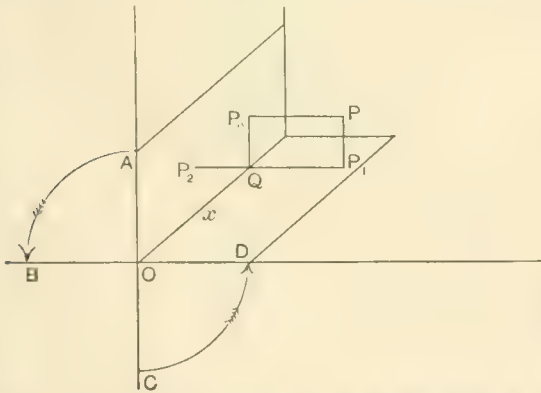
Projection [from Lat. *projec'tio*, a throwing forward, stretching out; *pro*, forward + *ja'cere*, *jac'tum*, throw, hurl]: the representation of a magnitude on a plane or other surface made in accordance with some geometrical law. In geometry, projection is restricted to the delineation of an object upon a plane surface by rays issuing from a point and intersecting the contour of the object; and this is in most cases the meaning of the word. If the point be supposed infinitely distant the rays form a system of parallels. If

J. C. W. BROOKS.

their direction is perpendicular to the plane we have *orthographic* projection; if the direction is not perpendicular we have *oblique* projection; and if the point is at a finite and proper distance for ordinary vision we have *perspective* projection, or linear perspective. (See PERSPECTIVE.) Other systems of projection are used for delineating the earth's surface. In geometry the object projected is a geometrical figure; the fixed point is called the vertex, the joining lines form a cone, and the section in which the cone is cut by any plane (the plane of projection) is called the projection. This method supplies very important conclusions, according to which from a particular theorem, the general one under which it is contained, may be inferred. It is due to Poncelet, whose *Traité des Propriétés Projectives des Figures* may be regarded as marking a new era in geometry. By this method theorems concerning infinitely distant points may be extended to finite points on a right line; while theorems concerning imaginary points and lines may be extended to real points and lines. In the last we have the principle of continuity, according to which the properties of a figure are asserted to be equally true, whether any of its points or lines are real or imaginary. (See IMAGINARY QUANTITIES.) In what follows, however, orthographic projection and spherical projections alone are considered.

Orthographic Projection.—This projection is the feature of Monge's descriptive geometry, a method which was devised for the purpose of giving a representation of solids and other figures in three dimensions by means of a drawing in one plane. In this method a figure is represented by its orthographic projections on two planes, one horizontal and the other vertical. The first projection is called the plan and the second the elevation. The line of intersection of the planes is called the axis. If the drawing-paper is the surface of the plan, the plane of the elevation will be the plane perpendicular to it drawn through the axis. In order to bring the plane of elevation into the plane of the paper, we may turn it round the axis until it coincides with the horizontal plane, in which case A moves to B and C to D . This process is called *rabatting*.

Let $P_0 P_1$ be the feet of the perpendiculars from a point P on the vertical and horizontal planes, respectively; then if we turn the vertical plane toward the left round the axis until it coincides with the horizontal, P_0 will come into the position P_2 , a point evidently lying on the perpendicular to the axis drawn through P_1 at a distance $P_2Q = P_0Q = PP_1$ from the axis. In the figure it is seen through the vertical



plane. Thus any two points, $P_1 P_2$, on the plane of the paper lying on a perpendicular to the axis will be the projections of some point in space, after the vertical plane has been turned round the axis so as to become horizontal. Hence we have a method of representing points in space. We take in the plane of the paper a line x as axis; then any pair of points on a perpendicular to the axis represent a point in space.

The horizontal and vertical planes divide all space into four parts, called quadrants. The first is the upper part on the right in which P lies, the second the upper part on the left, and the third and the fourth the other parts taken in rotation from right to left. Thus if P_1 is said to be below and P_2 above the axis, a point lies in the first quadrant, if the elevation is above and the plan below the axis; in the second, if elevation and plan are both above; in the third, if the elevation is below and the plan above; and in the fourth, if elevation and plan are both below the axis.

As we can represent any point thus, we have a representation of any figure in space by considering it as an assemblage of points. A plane, however, can not be represented in this way, as the projections of its separate points would entirely cover the planes of reference, and all planes would become alike. But any plane cuts the two planes in two lines meeting on the axis. These lines are called the traces of the plane. Thus a plane is determined by its traces, which are two lines intersecting on the axis; and, conversely, any two lines intersecting on the axis determine a plane. If the plane is parallel to the axis its traces are two lines parallel to the axis. One of the traces is altogether at infinity if the plane is parallel to the plane on which the trace lies. If the plane passes through the axis both traces coincide with the axis and the method of representation fails, as all planes fulfilling this condition become alike. We therefore introduce a third plane at a point O of the axis perpendicular to both the other planes. Then this plane with its trace is rabatted about the perpendicular to the axis at O so as to become horizontal, and then the traces of the plane to be represented are the axis x and a line passing through O .

In order to represent a line we consider it either as the connector of two points which have each their appropriate representation or as the intersection of two planes with their corresponding traces. In the first case the line may be represented by its projections on the two planes. These lines are entirely arbitrary, so that any two lines represent a line in space, for when we bring the plane of elevation into its original position the perpendicular planes through the two lines must intersect in some line in space. In the second case a line is represented by its traces, namely, the two points in which it meets the vertical and horizontal planes, as these two points are not connected by any relation, and two points determine a line in space. If the traces coincide at a point on the axis this representation fails, and we must introduce a third plane or have recourse to the representation by projections.

For the further numerous problems of descriptive geometry and their solution, we must refer the reader to formal treatises upon the subject.

Spherical Projections.—In the construction of maps we have to consider the means of representing the surface of a sphere upon a plane. There is no method by which the length of lines is strictly preserved, but there is a variety of methods which have their special appropriateness, that is, produce the least amount of distortion, in particular cases. If orthographic projection is used the plane is supposed to pass through the center and the eye to be at an infinite distance perpendicular to the plane. If the plane is the equator the parallels and meridians become concentric circles and rays passing through the center, respectively. If a meridian is the plane of projection the meridians become ellipses having a common transverse axis, and the parallels a system of parallel lines perpendicular to that axis. In other cases meridians and parallels both become ellipses. In this method places near the plane of projection are crowded together, while those farthest away are fairly represented. In perspective projection the eye is supposed to be at the vertex, and the plane of projection is taken perpendicular to the line joining it to the center, and by suitably choosing the distances of the eye and plane from the center we can arrive at different systems of projection which are serviceable in representing certain portions of the earth. In general both meridians and parallels are projected into ellipses. If the point is on the sphere and the plane passes through the center the projection is called *stereographic*; and circles whose planes pass through the eye are projected into straight lines, while all other circles are projected into circles. In this method places near the plane of projection are fairly represented, and those farthest away are crowded together, but all angles remain absolutely unaltered. In *gnomonic* projection the eye is at the center and the plane of projection touches the sphere. This method gives a map of a limited portion of the sphere with little distortion. A series of star maps was constructed on this principle by R. A. Proctor; he first circumscribed the sphere by a regular dodecahedron, and then projected the entire sphere upon the several faces of the dodecahedron.

There are several other methods of representation, of which a few may be enumerated. In *conical* projection the eye is at the center of the sphere, and the projection is made on the surface of a cone touching the sphere along the parallel which most nearly divides the area to be represented,

or sometimes of a cone passing through two parallels midway between the central parallel of the area and the extreme parallels. After projection the cone is cut along a generator and opened out into a plane. The parallels here are represented by concentric circles, and the meridians by lines passing through the common center of the circles. This method is useful if the tract of country to be represented is of no great extent in latitude, but of any extent along a parallel.

In *cylindric* projection the eye is at the center of the sphere, and the projection is made on a cylinder touching the sphere along the equator. After projection the cylinder is opened out on a tangent plane. Here meridians and parallels become rectangular systems of parallel lines. This method is applicable to the case in which a map of the equatorial regions is to be made.

In *polyconic* projection each parallel of latitude is developed symmetrically from an assumed meridian by means of a cone touching the surface along the parallel. Here the parallels become arcs of circles, and the meridians may be constructed by laying off on each parallel the degrees of longitude according to their true lengths. This is the method of projection used by the U. S. Coast Survey in projecting small maps and charts. For Mercator's projection, see the article under that heading. R. A. ROBERTS.

Prolap'sus U'teri [Lat., falling of the womb]: the descent of the uterus below its normal position in the pelvis; in extreme cases a protrusion of part or the whole of the organ from the body. The chief causes are the enlargement of the uterus by inflammation, uterine and abdominal tumors, relaxation of the tissues which are the anatomical supports of the organ, rupture of the perineum by instrumental delivery, and sudden violence in falling or jumping.

Prome'theus (in Gr. *Προμηθεΐς*): one of the most interesting creations of Greek mythology; a son of Iapetus and Clymene, Themis, or Asia, the brother of Atlas, Menæti, and Epimetheus, and father of Deucalion. The myths relating to him are very variously told by Hesiod, Æschylus, and later poets and philosophers, but there are nevertheless certain fundamental traits in which all the different versions agree. They all represent Prometheus as a benefactor of the human race. According to some, he was the creator of man; according to others, he only brought to him fire and the arts depending on the use of fire. Next, they all agree that those benefits which he conferred on the human race for some reason excited the wrath of Zeus, who chained him to a rock and sent a vulture or an eagle to feed daily on his liver. From these sufferings, under which the Titan did not succumb, Hercules at last delivered him by shooting the vulture and unlocking the chains, after which Prometheus returned to Olympus. Of Æschylus's trilogy only the middle piece, *Prometheus Bound*, is extant. For Prometheus in art, see the article *Prometheus* in Baumeister's *Denkmäler*. J. R. S. STERRETT.

Promise (in law): See CONTRACT.

Promise, Breach of: See MARRIAGE.

Promissory Note [*promissory* is from Lat. *promis'sor*, promiser, deriv. of *promit'tere*, *promis'sum*, send forth, promise]: an unconditional promise in writing made by one person to another signed by the maker, engaging to pay, on demand or at a fixed or determinable future time, a sum certain in money, to, or to the order of, a specified person or to bearer. (British Bills of Exchange Act, 1882, § 83.) Sealed notes were unknown to the early law merchant, and as a rule the courts have held that attaching a seal to a promissory note destroys its negotiable character. This doctrine has been changed by statute in many of the U. S., and the British Bills of Exchange Act authorizes a corporation to use its seal as a signature to commercial paper. Government and corporate bonds, though under seal, have long been treated by the courts in the U. S. as negotiable, on the ground that modern commercial usage had given to them a negotiable character. *Morris Canal Co. vs. Fisher*, 1 Stockton (N. J.) 667.

The negotiability of promissory notes was denied by Lord Holt, but was secured by act of Parliament (3 and 4 Anne, c. 9, A. D. 1704). In the U. S. this statute or its equivalent has become a part of the law of every jurisdiction. The better view seems to be that it was declaratory only of existing law. (*Goodwin vs. Roberts*, Law Reports, 10 Exchequer 337; appendix to 1 Cranch 367; see *Holloway vs. Porter*, 46 Ind. 62, *contra*.) It should be noted that words

of negotiability are not necessary to a valid promissory note. A non-negotiable note is entitled to days of grace; it imports a consideration, and the holder suing upon it need not allege or prove a consideration. (*Cornwright vs. Gray*, 127 N. Y. 92.) Bank-notes, certificates of deposit, and instruments which are so ambiguous that they may be construed as either notes or bills of exchange, may be sued on as promissory notes. A bank-note (that is a promissory note issued by a banker, payable to bearer on demand) differs from an ordinary note in some respects; for example, it may be reissued after payment. The maker of a note is not allowed to deny to a holder in due course the existence of the payee or the payee's capacity to indorse at the time the maker issues it. Nearly all the rules which determine the rights and liabilities of the parties to notes, and the manner in which the rights are to be exercised and the liabilities to be fixed, have been described in the article on BILL OF EXCHANGE (q. v.). FRANCIS M. BURDICK.

Promorphology: See MORPHOLOGY, ANIMAL.

Pronghorn: See ANTILOCAPRA.

Pronouns [*pro-* + *noun*, representing Lat. *prono'men*, a translation of Gr. *ἀντωνυμία*; *ἀντί*, instead of + *ὄνομα*, name, noun]: a class of words which serve the purpose of indicating objects without naming them. They do this in terms of the context or situation and of relations to the speaker. Thus when *he said* is used to replace *John said*, the pronoun *he* indicates either in relation to something said before, or in relation to what is in the speaker's presence. Nouns are name-words. Pronouns are essentially gesture-words. They act as proxies for nouns. They are not, however, mere stop-gaps or dummies, but, being universal or public proxies—i. e. capable of substitution for any noun—they are selected according to the relations borne by the object named either to context or speaker. They therefore give to language the possibility of expressing vastly more than the use of nouns alone would permit.

The so-called adjective-pronouns or pronominal adjectives, like *this*, *that*, *other*, *all*, etc., are pronominal in the sense that they express general relations to context, situation, environment, but not in the sense that they are necessarily substitutes or proxies for nouns. They may dispense with the use of the noun, but generally the apposition of the noun is found desirable; thus *get that* may require, in order to clearness, the addition of the name of the object, *get that hat*. A large class of so-called adverbs, like *here*, *there*, *then*, *thus*, are pronominal in precisely the same sense as *this*, *that*, *such*; they may be called pronominal adverbs. In the sentence *he speaks so*, the action-name *speaks* is modified by the pronominal adjunct *so*, just as, in the sentence *he uses such language*, the name language is modified by the pronominal adjunct *such*. The conjunctive adverbs *where*, *when*, *while*, *as*, etc., are pronominal in precisely the same sense as the relative pronouns *who*, *which*, etc.

BENJ. IDE WHEELER.

Pronunciation [from Lat. *pronuntiatio*, proclamation, publication, deriv. of *pronuntiā're*; *pro*, forth + *nuntiā're*, announce]: the act of giving the proper sounds and accent to the individual words of a language. Besides this specific meaning, pronunciation is used in general for either the right or the wrong form of the spoken word. The more distinctive term is orthoëpy (Gr. *ὀρθοέπεια*), which from derivation means right or correct pronunciation.

The history of English pronunciation in its general sense has been written by Alexander J. Ellis, *Early English Pronunciation* (1869-89), and by Henry Sweet, *History of English Sounds* (1888). Both of these writers trace pronunciation from the earliest times, showing the changes sounds have undergone, and the standard pronunciation in different periods. Orthoëpy, as the attempt to establish and govern pronunciation, is of comparatively recent date, but its history is interesting as showing upon what such attempts have rested and what has been their effect upon speech.

The earliest English dictionaries made no attempt to mark pronunciation, but gave their whole attention to definition and etymology. Later, as in the time of Bailey, whose *Universal Etymological Dictionary* was published in 1721, the accent of words began to be marked. Even Johnson's great dictionary, which ran through seven editions from 1755 to 1783, marked accent only, and Boswell tells us that Johnson justified this as sufficient for all purposes of speech. The first dictionary to make special mention of orthoëpy in its title is that of Benjamin Martin, published in 1749. The dictionary of William Kenrick (1773) was the first to separate words into

syllables, and to indicate the pronunciation of vowels by numbers referring to a table of English sounds. Since Kenrick's time pronunciation has had an established place in English dictionaries, as shown by those of Perry, 1775, Sheridan, 1780, Walker, 1791, as well as by those published in Great Britain and the U. S. during the nineteenth century.

In considering the pronunciation of dictionaries and orthoëpists the fundamental question is: "How does the orthoëpist arrive at his standard of correctness?" Kenrick, who first marked sounds in an English dictionary, claimed to register the speech of "polished speakers in the metropolis"—that is, London. He complained especially that rules of pronunciation had hitherto been "laid down by Irishmen and Scotchmen who did not themselves know how to pronounce." Perry took a similar standard, that of "men of letters, eminent authors, and polite speakers in London." Sheridan set up the standard of Queen Anne's court, a pronunciation which he claimed to derive from his schoolmaster, a contemporary of Swift. He thus undertook to follow the pronunciation of a previous generation, which he could not have heard in its purity, and it is therefore not strange that his dictionary received much severe criticism in his own time. Walker took still a different standard, a sort of "compound ratio" of the pronunciation of the "learned, the polite, and the bulk of speakers," whatever that may mean. He also took into account in doubtful cases what he called the "analogies of language," the meaning of which is by no means clear. Of lexicographers in the U. S., Webster in 1806 gave it as his opinion that "a living language admits of no fixed state," but he clearly regarded American English rather than the "London dialect" as correct. Worcester, on the other hand, in his dictionary of 1827 followed London English as the standard for American speech.

It will thus be seen that orthoëpists themselves have variously settled the question of standard English speech. It is not strange, therefore, that as to the pronunciation of many words they should differ among themselves and sometimes from the majority of good English speakers. Moreover, orthoëpists in determining pronunciation have failed to take into account certain necessary factors. The first of these is the history of English sounds and the laws of sound-development. These laws show that certain sounds have developed differently under various phonetic influences, as of accent or different phonetic environment. For example, the reason we speak *exile* with a *ks* sound and *exist* with a *gz* sound is one of accent. So the reason we pronounce *man*, *path*, *far* with two or three different vowels is due to the different consonants following the original short *a*. Moreover, sound laws, rather than the spelling of English words, point out the true analogies of speech, and by them in doubtful cases the proper sound may be more easily determined.

Another element to be regarded by the orthoëpist is the comparatively new science of phonetics, or the doctrine of speech-sounds. This treats of the true nature of sounds, their exact relationships, and the correct classification of them. The importance of phonetics is clear when we understand that the common classifications of dictionaries are often radically wrong. For example, the long *ā* sound, as it is called, should be classed with the *e* of *men*, and not with the *a* of *hat*, *ask*, *far*, *care*. So the *a* of *all* is not an *a* sound, but an *o* sound, and should be classed with the *o* of *not*, *strong*, and the long *ō* of *no*, *note*. The sounds of *i* are the short as in *hit*, the long as in *see*, and not at all the diphthong in *might*. It is not necessary that the minute distinctions of phoneticians should be regarded, but it is certainly important that no misleading classifications should be used. Nor can such a classification be upheld because it has been followed by orthoëpists for more than a century. Moreover, the orthoëpists have sometimes overstepped their province in trying to force a particular pronunciation, because it seemed to be in accordance with "analogy." This was particularly true of Walker, many of whose blunders might have been prevented by a knowledge of phonetics.

From the very nature of language, a single standard of pronunciation can not be followed by all the English-speaking peoples of the world. The natural divisions and the wide separation make it impossible that the usage of Great Britain, of North America, and of Australia should be exactly the same, although it is highly important that there should be as much harmony as possible. For citizens of the U. S. an American standard of spoken English is inevitable. This should be as slightly different from the spoken English of Great Britain as is warranted by the pronunciation of the better classes, while it should be equally free

from servile imitation of British speech. An American standard, however, is by no means easily determined. It is at best a compromise of varying usages in different parts of the republic, since the speech of no single city or section can be regarded as standard in every particular. No city in the U. S. exercises such influence on speech as London does in England, and it is therefore absurd to set up the speech of one city as necessarily better than that of another. Still, certain general principles may be laid down for guidance in determining standard pronunciation.

The first of these principles is that present usage must always be taken instead of past or antiquated usage. Lexicographers tend to preserve the old, but it must be clear that the orthoëpists of a former generation or century are no authority in those cases in which the best present usage generally differs. Thus if the present established accent of such words as *ally*, *canine* is on the first syllable, the authority of a dozen dictionaries does not make correct the accent on the last syllable; for it is the province of the dictionary to register the best present usage, not to set up the standard of a past age, or of some supposed analogy. But past usage may assist in determining the analogies of speech, and so deciding in doubtful cases. For example, past usage shows that *wound* has had the vowel-sound of *fool* rather than of *pound*, probably because of the influence of the preceding *w*. Walker gave *wound* an alternative pronunciation rhyming with *pound*, and this has been generally followed, although Walker himself admits it was not the pronunciation of his time. The older pronunciation of *wound* is therefore better, not because it is older, but because it has been and is the best usage.

The second principle is that reputable usage indicates the standard. Reputable usage avoids the extremes of affected precision on the one hand, and ignorance or slovenliness on the other. It is neither the usage of fastidious society nor of the half-educated. It is rather that of the well-educated, who are carried away neither by the extremes of fashion in speech nor by hypercritical standards sometimes set up by orthoëpists themselves. For example, reputable usage makes no distinction between the vowel-sounds in such words as *her* and *urn*, yet the majority of orthoëpists insist on marking these sounds differently. Reputable usage implies, therefore, that careful observation of the best speakers should be compared with standards set up in books.

Lastly, national usage is to be taken as the standard rather than local or dialectal use; that is, the present reputable usage of the well educated in a whole nation is to be regarded as distinct from the usage even of the well educated of a single section. Even when this can not be determined with precision in all cases, local or dialectal use may be distinctly avoided. Thus dictionaries printed in the U. S. still recognize the pronunciation of *r* before a consonant, since it is only in the extremes of speech in the Eastern and Southern States that *r* in this position is wholly lost (as in *caad* for *card*, *faather* for *farther*). So *a* in *ask*, *path*, *far* is marked as a sound between *a* of *man* and *a* of *far*, because such a sound is a compromise between the extreme broad *a* used in some parts of the East and the extreme flat *a* of the West and South. OLIVER FARRAR EMERSON.

Pronunciation of Botanical Names: It is a law of the science of botany that the names of species, genera, tribes, families, orders, classes, branches, etc., shall be in Latin, or where derived from words taken from other languages they shall be Latinized. The occurrence of these names in English books has led to much confusion of pronunciation, since they can not properly be treated as English words. In the absence of any formulated system of rules there has been little uniformity in practice. In a general way the pronunciation of these Latin or Latinized names, as practiced by English-speaking botanists, approximates that of the so-called "English pronunciation" of Latin in vogue twenty or more years ago, but long since discarded.

There is a growing feeling among botanists that the pronunciation of botanical names should conform to the usage of Latin scholars, and at least one attempt has been made to accomplish this end. The editors of Nicholson's *Dictionary of Gardening* (1884-88), after consultation with eminent English-speaking botanists, adopted for their work the so-called Roman system of pronunciation. Accordingly, the long sound of *a* is as heard in psalmist; short *a* as in apart; long *e* as in vined; short *e* as in slender; long *i* as in machinist; short *i* as in thin; long *o* as in vöter; short *o* as in rotten; long *u* as in ruler; short *u* as in power; long

g, and *ch* always hard, as in muscular, good, and Christian; *s* always hard, as in this; *t* always with its proper sound, as in Latin. We have then *Ac-er* (ăk-er, not ā-ser), *Cer-as-us* (ker- not ser-, much less sē-rā-sus), *Chel-o-ne* (kel-, not chel-, nor shel-), *Gen-ti-a-na* (*g* hard, not jēn-shī-ā-na), etc. The only exception to this rule is that in the case of words derived from the names of persons, in which the Latin ending only comes under the rule, the preceding part being pronounced like the original name. This is unfortunate, since it gives us Jones'-i-a (instead of Jo-nēs'-i-a), Stokes'-i-a (instead of Sto-kē'-si-a), etc., pronunciations which could not be followed by any non-English botanists.

CHARLES E. BESSEY.

Pronunciation of Foreign Names: The purpose of this article is to afford some help for the pronunciation of the many foreign geographical and personal names met in reading. The commoner geographical names which have been thoroughly Anglicized in pronunciation are not included, and those names which come from the most remote and least-known languages, and in general those not originally written in Roman letters, are respelt by English writers or by continental Europeans who use the Roman alphabet. The main difficulties in their pronunciation come from the different orthographical usages of the best-known languages of Europe, and the resulting doubt whether a Russian or Oriental name, for example, is spelt for English readers according to English, French, or German usage. For geographical names not originally written in Roman letters much of this uncertainty would be removed if the system of spelling devised by the Royal Geographical Society in London in 1885, and substantially adopted by the U. S. Government, were in exclusive use in English-speaking countries. (See *Proceedings of the Royal Geographical Society*, vii., 535-536; xiv., 116-119, 770-777; and for a comparison with similar French and German systems, *Phonetische Studien*, vi., 322-334.) According to this system vowels are pronounced as in Italian, and consonants generally as in English. The vowels are accordingly as in *father*, *fête*, *machine*, *note*, *rude*, and *ai* is about like *i* in *ice*, *au* like *ou* in *out*, etc., *aw*, however, being added with the sound it has in *law*. The sound of *k* is always written *k* (never *c*), and *s* is preferred for the sound of *s* in *mason*, *ch* is always as in *church*, *g* always as in *go*, *get*, *j* is always used for the sound of *g* in *gem*, *j* in *joke*, *hw* is written for the sound of *wh* in *what*, *ng* is as in *finger* or as in *singer*, *ph* is as in *loophole*, never like *f*, *kw* is written for the sound of *qu* in *quite*, *sh* is as in *shire*, *th* as in *thin*, or, less often, as in *this*, *y* is always a consonant as in *yard*, *zh* is like *s* in *pleasure* or *z* in *azure*, while *kh* and *gh* are used for Oriental guttural sounds. Unfortunately, older spellings, like *Foochow* (instead of *Fuchau*) are frequent, and often cause embarrassment. In general, these older spellings are to be pronounced according to the analogies of ordinary English spelling. The system just described aims only at an approximate indication of the native pronunciation. For the numerous other foreign geographical and personal names, that is, those belonging originally to European languages (including those spoken in America and elsewhere) always or often written with Roman letters, the list of letters and letter-groups below, with indication of the pronunciation, has been prepared. It also covers to a considerable extent modern Greek names and Slavic names originally written with the Russian alphabet. It is not intended to give an exact or complete description of native pronunciations, but to furnish a guide to the commonest orthographic usages of the most important European languages. Some sounds not existing in English are entirely ignored, or are described as resembling certain English sounds. Since there are, especially in proper names, many individual cases and exceptions, recourse must often be had to pronouncing gazetteers or other lists of names with indication of pronunciation. The following general principles, though not entirely free from exceptions, will be useful:

1. The number of syllables is generally determined by that of the vowels (or diphthongs) written, except that doubled vowels are generally equivalent to the simple vowels pronounced long. See, however, *e*, *ie*, and other vowel combinations below.

2. Unaccented syllables are pronounced more distinctly than in English.

3. In German, Dutch, Danish, Swedish, Norwegian, Icelandic, Hungarian, and Bohemian the accent is usually on the first syllable. In French, in which language it is very weak, it is always on the last syllable, unless this contains

the so-called "mute *e*" (see *e* below) as its only vowel, in which case it is on the preceding syllable. In Italian it is most often on the penult; so also in Spanish and Portuguese if the word ends in a vowel preceded immediately by one or more consonants; in Spanish it is most often on the last syllable if the name ends in a consonant. The place of the accent is sometimes marked in Spanish with the acute accent, in Italian with the grave. In Polish the accent is commonly on the penult. For Latin names the well-known rule is that the accent is on the penult if that syllable is long, otherwise on the antepenult, and classic Greek names are usually given in Latinized forms and pronounced according to Latin rules.

4. A written acute accent indicates a long vowel in Hungarian and Bohemian.

5. In classic Greek, Latin, and Hebrew names vowels and consonants are usually pronounced according to English analogies, *ch*, however, having the value of *k*. In other names the vowels have commonly the Italian values as indicated above.

6. In German, Dutch, and the Slavic languages (as Russian, Polish, and Bohemian) the sounds of English *b*, *d*, *g* (whether in *go* or in *gem*), *v*, *z* (whether in *zone* or in *azure*), can not occur at the end of a word; if the letters for these sounds are written in that position in one of these languages they are sounded respectively like *p*, *t*, *k* or *ch* in *church* instead of *g* in *gem*, *f*, *s* (instead of *z* in *zone*), *sh* in *she* (instead of *z* in *azure*). See, however, *g* below.

7. Doubled consonants are pronounced long or doubled (e. g. *tt* as in *that time*) in Italian, Swedish, and Hungarian.

ALPHABETICAL LIST OF NOTEWORTHY LETTERS AND COMBINATIONS.

a is generally as in *father*. In Hungarian *a* is nearly equivalent to *o* in *hot*, and *ā* as *a* in *father*.—*â* in Roumanian is like Roumanian *i* (see below).—*ä* in German and Swedish is like *e* in *net* or *there*: in German *ae* is sometimes written for *ä* (see *ae*).—*ă* in Roumanian approaches *u* in *hut* or *hurt*.—*ã* in Portuguese is nasal *a* (see *ae*, *ao*, below).—*ą* in Polish is like *o* in *nor*, pronounced through the nose.—*å* in Swedish and *aa* in Danish and Norwegian are like *aw* in *law*.—*ae* or *æ* in German, Danish, and Norwegian is like *e* in *net* or *there*; in Latin names *ae* is like English *e*; in Welsh it resembles *i* in *ride*.—*æ* in Portuguese resembles *i* in *ride*, pronounced through the nose.—*ai* is generally like *i* in *ride*, but in French it is like French *é* or *è* (see below, but also *aïl*, *aïll*, *aim*, *ain*), and in modern Greek spelling *ai* (*ai*) approaches *e* in *red*.—*aïl* in French, when final, and *aïll* in French: see *il*, *ill*, below.—*aim*, *ain* in French, if final or followed by any consonant except another *m* or *n*, are similar to *a* in *fag*, pronounced through the nose.—*aj* is in Danish like *i* in *ride*; in Hungarian like *oi* in *boil*, but Hungarian *áj* approaches *i* in *ride*.—*am*, *an*, under the conditions given above for *aim*, *ain*, represent in French and Portuguese nasal vowels resembling *a* in *part*, pronounced through the nose.—*ao* in Portuguese is similar to *ou* in *loud*, pronounced through the nose.—*au* is usually like *ou* in *loud*, but in French it is like *o* in *note*. In modern Greek *au* (*au*) is equivalent to *av* before vowels and voiced consonants (as *b*, *d*, *g*), and to *af* before voiceless consonants (as *p*, *t*, *k*).—*äu* in German is like *oi* in *boil*.—*aui* in Dutch is like *ow* in *now*.—*av* in Danish before a consonant is generally like *ou* in *loud* (see *v*).—*aw* is generally like *a* in *father* followed by *v*, but in Welsh it is like *ou* in *loud* (see *w*).—*ay* is generally like *ai* above; in French it is like French *ai*, but if a pronounced vowel immediately follows, it has this sound (or sometimes that of *a* in *father*) followed by *y* as in *ye*.

b is in general as in English; but if final in German and some other languages (see 6 above) it is like *p*. Between two vowels *b* in Spanish approaches the English *v*, and the same pronunciation is the usual one of *b* (*β*) in all positions in modern Greek. The sound may be described as a *v* formed with the lips alone, instead of with the lower lips and upper teeth.—*bh* is sometimes used in Sanskrit or East Indian names to express *b* followed by an aspiration. It need not be distinguished from *b*.

c is equivalent to *k* in most European languages except when it stands before *e* or *i*. In Welsh and Gaelic it is always like *k*. In Polish, Bohemian, and Hungarian, *c* always means *ts* (see also *ch*, *cs*, *c2*). Before *e* and *i* (or *y*) in French, Portuguese, and Catalan it is like *s*; as also in English and in Latin names, in which last it has the same sound also before *ae* and *oe*. In German *c* (little used) before *e*, *i*, *ä* (*ae*) is like *ts*. In Italian and Roumanian *c* before *e* or *i* is like *ch* in

chin (but before *i* in Roumanian it is like *k*; see also *see*, and in Spanish before the same letters like *th* in *thin*). In names from Sanskrit *c* is sometimes used, and has the sound of *ch* in *chin*, but *ch* is also used in such words. See also *ch*.—*y* is like *s* in *mason*; in names from Sanskrit many pronounce it like *sh* in *she*.—*ĉ* in Bohemian is like *ch* in *chin*.—*ċ* in Polish is between *ts* and *ch* in *chin*.—*cc*, *cc*h, *ccs*. In Italian and Hungarian *c* before another *c* only indicates a lengthening of the consonantal sound.—*ch* is pronounced *k* in Latin, classic Greek, Hebrew, Italian, Catalan, and Roumanian names. In French and Portuguese it is like *sh* in *she*, in Spanish like *ch* in *chin*. In German it has two sounds, one somewhat resembling the hawking sound heard in clearing the throat, a strong aspiration in the back of the mouth, heard after *a*, *o*, *u* (this sound is also written *ch* in Welsh and Gaelic), the other pronounced farther forward in the mouth (a voiceless German *j*), after *e*, *ä*, *i*, *ö*, *ü*. The same two sounds occur in modern Greek for *ch* (representing *χ*), the former before *a*, *o* (not *oi*), *ou*, the latter before the sounds *e* and *i* (however written). In some Slavic words (as Polish and Bohemian) *ch* is used as in German, but the Russian letter corresponding in sound is often indicated in Roman letters by *kh*, and *ch* in names from Russian oftener means *ch* in *chin*. In Sanskrit and East Indian names *ch* is like *ch* in *chin*, and *chh* need not be distinguished from this. (See also *sch* below).—*cs* in Hungarian is like *ch* in *chin*.—*cu* in Spanish, when a vowel follows and the *u* is not accented, is like *kw*, or *qu* in *quite*.—*cz* in Polish is like *ch* in *chin* (so also in the word *Czech*). In Hungarian *cz* is like *ts*.

d is generally as in *did*. If final in German and some other languages (see 6 above) it is like *t*. If final, it is usually silent in French, and like *th* in *thin* in Spanish. In modern Greek *d* (δ) is usually like *th* in *that*, and it may have this sound in Spanish when between vowels.—*dd* in Welsh is like *th* in *that*.—*dh* is sometimes used in Sanskrit or East Indian names to express *d* followed by an aspiration. It need not be distinguished from *d*.—*ds* is in Hungarian like *j* in *joke*, and *dsch* is occasionally found in imitation of German spellings for the same sound.—*dt* is like *t*.—*dż* (Polish) and *dž* (in some Slavic names) are like *j* in *joke*.

e is usually nearly like *a* in *fate* or *e* in *pet* or *there*; but when final in French it is regularly silent (mute *e*), unless written with an accent (*é*). It is usually also silent in French (or very short, like *e* in *battery*) if in the middle of a word and not followed by a consonant in the same syllable, unless it has an accent (*ê*, *è*, *é*). In German *e* in final syllables is similar to *e* in *battery*. In modern Greek *e*, if representing *ε*, is like *e* in *pet*; if it represent *η*, like *i* in *machine*. In Slavic words *e* is often pronounced like *ye* in *yet*. (See also *ae*, *ei*, *ej*, *em*, *en*, *er*, *es*, *et*, *eu*, *ey*, *ez*, *ie*, *oe*, *ue*).—*ê*, *è* in French are pronounced, the former nearly like *a* in *fate*, the latter nearly like *e* in *pet*.—*ê* in French is similar to *e* in *red* or *there*. In Roumanian *ê* is like Roumanian *î* (see *î*).—*ę* in Polish is nearly like *e* in *red*, pronounced through the nose.—*eau* in French is like *o* in *note*.—*eeu*, *eeuw* in Dutch are long *e* (*a* in *fate*) followed by *u* (in *rule*) in the same syllable, not like Dutch *eu*.—*ei* is in French like French *ê* (see above); in German, Dutch, and Welsh similar to *i* in *ice*; in modern Greek *ei* (ει) is like *i* in *machine*; in other cases it is generally *e* followed by *i* in the same syllable, that is, nearly like *ey* in *they*.—*eil*, *eill* in French: see *il*, *ill*.—*ein* in French is like French *ain* in the same position (see above).—*ej* in Danish approaches *i* in *ride*; in Hungarian it is similar to *ey* in *they* (that is, *e* followed by *i* in the same syllable).—*em*, *en* in French represent a nasal vowel under the conditions described above for French *aim*, *ain*, *am*, *an*, and the sound is the same as that described for French *am*, *an*, but final *em* (not common) is sometimes like *em* in *hem*. In Portuguese, under the same conditions, *en* and *em* before *p* or *b* is like *a* in *fate*, pronounced through the nose, and *em* is generally like Portuguese *æ* (see above), or (in Brazil) like *ey* in *they*, pronounced through the nose. (See also *ien* below).—*er* when final in French is generally like French *ê* (see above).—*es* when final in French is generally silent unless the *e* is accented (*é*, *è*), in which case *s* is generally silent.—*et* when final in French is generally like French *ê* (see above).—*eu* in French and Dutch is nearly like *u* in *hurt*; more exactly, it is like *a* in *fate* or *e* in *pet*, with the lips rounded as for *o* in *note* or *nor*. (See also *eeu*.) In German *eu* is like *oi* in *boil*. In modern Greek *eu* (ευ) is pronounced *ev* or *ef*, according to the rule given above for *au* in that language. In

other languages both *e* and *u* have their usual sounds, one following the other in the same syllable.—*ey* is, in general, like *ei*, but in French it is followed by a distinct *y* (as in *ye*) when a pronounced vowel comes after the *y*; that is, it is then French *é* followed by *y*.—*ez* final in French is like French *é* (see above).

f in Welsh is pronounced *v*, and *ff* in Welsh is like *f*.—*fv* in Swedish is pronounced *v*.

g is generally as in *go*, *get*. When *e*, *i*, or *y* follows, it is in French and Portuguese like *z* in *azure*; in Italian, Roumanian, Latin, and classic Greek names like *g* in *gem*; in Spanish like a strong *h*. In Norwegian and Swedish *g* before *i* is similar to in *ye*, and is silent before *j*. Final *g* in German and Dutch is pronounced like German *ch* (see above), or in German by some like *k* (see 6 above). In modern Greek and in Dutch *g* is in all positions regularly a spirant, with the voiced sounds of *ch* as described above for those languages.—*gh* in Italian and Roumanian is like *g* in *get*. In Irish it is nearly like *ch* in Welsh and German. In Sanskrit and modern East Indian names it is sometimes used to express *g* (as in *go*, *get*) followed by an aspiration which need not be imitated. In some Oriental names it represents a peculiar guttural sound.—*gli* in Italian is similar to *lli* in *million*; if no vowel follows, the sound is the same followed by *i* as in *machine*.—*gn* in French and Italian is nearly equivalent to *ni* in *union*.—*gu* in French, when followed by *e*, *i*, or *y*, is generally like *g* in *get*, but like *gu* with French *u* if a consonant or *ë* follows the *u*. In Spanish *gu* before *e* or *i* is like *g* in *get* unless the *u* is marked with the diæresis (*û*), in which case, as before other vowels, *gu* is like *gu* in *languid*, and this last is the regular value of *gu* in Italian before a vowel.—*gy* in Hungarian is somewhat like *dy* (with *y* as in *ye*).

h is silent entirely in French, Italian, Spanish, and Portuguese; see, however, *ch*, *gh*, *th*, *nh*, *sch*. In German it is heard when initial, but is generally silent when preceded by a vowel and followed by simple *e* (not *ei*, before which it is heard), and when final it is generally silent in German and other languages. In Roumanian, however, *h* regularly has the first sound described above for German *ch*. In Scandinavian names *h* is silent in initial *hj* (= *y* in *ye*) and *hv*.

i is as in *machine*, or sometimes as in *pit*, and *î* is like *i* in *machine*, except in Roumanian, where it is like Polish *y*, or somewhat like *i* in *pit* (see *y*).—*ie* in German and Dutch is like *i* in *machine*; in other languages it is oftener like *ye* in *yet* (for French, see *e* above).—*ieuw* in Dutch is like *i* in *machine* followed by *u* as in *rule* in the same syllable.—*ien* in French, when final or before a consonant (except another *n*), is like *y* (in *ye*, *you*) or a short *i* followed by the French nasal vowel written *in* (see *in*).—*ij* in Dutch is similar to *i* in *ice*.—*il* in French when final and *ill* in French mean usually, after a consonant or silent *u* (see *gu*, *qu*), the sound of *i* in *machine* followed by a strongly consonantal *y* as in *ye*; after a pronounced vowel they indicate the latter sound (*y*) alone, the preceding vowels having their usual French sounds (written *e* = French *è*).—In French *im*, *in*, under the conditions described above for *aim*, *ain*, have the sound there described, nearly like *a* in *fag*, pronounced through the nose. In Portuguese, under the same conditions, *im*, *in* are about like *i* in *machine*, pronounced through the nose.

j is generally like *y* in *ye*, *you*. In French, Portuguese, and Roumanian it is like *z* in *azure*, and for the Russian letter with this sound *j* has sometimes been used (see *zh*). In Spanish it is a strongly aspirated *h*. When in Scandinavian or Hungarian names it stands before a consonant and after a vowel it combines with that vowel to form a diphthong as *i* would do (see *aj*, *ej*, *oj*). In Italian *j* sometimes is a vowel, with the long sound of *i* in *machine*. In names from Sanskrit or modern East Indian tongues *j* is as in *joke*, as is also *jh* (properly the same followed by an aspiration).

k is generally as in English; but in Swedish before *e*, *i*, *ö*, *y* it resembles *ch* in *chin*, and in Norwegian before *i* and *y* it has the second sound of *ch* in German (voiceless *y*).—*kh* is sometimes used for a Russian letter sounded like German *ch* (see above); also for an Oriental guttural sound. In Sanskrit and modern East Indian names it is nearly as in *inkhorn*.—*kj* in Swedish and Norwegian respectively has the sound of Swedish or that of Norwegian *k* before *i* described above.

l is generally as in English.—*l* in Polish is an *l* with guttural quality, resembling somewhat the *l* of some Englishmen in *hill*.—*lh*, *ll* are used, the former in Portuguese, the latter in Spanish, for a sound similar to *lli* in *million*, and *ll* in Welsh is voiceless *l*.—*ly* in Hungarian represents for

some speakers the sound of *lh* just described, but it is now oftener pronounced as *y* in *ye*.

m, *n* in French and Portuguese, when final or before a consonant (except another *m* or *n*), serve only to mark that the preceding vowel is nasalized. (See *aim*, *ain*, *am*, *an*, *em*, *en*, *im*, *in*, *om*, *on*, *um*, *un*).—*mp* (*μπ*) in modern Greek is like *b*, but it may also mean *mb* if not initial.—*ñ* in Spanish is similar to *ni* in *union*, and *ñ* in Polish and *ň* in Bohemian have the same value.—*ng* in German, Dutch, and Scandinavian is generally like *ng* in *singer*.—*nh* in Portuguese is about like *ni* in *union*.—*nt* (*ντ*) in modern Greek is like *d*, but it may also mean *nd* if not initial.—*ny* in Hungarian and Catalan represents the same sound as the preceding (*nh*).

o is like *o* in *note* or *nor*.—*ô* in French is like *o* in *note*.—*ö* in German, Danish, Swedish, Norwegian, and Hungarian is like French *eu* or nearly like *u* in *hurt*, and *ø* in Danish has the same sound.—*õ* in Portuguese is like *o* in *note*, pronounced through the nose (see *œ* below).—*œ* or *ø* is sometimes written in German or Scandinavian names; it is pronounced like *õ* above. In Dutch *œ* is like *u* in *rule*, *oo* in *fool*. In Latin names *œ* is pronounced like English *e*, in Welsh it is similar to *oi* in *boil*.—*õe* in Portuguese is similar to *oi* in *boil* pronounced through the nose.—*œi* in Dutch is Dutch *oe* (= *u* in *rule*), followed in the same syllable by *i* as in *machine*.—*œu* in French is like French *eu*.—*oi* is as in *boil*, except that in French it is nearly like English *w* followed by *a* as in *father*, and in modern Greek *oi* (*οι*) is like *i* in *machine*.—*oin* in French, if final or followed by a consonant other than *n*, is similar to English *w* followed by the French nasal vowel written *in* or *ain* (see these above).—*øj*, *øj* in Danish are like *oi* in *boil*.—*oo* is like *o* in *note*.—*ou* in French and modern Greek (*ου*) is like *u* in *rule* or *oo* in *fool*; it is often used for this sound in other names. In Portuguese *ou* is nearly like *o* in *note*, and in Dutch like *ou* in *out*.—*ouw* in Dutch is like *ou* in *out*, *ow* in *now*.—*oy* is generally like *oi*; in French, if a pronounced vowel follows, it is like French *oi* followed by *y* as in *ye*.

ph is generally like *f*, except in Sanskrit and some East Indian names, where it is like *ph* in *loophole*.

q is like *k*.—*qu* in French is generally like *k*, so too before *e* and *i* in Spanish and Portuguese. In other words it may be pronounced as in *quite*, though in German it is more like *kr*.—*qv* in Swedish is like *kr*.

r may be pronounced as in *red*; it should not be omitted (see, however, *er* above).—*ř* in Bohemian is like *r* followed by *z* as in *azure*.—*rh*, if both letters are in the same syllable, is as in *Rhine*.—*rz* in Polish is generally like *z* in *azure*.

s is generally as in *mason*, but in French, German, Italian (generally), and Portuguese a single *s* between vowels is like *z* in *zone*, and initial *s* in German before a vowel may be pronounced as *z*. In German initial *s* in *sp*, *st* may be pronounced like *sh* in *she*. In Hungarian *s* (see also *ss* below) is like *sh* in *she*. In French final *s* is generally silent; in Portuguese final *s* or *s* before a voiceless consonant, except another *s* (*p*, *t*, *f*, etc.), is like *sh* in *she*, and *s* before a voiced consonant (*b*, *d*, *v*, etc.) is like *z* in *azure*. (See also *sc*, *sch*, *sk*, *skj*, *stj*, *sz* below).—*š* is written in some Slavic languages, as Bohemian, for the sound of *sh* in *she*, and *ș* in Roumanian has the same sound; also *s* is sometimes used in names from Sanskrit with the same value.—*ś* in Polish is a palatalized *s*, between *s* in *see* and *sh* in *she*.—*sc* before *e* or *i* is like *sh* in *she* in Italian; in Roumanian it is like the same sound followed by *t*.—*sch* in German is like *sh* in *she*, and this German spelling is sometimes found in names not properly German. In Dutch it is like *s* followed by Dutch *ch* (see *ch*); in Italian and Roumanian like *sk*.—*sh* is like *s* followed by *h*; but in Russian names it is as in *she*.—*sj* in Dutch, Danish, Norwegian, and Swedish is nearly like *sh* in *she*.—*sk* is generally as in *skin*, but in Swedish before *e*, *i*, or *y* it is like *sh* in *she*, as also in Norwegian before *i* or *y*, and *skj* in Swedish and Norwegian has the same sound.—*ss* is generally like *s* (sometimes lengthened; see 7 above); in Hungarian it is like *sh* in *she* lengthened.—*stj* in Swedish is like *sh* in *she*.—*sz* in Polish is like *sh* in *she* (see also *cz*); in Hungarian *sz* is like *s* in *mason*, and *ss* is a long *s*.

t is generally as in *state*. If final in French it is usually silent.—*ț* in Roumanian means *ts*.—*th* is generally like *t*; but in modern Greek (*θ*), Icelandic (representing *þ*), and Welsh it is as in *thin*.—*tsh* in German is like *ch* in *church*; it is sometimes found in names not properly German with the same sound.—*tsh* in Slavic names is like *ch* in *church*.—*ty* in Hungarian is similar to *ty* with consonantal *y*.—*tz* is like *ts*.

u is generally as in *rule* or as *oo* in *fool*; but in French (see, however, *um*, *un*) it has a sound not existing in English, produced by pronouncing *i* as in *machine* with the lips rounded as for *u* in *rule*. In Dutch it has the same sound when it ends a syllable (see also *uu*); if a consonant follows in the same syllable Dutch *u* is nearly like *u* in *cut* or *hurt*. In Welsh *u* is generally like *i* in *machine*. Written *u* is sometimes silent (see *gu*, *qu*).—*ü* in German and Hungarian is like French *u*.—*ue* is sometimes written instead of *ü*; except in German both vowels are usually heard; see, however, *gu*, *qu*.—*ui* in French is French *u* followed by *i* in *machine* in the same syllable, but the *u* is sometimes silent (see *gu*, *qu*). In Dutch *ui* is somewhat like *oi* in *boil*.—*um*, *un* often represent in French and Portuguese nasal vowels (see *m*, *n* above), though French final *um* is sometimes pronounced *om* (somewhat like *om* in *Tom* or *um* in *hum*). The French nasal sound is French *eu* nasalized, much like *u* in *hut*, pronounced through the nose; the Portuguese one is *u* in *rule* or *oo* in *fool*, pronounced through the nose.—*uu* in Dutch is like long French *u*.—*uy* is in French like French *ui*, but, if a pronounced vowel stands after *y*, the *ui* is followed by *y* as in *ye*. Dutch *uy* is like Dutch *ui*.

v is generally as in English; but in German initial *v* is like *f*, and in Danish *v* is written instead of *u* as the last vowel of some diphthongs. See also *w* and see 6 above.

w is in general like *v*. In a few German names in *-ow* the final *w* is silent (see also *awu*, *eeuw*, *iewu*). In Welsh *w* is generally a vowel, like *u* in *rule*. The Russian letter sounded like *v* is sometimes written *w* in Roman letters, and sometimes *v*, or when final *ff* (see 6 above).

x is generally like *ks* as in English; but in Portuguese and Catalan *x* is like *sh* in *she*, and in some Spanish names *x* is occasionally found for the sound of a strong *h*, where the usual modern spelling has *j* or *g*.

y is generally like *i* in *machine*. Before a vowel it is like *y* in *ye* in Spanish and French (see also *ay*, *ey*, *oy*, *uy*). In Danish, Swedish, and Norwegian it is like French *u*. In older Dutch spelling it was like *i* in *ice*, as in Flemish; Dutch now writes *ij* instead. In Polish, and when it represents a certain Russian letter, it is a kind of retracted *i*, somewhat resembling *i* in *pit*. In Welsh it is sometimes like *i* in *sir*, and sometimes resembles *i* in *pit*.—(See also *gy*, *ly*, *ny*).—*ym*, *yn* in French are like French *im*, *in*.

z is often as in English; but in German it is always like *ts*; in Italian it is like *ts* or sometimes, especially when initial, like *dz*, and in Spanish it is like *th* in *thin*. Final *z* in Portuguese is like *sh* in *she*.—*ż* (in Polish), *ž* (common in Bohemian), *zh* (sometimes representing a certain Russian letter), and *zs* (in Hungarian) are all like *z* in *azure*.—*ž* in Polish is a palatalized *z*, between *z* in *zone* and *z* in *azure*.—*zz* in Italian is generally like *ts*.

Some letters with diacritic marks, as dots or other signs, not included above, are mentioned in the list of PECULIAR PHONETIC SYMBOLS at the beginning of this volume; see also the KEY TO THE PRONUNCIATION. For fuller information as to the sounds and the orthography of the languages concerned, see the articles on FRENCH, GREEK, LATIN, and other languages, and various grammars; also PHONETICS, and the works there referred to, especially *Phonetische Studien* and the bibliographical list in Sievers's *Grundzüge der Phonetik*.
E. S. SHELDON.

Pronunciation of Greek: the prevailing methods of pronouncing the ancient classical Greek. Though characterized by minor diversities, these may be grouped in general under three heads: (1) The English method, which gives to the symbols the value common to them in English, and accents according to Latin rules, disregarding the written accents. This method has been almost entirely discontinued in the U. S., but is still widely used in Great Britain and Canada. Among the different nations of continental Europe analogous methods are in vogue—i. e. the letters are sounded according to the general analogies of the native tongue, though the written accent is observed. This does not, however, necessitate, in general, so wide a departure from the original pronunciation as the English method. (2) The modern Greek method. This assigns to the letters the values they have in modern Greek; see under GREEK LANGUAGE (*Modern Greek*). Though this method has many advocates, it is unlikely of adoption, because it sadly confuses the original vowel-sounds, and departs widely from the clearly ascertained facts of the ancient pronunciation. The application of the modern English pronunciation to the reading of Chaucer would be a fair parallel. (3) The ancient

Greek method. The present tendency is strongly toward the adoption of what can, with reasonable certainty, be determined to have been the Attic pronunciation of the fourth century B.C. Its chief characteristics are approximately indicated in the following table:

VOWELS.	CONSONANTS.
a as a in Eng. <i>father</i>	γ as g in Eng. <i>go</i>
ε as e close in Fr. <i>bû</i>	γ before κ, γ, λ, ξ, as n in Eng. <i>ink</i> .
η as e open in Eng. <i>there</i>	θ either as d or t.
ι as i in Eng. <i>machine</i>	θ as th in Eng. <i>hathouse</i>
ο as o close in Fr. <i>out</i>	ξ as x in Eng. <i>box</i>
ω as a open in Fr. <i>encore</i> , and nearly as o in Eng. <i>orb</i> .	σ as s sharp in Eng. <i>sex</i>
υ as u in Fr. <i>ruse</i> , or Germ. <i>u</i> in <i>für</i> .	τ always as t in <i>top</i> or <i>out</i>
	φ as ph in Eng. <i>uphill</i>
	χ as kh in Eng. <i>blackhead</i>
	ψ as ps in Eng. <i>autopsy</i> .
DIPHTHONGS.	
αι as ai in Eng. <i>rash</i> .	
αυ as ou in Eng. <i>out</i> .	
ει as ei in Eng. <i>rain</i> .	
ου as e followed by u of Eng. <i>rule</i> .	
οι as oi in Eng. <i>bird</i> .	
ου as ou in Eng. <i>you</i> .	
υι as u of Eng. <i>rude</i> followed by a	

Other consonants have the ordinary sounds of their equivalents in English. Rho (ρ) should always be given its own distinct sound, and not be dropped at the end of words after a vowel, as is common in English. The vowels ε and ο were close and short, and have no equivalents in English; η and ω were, however, open and long. The long vowels corresponding to the shorts ε and ο were, at least until the middle of the fourth century, when ου became ō, the pseudo-diphthongs ει and ου. In direct contrast with the Greek it is to be noted that in Latin ē and ā are open and ē and ā are close. See F. Blass's *Pronunciation of Ancient Greek* (trans. from the 3d German ed., 1890); K. Zacher, *Die Aussprache des Griechischen* (1888). BENJ. DE WHIELER.

Pronunciation of Latin: The pronunciation of the Romans themselves at the height of their civilization (i. e. in the Augustan age and the time of the early empire) was substantially as follows:

A. *Vowels*.—ā as in *father*, ā as in the first syllable of *ahā*; ē as in *they*, ē as in *met*; ī as in *machine*, ī as in *pin*; ū as in *rule*, ū as in *put*; η like French *u*, German *ü*.

B. *Diphthongs*.—ai like ai in *aisle*; au like oi in *oil*; au like ou in *how*; eu with its two elements pronounced in rapid succession.

C. *Consonants*.—b, d, f, h, k, l, m, n, p, q, u were pronounced as in English; bs and bl had the sound of ps and pl; c always as k; t always a plain t, never with the sound of sh as in English *oration*; g always as in *gel*, except that when ngu precedes a vowel gu has the sound of gw, as *anguis*, *languidus*; j like y; r slightly trilled; s always voiceless as in *sin*, but in *suadeo*, *suavis*, *suesco*, and in compounds and derivatives of these words su has the sound of sw; v like w; x always like ks, never like English gz or z; z like English d or d. The aspirates ph, ch, th were pronounced like English ph, ch, th in such compound words as *loop-hole*, *black-house*, *hot-house*. Geminated consonants (e. g. ll, mm, tt) were pronounced with each member of the combination distinctly articulated.

For Latin scientific names the following pronunciation (often called English) is usually followed; but a strong tendency is now manifesting itself among scientists to adopt the Roman pronunciation:

A. *Vowels*.—These have their long English sounds (a in *make*, e in *met*, i in *kite*, o in *go*, u in *rule*, y in *lynx* when final; before another vowel; in penultimate (next to the last) and unaccented syllables, not final, before a single consonant or before a mute followed by l or r. Vowels have their short English sounds (a as in *bat*, e as in *met*, i as in *pin*, o as in *not*, u as in *run*, y as in *myth*) in final syllables ending in a consonant; in all syllables before x or any two consonants, except a mute followed by l or r; in all accented syllables, not penultimate, before one or more consonants.

B. *Diphthongs*.—æ and æ like e in the same situation; au as in *author*; eu as in *neuter*.

C. *Consonants*.—These are pronounced in general as in English, but c, s, t, when preceded by an accented syllable and followed by i and another vowel, have the sound of sh; r, under the same circumstances, is pronounced as *hsh*; ch is always hard, as in English *echo*.

See Seelman, *Die Aussprache des Latein* (1885); Lord, *The Roman Pronunciation of Latin* (1894).

CHARLES E. BENNETT.

Propagan'da [abbrev. from Lat. *Congregatio de Propagan'da Fide*, the Lat. name, liter., association for spreading

the faith]: a congregation of cardinals at Rome, first fully established in 1622 by Gregory XV., for furthering the spread of the Roman Catholic religion among the heathen; also, the great college (Collegium Urbanum) for training missionaries sustained by this body.

Proper'tius, **SEXTUS**: elegiac poet of Rome; b. in Umbria, near the frontier of Etruria, probably at Assisi; lost while still a youth most of his property by confiscation, and lived in Rome on a small competence; devoted himself to poetry; attracted the attention of Maecenas, and resided on the Esquiline in familiar intercourse, as it seems, with Maecenas, Vergil, and Ovid. The exact dates of his birth and death are unknown, but he was probably born about 49 and died about 15 B. C. His *Elegies* (in five books), which appear to have been much appreciated in antiquity, have come down only in a very corrupt text, and are in a way less enjoyable than the similar productions of Tibullus and Ovid on account of their style, which is cumbersome and obscure. These defects are offset by his strength of imagination, and vivid power of description, the genuine fervor of his passion, and his delicate sense of beauty. There are editions by W. Hertzberg (Halle, 1843-45, 3 vols.), Keil (Leipzig, 1850), Haupt (revised by Vahlen, Leipzig, 1885), A. Palmer (Dublin, 1880); a translation into English verse by Charles Robert Moore (Oxford, 1870); and an excellent edition of selections, with introduction and notes, by Postgate (London, 1881). See also W. Y. Sellar, *Horace and the Elegiac Poets* (Oxford, 1892). Revised by M. WARREN.

Property [from O. Fr. *proprete* < Lat. *proprietas*, property, liter., ownness, deriv. of *proprius*, own, proper]: in the broadest sense, all private rights of economic value. In this sense the term covers (a) real rights—i. e. rights over corporeal objects; (b) obligations—i. e. rights of demanding from particular persons that they do or refrain from doing particular things; (c) rights of a monopolistic nature (patents, copyrights, etc.), which confer an exclusive power of making and selling certain things. As here treated the word property is confined to rights over corporeal things.

ROMAN AND EUROPEAN LAW.

Roman Law.—Many provisions of the Roman law are applicable only to immovables, and many other provisions only to movables; but in general the same body of rules governs both classes of property, both as regards relations *inter vivos* and as regards inheritance.

Rights over things are either general or partial. The general right is ownership (*dominium*, *proprietas*). This includes all rights over the thing not expressly withheld by the law or granted by the owner to other persons. Ownership is acquired either from a former owner, so that the title of the new owner depends upon that of his predecessor (*auctor*), or by the operation of some rule of law which vests in the new owner an independent title. In the former case the acquisition is "derivative"; in the latter case it is "original." The most important modes of derivative acquisition recognized at Roman law were (a) conveyance, which implies an agreement between the conveyor and the conveyee and the delivery of possession (*traditio*), and (b) inheritance or legacy. (See **SUCCESSION**.) The modes of original acquisition were occupation, accession, specification, and prescription. (a) Occupation signifies, literally, taking possession. If the thing occupied has no owner (*res nullius*), the assumption of possession with the intention of assuming ownership creates ownership. Among *res nullius*, capable of occupation, the Romans classed wild animals; shells, stones, etc., on the seashore; and things derelict. Dereliction is the opposite of occupation; it consists in the abandonment of possession with the intention of abandoning ownership. Things lost are not derelict, and the finder does not acquire ownership; but treasure-trove (*thesaurus*) is regarded as *res nullius* when the articles found have been so long hidden that the owner can not be discovered. In such case half the treasure goes to the finder, the other half to the owner of the soil. (b) Accession signifies that what was previously an independent thing has become a part of some other thing, and has thereby passed into the ownership of him who owns the principal thing. An example of accession is the planting of a tree. No separate ownership is possible in the tree; it goes with the land. The same rule properly applies to a building erected on another man's land, and to the materials employed in its construction; but here the original ownership of the materials is not deemed to be extinguished, but simply suspended. Other cases of accession

are *alluvio*, or the gradual deposit of soil by the action of running water; and *avulsio*, or the sudden deposit of soil torn from another's land by a freshet or a landslide. Accession is also possible in the case of movables; so when a leg is fitted into a chair, a blade inserted in a knife, etc. (c) Specification takes place when a thing is converted by labor into a new and different thing (*nova species*). Cases of specification range from the conversion of wine into vinegar to the manufacture of watch-springs out of a bar of metal, and from these purely mechanical transformations to such as are effected by the artistic skill of a sculptor or painter. In all these cases the maker of the new thing becomes owner, although the material was not previously his, provided he has acted in good faith; provided also (by a positive rule of Justinian's) the new thing can no longer be reduced to its previous condition.

Partial rights (*jura in re*) were divided by the Roman jurists into rights of use and rights of pledge or mortgage. Rights of use were (a) servitudes; (b) hereditary leaseholds. The ordinary lease was a purely contractual relation, and created no *jus in re*; but where unimproved land was leased for long terms a very liberal measure of "tenant right" was accorded to the lessee. Such leaseholds were termed *emphyteusis* when the land was used for agricultural purposes, *superficies* when it was used for the erection of buildings.

Mediæval Developments.—Teutonic custom drew a much sharper distinction between realty and movables than was drawn at Roman law. The feudal system, which associated political powers with the ownership of land and public or quasi-public duties with its possession, accentuated the distinction; so that mediæval law developed quite different rules for realty and personalty, both as regarded relations *inter vivos* and as regarded inheritance.

Rights in immovables could be acquired as a rule only by inheritance or by some public form of "investiture" or conveyance. Transfer of realty was generally restricted: partly in the interest of the ruling classes by the system of feudal tenures, and partly in the interest of the family by the system of family community. As regarded movable property, delivery of possession regularly passed title. Except in the case of lost and stolen things, and except as between bailor and bailee, Teutonic custom treated possession as equivalent to title. Transfer of movables was regularly unrestricted.

In neither field of property rights was the distinction between ownership and the lesser rights so sharply formulated as in the Roman law. As regarded realty the confusion was increased in the course of the Middle Ages by the systems of feudal and of peasant tenures. The feudal system gave to one person, the lord, general residuary rights in the land, and in particular a more or less effective reversionary right; to another person, the vassal, it gave rights of possession and use which everywhere tended to become hereditary and alienable. When Roman legal theories began to dominate mediæval thought the jurists found some difficulty in deciding whether the lord or the vassal really owned the land; and they solved the problem by attributing to the former a higher or superior ownership (*dominium emineens* or *directum*), and to the latter "practical ownership" (*dominium utile*). Similar difficulties were encountered in dealing with peasant tenures, especially in Germany. In many parts of Germany the private or property rights of the manorial lord (as distinguished from his jurisdictional rights) were limited to the receipt of customary rents and services, the peasants having perpetual and hereditary leases (*Erbpacht*). Here again, with the reception of the Roman law, the jurists worked out the un-Roman distinction of superior and inferior ownership (*Obereigenthum* and *Untereigenthum*). With the decay of the feudal system and the disappearance of the reversionary rights of the feudal lord, the inferior rights of the vassal developed into the full right of ownership, while the eminent domain of the lord gradually lost the character of a property right and became simply governmental power. Peasant rights also have usually been converted by modern legislation into full proprietorship. In all modern European states the confused system of the Middle Ages is rapidly disappearing, and ownership in the Roman sense is sharply distinguished on the one hand from political power and on the other from lesser and partial rights in the land.

The feudal system has nevertheless left permanent traces in the modern law of property, both as regards inheritance of realty (see SUCCESSION) and as regards other modes of acquisition. The effort of the feudal princes to reserve control over forests, hunting, and fishing, paved the way

for the modern governmental control of all these matters. Early in the Middle Ages animals *feræ naturæ*, if regarded as objects of sport, ceased to be open to occupation except by him who had the right to take them. The efforts of the feudal princes to increase their revenues led also to an assertion of exclusive governmental right over other things which the Romans regarded as *res nullius* (e.g. things washed up by the sea, abandoned land, enemy's goods; in some territories *thesaurus*, or treasure-trove). The same efforts gave rise to the theory that mining privileges belonged to the feudal lord, and could be exercised only by his license, which was regularly issued to the first finder. The owner of the soil could demand only compensation for damage done to the surface, and in some territories a share in the venture. The right to minerals was thus separated from the right to the surface. Nearly all these "royalties" (*regalia*) have passed into modern European law as rights of the state or "fiscus."

Modern Legislation.—Some of the older codes confuse rights over things with property rights in the broader sense, and speak of an "ownership" of obligations, etc.; but in the more recent codes rights over things are sharply distinguished from rights *in personam*. Immovables and movables are subjected to very different rules, but the distinction is obscured by a formal unity of treatment.

Ownership (*domaine, propriété, Eigenthum*) is the general right in the Roman sense. As regards original acquisition, the list of *res nullius* has been limited and the field of occupation narrowed by the development of fiscal rights. The Code Napoléon declares that all property without an owner belongs to the state, but it makes an exception in the case of treasure-trove (*trésor*) and applies the Roman rule. Some of the existing German codes give a share of treasure-trove to the state or the commune, but the draft code for the whole empire proposes to re-establish the Roman rule. As regards accession, the Roman rules are generally accepted. The law of specification is substantially Roman; but the Saxon code and the German draft code discard the distinction between the honest and the dishonest maker, and all the modern codes reject the distinction between a new thing that can be reduced to its original form and one that can not be so reduced. In determining the ownership of the new thing many codes lay stress on the relative value of the material and the labor.

As regards conveyance, the French law breaks with the Roman law by declaring that title passes with the conclusion of the contract and without delivery of possession; but while this rule governs the relations between the conveyor and the conveyee it does not operate against third persons.

The most sweeping changes that have been introduced in the modern law of property are due, in the case of movable property, to the protection given to the honest possessor (see POSSESSION), and in the case of immovable property to the registration laws. See RECORDING etc. MUNROE SMITH.

ENGLISH AND AMERICAN LAW.

The English law of property, from which that of the U. S. is derived, followed an independent line of development. Whereas, to the Roman law, land and goods were only differing forms of property, accidentally discriminated by the physical differences between them, but both of them subject to ownership in the same sense of that term and for the most part governed by the same rules of law, in the English system this physical difference became fundamental, and resulted in two distinct bodies of law—the law of "real property" and the law of "personal property." This result was due to the peculiar and exceptional character impressed upon land as the subject of property by the feudal system. As explained in the articles on ESTATE and LANDLORD AND TENANT, that system was wholly based on the conception of land, not as subject to ownership, as chattels are owned, but as subject to a qualified interest or estate, limited in duration, and exacting of the holder, or "tenant," the performance of feudal services as the condition of his tenure. Nor was the "lord," of whom the land was held, in any better situation: he in his turn held the land as tenant of some superior lord, and so the feudal hierarchy ascended until it reached the king as lord paramount. So while goods and chattels continued to be subject to that absolute control which we call ownership, lands were merely "held" by a variety of tenures or estates, the ultimate ownership being vested in the crown or state.

It would be a mistake, however, to assume that the distinction between real and personal property coincides with

that between land and goods, or between the "movables" and "immovables" of the Roman law. Here, as so often in the history of the common law, the inflexible methods of procedure by which rights were enforced gave rise to an artificial distinction, based, indeed, on the fundamental difference between movables and immovables, but not following the natural line of cleavage between them. The terms "real" and "personal," now employed to describe different classes of rights over things, originally described only different forms of action. The *real* action was a proceeding for the recovery of the *res*, the very thing of which the party complaining had been deprived; the *personal* action, on the other hand, was an action against a certain person for the infringement of a right, but it sought to recover, not the property itself, but damages for its detention or destruction. By reason of the permanent, indestructible character of lands, the real action was especially appropriate for recovering possession of them. Hence lands were called *real* property. But goods and chattels, being easily susceptible of destruction, or loss, or concealment, and being, moreover, infinitely less important to feudal society than freehold interests in land, could not be pursued and recovered by a real action. The only remedy provided by law for the unlawful destruction or detention of a chattel was the personal action for damages. Hence goods, or chattels, came to be known as *personal* property.

Not all interests in land, however, could be recovered by a real action. All estates of freehold—fees simple, fees tail, life-estates—were considered worthy of recovery by this solemn form of procedure; but leases for years, which were not properly estates at all, which existed by virtue of contract merely, and which were deemed unworthy of freemen, were not recoverable by real action. In other words, the tenant for years, if he was unjustly dispossessed, whether by his lord or by a stranger, had originally no remedy but a personal action for damages. Accordingly, terms of years came to be regarded as personal property, notwithstanding the fact that the right to recover possession of his leasehold by ejectment was conferred upon the tenant for years at a very early period. By virtue of this right to maintain ejectment for its recovery, the term of years became a true estate or interest in lands, but it has never lost the anomalous character which its humble origin impressed upon it. A leasehold of 1,000 years is still, in the U. S. as well as in England, regarded as personal property, whereas an estate for life is a freehold, and has all of the incidents of real property. In Massachusetts and a few other States, however, leaseholds of great length are assimilated to real property.

Personal property, then, includes not only goods or chattels, but also such interests in lands as the early common law did not deem worthy of protection by a real action. The legal conceptions to which the feudal system gave rise were responsible for another anomalous extension of the notion of personal property. All property rights are in their nature rights of control over material objects—called rights *in rem*—and are opposed to those legal rights which do not directly concern things, but persons, which are known as rights *in personam*. A large body of rights of this latter class—i. e. rights of action, such as claims, demands, etc., called *choses in action*—were brought into the classification of personal property. To these must be added those other intangible rights recognized by modern law, such as trademarks, patent rights, copyright, etc.

Real property, on the other hand, comprehends much besides those estates or interests in land, called freehold interests, which were anciently deemed worthy of protection by real action. The term includes also all those rights of use or enjoyment in the lands of others which, under the description of easements, profits and rents, fill so large a space in the modern as well as in the ancient law of property, together with all those movables which, by becoming attached to the soil, have acquired the character of *fixtures* (*q. v.*). On the other hand, certain things which are usually regarded as real property, may, because of special circumstances or as between particular persons, fall into the category of personal property. This is true of such growing crops as have acquired the character of "emblements," of trees standing or cut, of stones which have been quarried but not removed, etc. In all such cases, however, the special circumstances must be shown in order to rebut the presumption arising from the apparent connection of the articles in question with the land.

The complicated system of feudal tenure¹ above referred to has long since been swept away. The freehold tenant no

longer holds his land as the fee of a lord, excepting in a few manors which still survive in England. But the tenure of lands, in the U. S. as well as in England, continues to exhibit the feudal form. In some of the States it is expressly provided by statute that all lands shall be held by "allodial"—that is, absolute—titles; but, notwithstanding that declaration, there is no such thing as absolute ownership of lands. The state is lord paramount, and the landowners hold their fees in subordination to its paramount title.

The popular notion of *ownership* is, for most purposes, a sufficiently accurate definition of the extent of the right of property: it indicates in general either a present or an ultimate right of possession, coupled with the control of the thing and the power of transferring this ownership in whole or in part to another. Of course, the actual physical possession may be in another than the owner, and even the right of possession may be temporarily vested in another person—as in a tenant of lands or a bailee of goods—but there can be no property without actual or constructive possession, or the right to resume or control the possession at some time in the future. Indeed, so important is the fact of possession even without right, and the right of possession without ownership, that they have in law many of the attributes of actual property rights. Attention is called in the article on *LIMITATION OF ACTIONS* to the extraordinary consequences of a disseisin, whereby a disseisor, by dispossessing the rightful owner of lands and installing himself in his place, acquires the lawful seisin, the "property" of the former owner, and becomes a new root of descent. But it is also true that the disseisor has by his act acquired a right of possession and a title against the whole world besides the rightful owner: and if he is, in his turn, disseised, he can recover the lands by process of law. So, in the law of personal property, one, not the owner, who has the temporary right of possession of chattels (as a pledgee, for example), is said to have "a qualified property" in the goods, giving him certain rights of control and disposition, which could not be lawfully exercised by one who had no proprietary interest. The term "seisin" was originally identical in meaning with "possession," and was applied indifferently to real property and to chattels, but it was ultimately appropriated exclusively to describe the possession of freehold interests in land, the term possession being reserved for chattels and chattel interests. Accordingly, if X, a tenant in fee simple, leases his lands to Y for a term of years and the latter enters and occupies them, there is a double possession; Y is *possessed* of the premises as tenant for years, and X is at the same time *seised* of them by virtue of his freehold.

The two classes of property under consideration differ greatly in the extent and kind of use and enjoyment which are the attributes of ownership of them respectively: but this difference is wholly due to the nature of the subject-matter in each case. As has been said before, the right of property in chattels is in its highest estate absolute and untrammelled. A man may do what he will with his own. But while the right of property in land is unlimited in extent—extending to an indefinite distance below and above the surface—it is nevertheless strictly limited and circumscribed by the physical and social conditions which prevail.

Land, as the seat of man's habitation, is so bound together with and related to all other adjoining land, that to admit an absolute right of property in one man would be to devote his neighbor's property rights to destruction. Hence we have the principle that a man may make only such use of his land as is compatible with the due and reasonable enjoyment by his neighbor of *his* land. In order to enforce this obligation of mutual forbearance the law recognizes three so-called "natural rights" of property: I have a right to require of my neighbor that he shall not by excavations on his own land withdraw the natural support of my land; that he shall not vitiate the air which visits my premises with noxious or disagreeable substances, odors, or noises; that he shall not unreasonably interfere with the watercourse which passes over my land. These are fluctuating rights, however, and vary in degree according to the conditions of life and industry which prevail in the locality, the test of infringement of the property right in each case being the reasonableness or unreasonableness of the act complained of in view of all the circumstances.

In addition to these original and natural limitations on dominion, the absolute right of property is further extensively limited by that numerous class of rights over the land of others known as easements, profits, etc. While these rights are in themselves, as has been explained above,

a species of real property, they are from the point of view of the person over whose land the rights exist, serious limitations on his enjoyment of his own lands.

The principal remaining differences between the two classes of property under consideration display themselves in the mode of conveyance requisite to transfer them, respectively, and in the disposition which the law makes of them upon the death of the former owner intestate. Personal property is still transferred by delivery, so far, at least, as it is susceptible of manual delivery; where this is not possible the transfer is effected by delivery of some evidence of the property or by some writing. The transfer of real property, which passed at common law only by "livery of seisin" (a symbolical delivery of possession), or, in the case of incorporeal hereditaments (see HEREDITAMENTS) by grant, or instrument under seal, is now effected by deed, sealed and delivered. (See DEED.) For the alienation of goods by SALE and GIFT, see those titles.

By the laws of descent and distribution, upon the death of a property-owner intestate his real estate passes at once to his heir, and his personal property into the jurisdiction of a probate or surrogate's court, where its distribution to creditors and next of kin is supervised and effected. This process of distribution is known as the "administration" of the estate, and is carried out through the medium of an administrator appointed by the court. If the decedent leaves a will his lands go directly to the devisee, but the personal property to the executor for distribution according to the terms of the will. See DESCENT and WILL.

The principal modes of acquiring property are considered elsewhere, and need only be referred to here. Under the head of "original acquisition" are included the taking of title to chattels by occupancy or finding, by capture (of wild animals), by confusion and accession, and the acquisition of title to new lands by accretion. The acquisition of title by disseisin and lapse of time is discussed in the articles on LIMITATION OF ACTIONS and PRESCRIPTION. Conveyances, by deed or otherwise, include gifts. Gifts *causa mortis* are a kind of informal will which has been much favored by the courts. (See WILL.) At the present time both real and personal property may be freely alienated by will, though the right to devise real property did not exist at common law. It was created by the Statute of Wills (32 Hen. VIII., ch. i., A. D. 1540). The subjects of descent and distribution are now wholly regulated by statute.

The law of property as above outlined prevails over the whole of North America, except in the State of Louisiana, the Province of Quebec, and the republic of Mexico, where modifications of the Roman or civil law are in force. The states of Central and South America are also governed by codes which are mainly derived from the civil law.

See also articles on FEUDAL SYSTEM, CHATEL, and REMAINDER. Consult Leake, *Digest of Law of Land*; Washburne, *Real Property*; Schouler, *Personal Property*; Pollock and Wright on *Possession*; and Raleigh's *Outline of the Law of Property*.
GEORGE W. KIRCHWEY.

Prophet [from Gr. *προφήτης*, interpreter, one who declares and explains clearly (*πρό*). The word is, however, also used to translate the Hebrew *nabi* with its sense of one who has insight into God's mind and reveals it]: he who speaks for another, *proclaimer*, preacher; or one who predicts future events. In the records of all nations from the most remote antiquity there are accounts of men who claimed, and were believed to have, special and immediate intercourse with the Deity. The most remarkable and familiar instances of these phenomena appear in the nations of the East, more particularly among the Hebrews. In the Old Testament they are called נָבִיא, speaker, interpreter—i. e. revealer—of the divine will to man (in no case does it mean predictor of future events), Ex. iv. 16; vii. 1. Comp. *רֹאֶה*, seer. In the earlier ages they appear chiefly as seers (רֹאֶה, 1 Sam. ix. 9), leading a contemplative life apart from the world. Apparently about the time of Samuel, with whom the prophetic age begins, they were organized into communities, known as בְּנֵי אֱלֹהִים (comp. *Darwīs* of the present day), established in various places under the charge of old and experienced prophets, devoting their time to the study of the sacred writings and ecstatic religious exercises. After the exile all trace of these organizations is lost; the prophets appear separately and at intervals, and from Malachi to John the Baptist there arose no prophet in Israel. The prophets led in the main an ascetic life, supported by the contributions of the charitable (2 Kings iv. 42), by the

gifts of those who sought counsel from them (1 Sam. ix. 7; 1 Kings xiv. 3; 2 Kings v. 15, 16 ff.; *ib.* viii. 8), or by fruits herbs, etc., gathered by themselves (2 Kings iv. 39; Matt. iii. 4). Their costume was a mantle of skin (Zech. xiii. 4; 1 Kings xix. 13) girded around the loins (2 Kings i. 8; Matt. iii. 4).

The call to the prophetic office was an inward one from God, but those so called were not at all times in a state of inspiration, nor was this under control of their will. The divine revelations were not received in a state of ecstasy, but in visions or in an elevated though entirely rational condition. The form in which the prophecies were communicated to the people depended entirely on the age and the individuality of the prophet, whether by verbal communication, symbolic actions which were mostly unreal, or by writings (Isa. xl. ff., and some of the later prophets). The prophets had mainly in view the reformation and elevation of the people, but announced future calamity or deliverance of their own or neighboring peoples as an aid to present guidance.
Revised by S. M. JACKSON.

Propion'ic Acid [*propionic* is from Gr. *πρῶτος*, first + *πῶλον*, fat; so called because it is the first member of the series of fatty acids that has oily or fatty properties]: the third member of the series of fatty acids. Its composition is $C_3H_5O_2$. It occurs in the fruit of *Gingko biloba*, in sweat, and in wood-vinegar. Gottlieb, its discoverer, obtained it by oxidizing metacetic acid, and therefore called it metacetic acid. It can be made in the laboratory by a number of methods, the most satisfactory being the oxidation of propyl alcohol, to which it bears the same relation that acetic acid bears to ordinary or ethyl alcohol, and formic acid to methyl alcohol. It is a liquid that mixes with water in all proportions. It boils at 140.9° C.
IRA REMSEN.

Prop'olis [= Lat. = Gr. *πρόπολις*; *πρό*, before + *πόλις*, city, so called because it is used to close small approaches to the hive]: a resin which the honey-bee collects upon its posterior tibia and carries to the hive, where it is used in filling crevices, finishing combs, and the like. In the U. S. it is mainly collected from the buds of the birch, the horse-chestnut, and the balsam-poplar.

Proportion: in mathematics, an equality of ratios, a ratio being the relation, expressed by division, which one quantity bears to another. Four quantities are said to be in proportion when the ratio of the first to the second is equal to the ratio of the third to the fourth. A proportion may be written in either of two ways; thus if the ratio of *a* to *b* is equal to the ratio of *c* to *d*, the equality may be indicated by either of the following expressions:

$$\frac{b}{a} = \frac{d}{c}, \text{ or } a:b::c:d.$$

Either of them may be read *a is to b as c is to d*. The first and third terms are *antecedents*; the second and fourth terms are *consequents*; the first and fourth are *extremes*; the second and third are *means*. The first ratio is called the *first couplet*, and the second ratio is called the *second couplet*. Two varying quantities are said to be directly proportional when their ratio is constant; inversely, or reciprocally, proportional when their product is constant. But this distinction of proportion does not seem to serve any useful purpose. A continued proportion is an expression of continued equality between three or more ratios; thus

$$\frac{b}{a} = \frac{d}{c} = \frac{f}{e}, \text{ etc., or } a:b::c:d::e:f \dots, \text{ etc.,}$$

is a continued proportion. The terms of a geometrical progression form a continued proportion.

The following are some of the ways in which proportions may be transformed: (1) The antecedents may be made consequents, and the consequents antecedents; the proportion is then said to be transformed by *inversion*. (2) Antecedent may be compared with antecedent, and consequent with consequent; the proportion is then said to be transformed by *alternation*. (3) The sum of the antecedent and consequent of each couplet may be compared with either the antecedent or consequent of the corresponding couplet; the proportion is then said to be transformed by *composition*. (4) The difference of the antecedent and consequent of each couplet may be compared with either the antecedent or consequent of the corresponding couplet; the proportion is then said to be transformed by *division*.

The most important principles of proportions are the following: (1) If four quantities are in proportion, the product of the means is equal to the product of the extremes; *con-*

versely, if the product of two quantities is equal to the product of two other quantities, the first two may be made the means and the other two the extremes of a proportion. (2) If a couplet in each of two proportions is the same, the remaining couplets will form a proportion. (3) If four quantities are in proportion, they will also be in proportion by inversion, by alternation, by composition, or by division. (4) Equimultiples of two quantities are proportional to the quantities themselves. (5) In a continued proportion the sum of all the antecedents is to the sum of all the consequents as any antecedent is to the corresponding consequent. (6) If the corresponding terms of two or more proportions are multiplied together, the products will be in proportion; consequently, like powers or like roots of all the terms of a proportion are in proportion. Revised by R. A. ROBERTS.

Proportional Representation: See REPRESENTATION.

Proposition: See LOGIC.

Propylite [Gr. *πρόπυλον*, or *τὰ προπύλαια*, gateway]: a name given in 1867 by von Richthofen to certain altered forms of andesites and allied volcanic rocks (formerly called greenstone trachytes), which are greatly developed in the silver districts of Hungary and the Comstock lode (Nevada). The name was selected under the impression that these rocks constituted a distinctive type which ushered in a renewed period of volcanic activity at the beginning of the Tertiary period, after long-continued inactivity in Mesozoic times. These rocks have since been shown by Wadsworth, Becker, and others to be only normal and widely distributed igneous varieties, whose ferromagnesian constituents have been extensively altered to fibrous hornblende, epidote, chlorite, and similar secondary minerals. The name propylite can not, therefore, be regarded as having any petrographic significance except to denote a certain phase of alteration, which may be closely connected with the deposit of silver ores in the regions above named. See Monograph III. and Bulletin No. 17 of the U. S. Geological Survey.

GEORGE H. WILLIAMS.

Prosecutor: in law, one who institutes and carries on a criminal proceeding against another in the name of the government.

In most countries the duty of making a preliminary investigation into the circumstances of an offense, collecting the evidence for trial, and managing the trial of the case is imposed upon public officers. This is the case throughout the continent of Europe. In Scotland there are officers (procurators-fiscal) charged with the duty of instituting criminal proceedings, obtaining evidence, securing the accused, etc.; and in Ireland (where in general the same laws, with slight variations only, prevail as in England) criminal prosecutions are conducted principally by solicitors and counsel who represent the crown.

In England, and in some English colonies, the prosecution of persons for public offenses is left entirely to private persons, or to public officers who act in their private capacity and have hardly any legal powers not possessed by private individuals. Every private person has exactly the same right to institute any criminal action as the attorney-general or any one else, and a private person may prosecute for high treason, a seditious conspiracy, or a libel upon a third person in which he has no sort of interest. Formerly there was no public official whose duty it was to inquire into cases of supposed criminal offenses; but as a matter of fact the duty was undertaken by the police, who in cases of any importance were usually authorized by the superior officers to instruct a solicitor, who in some cases instructed counsel to appear and prosecute. Now, by act of Parliament (47 and 48 Vict., c. 54), the chief officer of every police district is bound to give information to the director of public prosecutions of indictable offenses alleged to have been committed in his district.

When a private person has instituted a prosecution he is usually bound over to prosecute, and when a bill has been sent to the grand jury the matter must take its course, (unless the proper court sanctions the withdrawal, or unless the attorney-general enters a *NOLLE PROSEQUI*, *q. v.*), and the injured party must pay all the costs of the prosecution, unless the court allows him costs, which it may now do in all cases of felony and in all common cases of misdemeanor. This system of prosecution by private individuals, which is the result of historical causes and not of design, while apparently liable to great abuses, in practice is found to work well and to afford a very effectual guarantee of the due observance of the laws.

In the U. S. the system of prosecution by public officers is followed, and private prosecutions, except for petty offenses and in the lowest courts, are almost unknown. DISTRICT ATTORNEYS (*q. v.*) or prosecuting attorneys are appointed by the Federal and State governments to take exclusive charge of prosecutions, oversee the finding of indictments, and conduct the trial for the state. The injured person can do no more than lodge a complaint before the committing magistrate or the grand jury, and thus secure the arrest of the accused for examination and indictment. The public officer may employ private counsel in some instances or surrender the case to them, but they act as his delegates. This is the course of proceedings that generally prevails throughout the U. S. See Stephen's *History of the Criminal Law of England* and Bishop's *Law of Criminal Procedure*. F. STURGES ALLEN.

Proselytes [via O. Fr. and Lat. from Gr. *προσήλυτος*, convert, proselyte, liter., one who has come to (a party); deriv. of *προσελθεῖν*, come to; *πρός*, to, toward + *ελθεῖν*, come]: among the post-exilic Jews, Gentiles who conformed to Judaism. The rabbins speak of "proselytes of the gate," who simply observed the seven precepts of Noah; and "proselytes of the covenant," or of "righteousness," who were circumcised, baptized, and allowed all the privileges of the Jews; but Lardner recognized only the latter.

Prosencephalon: See BRAIN.

Proserpina: See PERSEPHONE.

Prosim'ia [Mod. Lat.; Lat. *pro*, before + *si'mia*, ape, monkey]: a division, usually considered as a sub-order, of the order *Primates*, containing the lemurs, aye-aye, and tarsius. These animals agree with the apes and monkeys in many particulars, but have a considerable portion of the cerebellum not covered by the cerebrum, the lachrymal opening in the cheek outside the orbit, and the orbit open behind. The ears are more or less pointed and turned outward, and without a lobule. The female has a two-horned uterus, and the clitoris perforated by the urethra.

F. A. LUCAS.





Prosobranchia'ta: an order of gasteropod molluscs in which the gills are in front of the heart. It includes the majority of the sea-snails, as well as some of those occurring in fresh water or on the land. See GASTEROPODA.

Prosody [from Lat. *prosō'dia* = Gr. *προσῳδία*, what accompanies the song, marks of accent, punctuation, breathings, quantity, etc.; *πρός*, in addition + *ᾠδή*, *ᾠδὴ*, song, deriv. of *ᾠδῆν*, sing]: a term properly meaning "accent," but including ACCENT, QUANTITY (*q. v.*), and versification. Here the general principles of versification are treated, the special verses being given under METRES (*q. v.*). This branch of prosody relates to the reduction of speech to rhythmical form. See RHYTHM.

Speech is composed of syllables that are either short, or long, or doubtful. In versification the long is made equal to two short syllables, and the doubtful or "common" may be used either as short or as long. In the treatment of syllables to produce rhythm some special processes arise. In the classic languages hiatus ("yawning" or "gasping" resulting from the concurrence of two vowels) between two words is not allowed except in special cases. It is prevented by elision, or crasis, or shortening (partial elision) of a long vowel or diphthong, or by synizesis (slurring) of two long vowels. Also within a word a short vowel may be slurred with a following vowel. Rarely in Latin *i* receives the sound of *y*, as *ariphe* (— *y* —) for *ariphe* (— *i* —), and *u* rarely receives that of *w*, as *tenuia* (— *w* —) for *tenuia* (— *i* —). Sometimes syllables are lengthened or shortened seemingly for metrical reasons, that is, to make an indispensable word suit the verse; but generally the quantity thus created was in use, though perhaps rare or obsolescent.

Elements of Verse.—As in speech there are syllables, words, clauses, etc., and in music notes, bars, or measures, etc., so in metre there are syllables, feet or measures, cola (clauses or sentences), periods. To the *χρόνος πρώτος* of rhythm corresponds the mora or short syllable of verse, as the unit of measure. From its name *σμεῖον*, or *σῆμα*, syllables are called monoseme, diseme, triseeme, etc., when the number of mora they contain is one, two, three, etc. Sometimes a syllable was prolonged (by *παρέκτασις*, now usually, but inappropriately, called syncope) to the length of three or more short syllables. Again, a long in certain feet may, as an irrational, serve as a short. Moreover, two short syllables may be used as one irrational, thus having the metrical

value of one short, and a long and a short may have the time of a long. Rests or pauses also occur in catalexis, i.e. at the end of cola or periods. Hence we have the following elements of metre, with their rhythmical analogues (the *χρόνος πῶτος* being conventionally represented by the one-eighth note or quaver):

Note.	Syllable.	Length.
	⏏	1 mora, monoseme.
	—	2 moræ, diseme.
	⏏	3 moræ, triseme.
	⏏	4 moræ, tetraseme.

Even a pentaseme is mentioned by some. The greater pauses are indicated by the caret (Λ) with quantity marks over it, but the monoseme pause by the simple caret. The irrational is indicated by >, two short syllables equivalent to one by ∞, and a short and a long, equivalent to one long, by ∞.

By resolution in some metres two short syllables may replace one long, and by contraction one long may replace two short ones.

Feet.—In rhythm the units of time must be marked. In English the accent serves as a mark, while in Latin and Greek the mark is the stress or loudness of long syllables as compared with short. Hence every fundamental foot must contain at least one long and one short syllable. The strong part of a foot was called thesis (*θέσις*, down-beat), and the weak part arsis (*ἄρσις*, up-beat); but some, following Roman grammarians, now interchange these terms.

Feet may be classified (1) according to the ratios between thesis and arsis (*γένος ἴσον*, *γένος διπλάσιον*, *γένος ἡμιόλιον*, etc., for the respective ratios 1, 2, 1½, etc.); or (2) according to the number of syllables they contain; or (3) according to their length as measured by moræ. Adopting the last method there are:

1. **Triseme Feet.**—(a) Descending: the trochee ⏏ and its substitutes, the tribrach ∞, the irrational choree >, ∞, the triseme syllable or syncopated trochee ⏏, the catalectic trochee —Λ, the cyclic and trochaic dactyls ∞, ∞. (b) Ascending: the iambus ⏏ and its substitutes, the tribrach ∞, the irrational iambus >⏏, the irrational choree >∞, and the cyclic anapest (perhaps ∞, or sometimes ∞>).

2. **Tetraseme Feet.**—(a) Descending: the dactyl ⏏ and its substitutes, the spondee —, the tetraseme trochee ⏏ (⏏), the tetraseme syllable or syncopated dactyl ⏏, the catalectic dactyl —Λ. (b) Ascending: the anapest ∞ and its substitutes, the spondee — and the dactyl —⏏. The proceleusmaticus ∞, ∞, ∞, is rare, and generally due to corruption.

3. **Pentaseme Feet.**—(a) The cretic ⏏ and its equivalents, the first and fourth pæons, ⏏, ∞, ∞. (b) The bacchius and anti-bacchius, ∞, ∞, ∞.

4. **Hexaseme Feet.**—(a) Ionicus a minori ∞, ∞, ∞, ionicus a majori —, ∞, ∞, with resolutions ∞, ∞, etc.; by contraction the molossus —, and by anacalasis (*ἀνάκαλσις*, breaking up) ∞, ∞, ∞ for ∞. Otherwise the ditrocheus and the diambus, ∞, ∞, ∞, ∞, are dipodies. (b) The choriambus = trochee or choree + iambus, ⏏, ∞. The antispast ∞ has only apparent existence.

5. **Heptaseme Foot.**—The epitrite (*ἐπίτριτος*, 3 : 4), ⏏, ∞, ∞, probably two feet with change of tempo making ∞ = —, but usually read either ∞ — or ∞ >.

6. **Octaseme Foot.**—The dochmius ∞, ∞, ∞, which through irrational syllables and resolutions assumes many forms.

Two short syllables, ∞, though not a foot, receive the name pyrrhic. Sometimes, in logaedic verse, a polyschematic (many-formed) foot—the so-called basis—consists of two syllables, either long or short, ∞, or three short syllables.

Measure.—In iambic and trochaic verse, where one ictus or stress is stronger than the other, and in anapaestic verse used in the march, a dipody or pair of feet is the measure, so that a dimeter, for instance, has four feet; in other metres the single foot is the measure.

Colon (*κῶλον*, member), called also clause or sentence.—When a verse contains more than eighteen moræ it is divided into members, each marked by an ictus stronger than that of the ordinary foot. Verses of less than eighteen moræ consist of a single colon, which, however, may be divided into commata (*κόμμα*, section) by cæsure or diæresis.

Period (*περίοδος*, circuit).—Either a single colon or several cola may form a fully rounded rhythmical unit, or period. Such a period is usually a verse, but may exceed the limits of a legitimate verse.

Verse (Lat. *versus*, a turning).—A verse is a period of rhythmical speech, sufficiently short to be perceived as a whole by the rhythmical sense. The ancients limited it to thirty or thirty-two moræ. *Versus* and *στίχος* (line) were both used of lines in prose as well as poetry. When a continuous rhythmical series or period exceeds thirty-two moræ it is usually divided into cola written as separate verses. A true verse is distinguished by its end, which (1) must not divide a word; (2) may end with a vowel when the next begins with a vowel; (3) does not usually allow elision; (4) admits the *syllaba anceps*, that is, a short where the rhythm calls for a long, and *vice versa*; in other words, a verse allows at its end a slight pause not included in the rhythm. Exceptions to the requirements stated are rare, such as the division of a compound proper name (*Ἀριστο | γελῶν*) between a hexameter and a pentameter, and elision at the end of an iambic trimeter (*εἶδος Σοφοκλείων*) in Greek, and a dactylic hexameter in Latin.

Cæsure, Diæresis.—When a word ends in a foot the cutting of the foot is called cæsure (*τομή*). It is masculine when it follows the ictus, feminine when it divides the weak part of a foot, ⏏ || ⏏, ⏏ || ⏏. When a word ends with a foot there is diæresis (*διαίρεσις*, pulling asunder) or “incision” between the foot and the next one, — || —. Every verse of more than one colon has either a “main cæsure” or “verse-cæsure,” or else a diæresis between the cola. Both the main cæsure and the diæresis are called simply “the cæsure.”

In the following examples (:) denotes masculine cæsure, (;) feminine cæsure, (||) main cæsure or diæresis, (,) diæresis.

Membranam poseas, scriptorum quæque retexens.

⏏ — | ⏏ : — | ⏏ || — | ⏏ — . | ⏏ : ∞ | ⏏ —

Eis ὅσον κλύδωνα δεινῆς συμφορᾶς ἐλήλυθεν.

— : ∞ | — : ∞ | — ∞, | — > || — ∞ | — : ∞ | — ∞ — Λ

Catalexis (*κατάληξις*, an ending).—A verse whose last foot is incomplete is catalectic; if the last foot is complete the verse is acatalectic. See the verses just cited.

Compound Verses.—Verses may consist of cola in different rhythms. For examples, see METRES.

Combinations of Verses.—Most recited poems of the ancients were stichic, that is, composed by the line. For hypermeters or systems, exceeding the length of a normal verse, see METRES. In elegiac and melic poetry larger units than the single verse were employed, as follows:

1. **Distich.**—The oldest couplet is probably the hexameter and pentameter of elegy. Later distichs are found in Epodes.

2. **Stanza.**—The Lesbian poets introduced four-lined logaedic stanzas in songs. These were imitated and modified by Roman poets. The most famous are the Alcaic and Sapphic. Stanzas were, and sometimes still are, included under the name strophe. They usually, though not always, contain two or three different forms of cola.

3. **Strophe.**—In choric poetry a group of lyric cola, usually more complex in form than the stanza, was followed by an exactly similar group, the former being a strophe, the latter an antistrophe. (See STROPHE.) Finally, a strophe as an epode was added, so that the great unit became the triad, AAB, which may be used once, or any number of times, as in Pindar. Sometimes in the drama a still more complex form is presented, the second strophe and antistrophe being unlike the first, the third unlike the second, and so on, thus: AA', BB', CC', etc.; and to such a series may be added an epode.

M. W. HUMPHREYS.

Prosopog'ii [Mod. Lat., from Gr. *πρόσω*, in front + *πυγή*, buttocks]: a class of worms, embracing the POLYZOA, BRACHIOPODA, and SIPUNCULACEA (q.v.), in which the body may be either long or short, the mouth is surrounded by a circle of tentacles, the alimentary canal doubled upon itself so that the vent is far in front, the body without evident segmentation, and provided with at most but two pairs of excretory organs (nephridia). With the exception of a few freshwater polyzoans all are marine.

J. S. K.

Prosper of Aquitaine: saint; commemorated June 25; b. in the southwest part of Gaul about 400; d. about 463. Little is known of his personal history, but he was certainly only a layman. He visited Rome during the pontificate of Celestine (in 431), and spent perhaps the latter part of his life there in the service of Leo the Great. The earlier part of his life appears to have been spent in Marseilles, where he came in contact with Semi-Pelagianism, and wrote those tracts against it on which his fame now principally rests.

His *Carmen de Ingratis* against the Semi-Pelagians, written about 430 in defense of Augustine, shows him to have been a poet of considerable technical merit. A book of epigrams, over 100 in number, contains theological dicta of Augustine done into elegiacs. He was author also of a *Chronicon Consulari*, in continuation of Jerome, reaching down to 455. The standard edition of his works is by the Benedictines Le Brun de Mareste and Mangeat (Paris, 1711; Rome, 1758); Migne, *Patrol.*, vol. II.

Revised by M. WARREN.

Prossnitz: town; in the province of Moravia, Austria; on the Rumsa; 13 miles by rail S. W. of Olmütz (see map of Austria-Hungary, ref. 4-F). It manufactures brandy, linen, and woolen fabrics, and has a large trade in grain, flax, cattle, and geese. Pop. (1890) 21,192.

Prostate Gland [*pros'tate* is from Gr. *προστάτης*, liter., standing before; *πρό*, before + *ιστάται*, stand]: a glandular mass which surrounds the neck of the bladder and urethra in the male.

Pro'tagon [possibly first introduced as an abbreviation of *protagonist*, one who plays the leading part; Gr. *πρωτος*, first + *ἀγων*, contest, drama]: a fatty compound which, according to Liebreich, its discoverer, forms the chief constituent of nervous tissue. It is prepared from brain-substance, first washed with water and ether, by the action of warm alcohol, in which it is soluble. At the temperature of melting ice the protagon is precipitated from the alcoholic solution, and may be obtained crystallized by further purification and resolution. The composition assigned is $C_{100}H_{300}N_6PO_{36}$. See NEURINE.

IRA RENSEN.

Protag'oras: philosopher; b. about 480 B. C. at Abdera; was instructed by Democritus; lived afterward at Athens, where he was the first who taught philosophy and rhetoric for money, and assumed the title of *sophist*, teacher of wisdom, but was banished on account of his frivolous statements concerning the existence of the gods, and died in exile 411 B. C. His impeachment was, indeed, founded on his book on the gods which began thus: "Concerning the gods, I am unable to say whether they exist or not" (*Diog. Laert.*, ix., 51). None of his works is extant.

Protection: a term in political economy correlative with free trade, referring especially to the relation of legislation to the movement of industry. Free-traders are those who hold that legislation should offer no inducement to capital to take any direction which it would not assume in the absence of such legislation. (See FREE TRADE.) Protectionists hold that situations arise in which the general interest may be best served by offering such inducements. They regard the legislative authority as possessing the right and responsibility of co-ordinating in a general way the industrial growth of the country, and as exercising this rightly to bring up the home production of necessary articles to the home demand.

The issue between the two parties is, therefore, a part of the larger controversy as to the sphere and duties of government. At one time the free-trade policy was advocated on grounds which practically reduced civil government to the functions of the policeman. The reaction against this *laissez-faire* theory in politics has taken the point from many arguments once alleged for the free-trade policy, and it is now defended on grounds chiefly of its economic expediency.

The same division of opinion has appeared in the politics of France, Belgium, Germany, Sweden, Russia, Italy, and Spain. In France the protectionist policy introduced by Henry IV., extended and systematized by Colbert, was exaggerated to caricature by Napoleon in his Continental System, although even that proved of great benefit to the continental industries, especially those of France, Saxony, and Switzerland. The congress of Vienna, by an inevitable reaction, tended toward the free-trade policy, but a few years' experience of it forced a return to protection. The Bourbons restored the policy of Colbert; Germany, under the lead of Prussia, organized the Zollverein, whose moderately protective tariff caused the British to work, through their hold on Hanover, for its dissolution.

The antagonism between the two policies first came into view in the closing quarter of the seventeenth century. In earlier times the protective policy had been accepted by governments generally. Even the Roman empire levied protective duties on imports at its frontier towns. In the Middle Ages, however, the practice was generally the other

way, because the dominant interest was agriculture, and the value of manufactures to a country's prosperity was not understood. The contemplation of the wealth of the Low Countries, and its contrast to the poverty of his own kingdom, led Edward III. to take vigorous steps to naturalize the woolen industry in England. He forbade the export of English wool to Flanders, and thus forced the Flemings to bring their industry to his dominions; and he enacted that every Englishman should be the owner of at least one suit of English-made woolen. The striking success of these measures, which laid the foundation of England's manufacturing system, led to the prohibition of a list of imports which was enlarged in successive reigns. It was in Queen Elizabeth's time that these prohibitions were converted into duties on imports, and thus became a source of national revenue. Henry IV. of France, Gustavus Adolphus, and Cromwell made notable and successful use of the same methods, which grew in favor with the rise of national feeling in their time.

The discovery of America exercised a profound influence on the economic condition of Europe through the rapid inflow of gold and silver from the Spanish possessions. Since the reign of Augustus there had been no substantial addition to the supply of these metals in European circulation, and industry of every kind felt the constriction produced by a growing scarcity of the instrument of association and of exchange. Within the four centuries after Columbus the European supply was increased thirty-fold (Humboldt), and the effect was even greater than that of European colonization upon America. Harbors were constructed, rivers bridged, great exploits of engineering were executed, the cities filled with splendid structures, the country better tilled, and manufactures took an impetus of growth never seen before. These results led to economic study into their cause, and the best means of extending them. Hence the rise of the mercantile school of economists, of which Colbert, John Locke, the Abbé Galiani, Sir James Steuart, and the banker-statesman Necker are the best representatives. (For the principles of this school, see the article POLITICAL ECONOMY.) They saw palpable evidence that the possession of an abundance of money was one of the surest means of national prosperity, and they planned, by means wise and otherwise, to secure its inflow and prevent its outflow. Some advocated the free-trade policy as the best and surest means to this. Most, however, held that the protection of manufactures by making a country independent of others for necessary articles, and furnishing it with those it could sell its neighbors, was the surest way of bringing in money and keeping it at home. This policy was often called Colbertism, after the great French statesman.

In France in the first half of the eighteenth century the school of economists known as Physiocrats, whose leading representative was Quesnay, asserted that agriculture is the only source of wealth, and therefore opposed the protectionist policy. Adam Smith, in his *Inquiry into the Nature and Causes of the Wealth of Nations* (1776), gives evidence of having studied in this school and of having gone beyond it. He enunciated for the first time the free-trade doctrine in its modern shape as a principle of "natural liberty." He holds that when every man is left "free to do what he will with his own," he will do that which will be most beneficial to society. An assertion so broad as this could not, of course, be derived from observation. Dr. Smith bases it on what he regards as an axiom of natural religion, viz., that the highest social well-being must result from the freest exercise of that principle of self-interest which our Maker has implanted in each of us.

The teachings of the *Wealth of Nations* were gradually absorbed by the educated classes of Europe and America, although they did not pass unchallenged. Hence the rise of free-trade parties on both sides of the ocean, especially in England, where the industrial situation favored an experiment of this kind. The destruction of the small farmer class, the comparative neglect of agriculture, and the immense development of manufactures, prepared the way for a combined and successful attack on the corn-laws as tending to keep up the cost of factory labor without enabling the country to feed its own people. Since their repeal in 1846 England has been the leading champion of the free-trade policy, but only after having pursued the other successfully for more than five centuries.

For the first thirty years after the adoption of the U. S. Constitution there was substantial agreement among public men in the support of protection. The colonies from

the outset had tried to establish all the industries known to the mother country. Their own circumstances, but especially the repressive enactments of the British Parliament, had prevented their manufacturing extensively. Yet they observed that in the case of articles which could not be imported cheaply, such as stoves and hollow-ware, farming was greatly benefited by the neighborhood of these home industries. This was re-enforced by the experiences of the war for independence, when the country, and especially the army, suffered dreadfully through the cessation of the supplies of goods from Europe. The industries which sprang up to meet this need were crushed after the peace, because the national Government had no power to protect them. It was this more than any other circumstance which forced the adoption in 1789 of a more perfect form of government "to provide for the common defense and promote the general welfare." President Washington and Alexander Hamilton, as Secretary of the Treasury, pressed the policy upon Congress, which legislated expressly for this purpose, keeping in view the need of manufactures as an element in national defense. It was not until the failure of the well-meant but fatally defective tariff of 1816 that the antagonism over this question became an element in U. S. politics. The Southern States had owed to the protective policy the establishment and development of their cotton-growing. They supported that policy so long as they cherished the hope of becoming a manufacturing region, or found in the Northern cotton-mills the only open market for their staple, which Great Britain taxed in the interest of her East and West Indian cotton-growers. When their hope of manufacturing proved futile, and Great Britain in 1832 repealed the import duty on U. S. cotton, the South changed front. Then came the great alliance of the U. S. cotton-grower with the British cotton-spinner, which supported the free-trade policy in both countries. The first free-trade tariff, that of 1835, had such effects as to provoke a protectionist reaction, which resulted in the tariff of 1842. Four years later the repeal of the British corn-laws re-enforced the cotton-planter interest by the support of the Western wheat-grower. The result was the mongrel tariff of 1847, carried by the casting vote of Vice-President Dallas, and further reduced in 1857.

The withdrawal of Congressmen from the Southern States in 1861 left Congress in the control of representatives and Senators from States interested in manufactures. The Morrill tariff of that year, signed by President Buchanan, marked a return to the earlier policy of the republic, and was framed as much in compliance with the demands of national defense as of economic theory. It was feared that the war for the Union would involve the U. S. in war with Europe, where the South had many friends. To leave the republic dependent on Europe, therefore, for staple commodities of any kind would be to invite attack, and the increased duties would bring a larger revenue so long as commerce was uninterrupted. The policy thus adopted has now (1894) continued for over thirty years, with the result of placing the U. S. among the foremost of industrial nations, a chief producer, and by far the greatest consumer of great staples like cotton and woolen goods, iron and steel, with a *per capita* average of national wealth surpassed only by Great Britain.

In the middle of the nineteenth century, Great Britain—in the words of *The Saturday Review*—became the propagandist of "a new religion, made up of free trade and the pleasanter parts of Christianity." The commercial treaty negotiated with Napoleon III. by Richard Cobden came quickly after the reduction of the U. S. tariff to almost a free-trade footing, and Cavour's free-trade experiment in Italy. Germany in 1864 made reductions in her Zollverein tariff which carried her in the same direction. Only the reaction in the U. S. darkened the prospect of universal free trade; but the example of the U. S. and still more experience at home have carried all these countries back to their former policy, which has come into favor also with the autonomous colonies of the British empire. The French Republic hastened to denounce the Cobden Treaty, which Napoleon never had dared to submit to the judgment of his Corps Législatif. Bismarck in 1879 carried Germany back to the earlier policy of the Zollverein, alleging the astonishing success of the U. S. under protection as his justification. Canada the same year became protectionist by a popular reaction, following the example of Victoria, and to be followed in its turn by other colonies. As *The Times* has said, a wave of protectionist sentiment seemed "sweeping round

the world," and in Great Britain itself a small party demands a return to protection in the interest of agriculture.

As in so many other cases, the practice of protection to home industry antedates the theory, and the theory itself has taken different forms according to the environment of the thinkers who have elaborated it. These forms, which may be distinguished as four, are not antagonistic, but mutually corroborative.

I. The mercantile school generally defended the protectionist policy in view of the industrial use and the international circulation of money. Seeing that the increased supply of this instrument of industrial association had resulted in a rapid and great development of productive industry, furnishing employment to idle people, bringing neglected resources into use, raising the standard of comfort, and making the collection of an adequate revenue an easy thing, they insisted that a "favorable balance of trade" was an object of national policy. No country could safely import to a larger extent than it exported, and if its imports fell below its exports, so that it drew upon its neighbors' reserve of coin in payment of the difference, so much the better. To this end the development of manufactures and the checking of imports by duties (or even prohibitions) were desirable means. The former enabled the country to sell more; the latter insured its buying less.

It was also found that it was hard, if not impossible, for a country to maintain a favorable balance, unless it were possessed of a body of shipping to carry on its own commerce. The surplus of exports would be swallowed up in paying freight to foreigners. Hence the navigation laws enacted under Oliver Cromwell, re-enacted by the first Stuart parliament, copied by the U. S. in Washington's first administration, and maintained by Great Britain until 1850. These laws confined the ships of foreign countries to bringing in the produce of those countries and their colonies and dependencies, and levied tonnage taxes on these ships in British harbors. Thus the British destroyed the monopoly of the carrying trade previously enjoyed by the Dutch; and thus the foundations were laid first of the British, and then of the U. S. mercantile marine.

This theory of protection rested entirely upon observed facts as to the use and functions of money, made during a period particularly favorable for such observation. It was in a different period that Hume and Turgot put forward a theory of money calculated to undermine it. In their view, money is merely a standard of value and an instrument of exchange, and exerts no definite and permanent influence upon production. An addition to a nation's supply of money could be of no lasting benefit to its industries; and the diminution of that supply could not harm them. The only real effect of an increase must be to raise prices; of a decrease, to lower them. The drain of money from a country would thus make it "a good place to buy in, and a bad place to sell in," as prices would fall. An influx of money would make it "a bad place to buy in, but a good place to sell in," as prices would rise. In the former case foreigners would bring coin and take away goods; in the latter, bring goods and take away coin. In each case the balance would be restored, "all things would find their level." In fact, the wiser point of view was to regard money as "a commodity like any other," and to treat its export or import as a matter of indifference to the nation. If it went abroad, it must be to secure in exchange commodities for which the country had greater demand, and adapted to meet human needs more directly.

This theory, which obtained the support of Adam Smith's school and holds its own even in the school which has displaced his, did not rest on observed facts. No case has ever occurred which conforms even remotely to its diagnosis of the results of an export or import of money. Nowhere do we find this lowering of prices as a result of the diminution of a country's supply of coin, or this beneficent reaction which restores the supply. The case of Portugal under the operations of the Methuen Treaty (1703), and of Japan under the treaties of 1868, signally refute the notion that "things find their level" in this easy way. Tooke and Newmarch, in their elaborate and irrefutable *History of Prices*, have proved that in Great Britain itself the fluctuation of prices has not corresponded to the fluctuation of the currency in this mechanical fashion. The common sense of the business world also has rejected the notion that "gold is a commodity like any other." Every great emporium of trade watches the export of it as a calamity, and uses all the means available to check it and to set the current moving in the opposite direction.

Prof. Stanley Jevons complains that the money articles of the London newspapers are "steeped in the mercantile theory."

The theory that money is merely an instrument of exchange and a commodity like any other failed as a diagnosis of the industrial movement because it was defective fundamentally. Money has a far more important function as the instrument of industrial association. It was this fact of which the mercantile school were conscious. In his *Growth of English Industry and Commerce* (London, 1894) Dr. W. Cunningham gives a much juster view of their aims and achievements than has been current. Under their guidance, one of his English reviewers says, "English statesmen strove to build up shipping, industry, and agriculture. They succeeded in their aims, and made England mistress of the sea and the workshop of the world."

II. The nationalist school of protectionists arose in the new awakening of national feeling in the revolt against the imperialism of Napoleon. Its first and most extreme representative was the philosopher J. G. Fichte, who proposed to confine foreign commerce strictly to the exchange of the products of different climates. Friedrich List, the founder of the German Zollverein, is its best representative, but it was substantially the point of view occupied by the earlier American statesmen. In this view nations are industrial no less than political units, and national boundary lines are economic boundaries also. Industrial power and independence are essential to political power and independence. National industry is one of the forms of national wealth, and is as much entitled to protection as is any other. This principle is implied in all the relations of peoples to their governments. They demand of their rulers not only an efficient police, which shall keep men's hands out of their neighbors' tills or pockets; they also hold them responsible, though less directly, for the general welfare of the country.

The duty thus imposed upon government is discharged only by promoting a full and balanced development of the industries needed for the largest industrial life each people is capable of, and securing the employment of all the resources offered by national character and natural environment. Experience, however, shows that the countries already in possession of profitable foreign markets for their products have the means and the will to resist the establishment in other countries of industries which would deprive them of these markets. This they do by selling for a time at cost, or even below it, often making great sacrifices to crush out incipient competition, and then recouping their losses by higher charges when they have the market to themselves. John Stuart Mill points out that under these circumstances it can not be expected that individuals should, "at their own risk, or rather to their certain loss, introduce a new manufacture and bear the burden of carrying it on until the producers have been educated up to the level of those with whom the processes have become traditional." By enacting a protective duty on the import, the nation assures the undertaker of a new industry against unfair competition, and enables him to overcome the grave initial disadvantages of such enterprises. By this means the people are lifted out of that uniformity of occupation which always keeps them poor and frequently exposes them to famine. Living in this uniformity they have few of the interchanges of commerce with each other. The great lines of commercial intercourse run all to the seaboard or the frontier to meet the foreign trader and his agents. So before the civil war the great railway lines of the U. S. ran to the Atlantic seaboard. They were the warp without the woof of a great national system. In Germany, the removal of all custom-house lines to the frontier and the establishment of free trade within and protection without the Zollverein is recognized to have been one of the great promoters of German unification. Hence the eagerness of Austria to obtain admission, and the successful efforts of Prussia to exclude her.

The second public interest is national defense. A country which can not supply from its own industrial resources the outfit of an army, and can not thus meet the needs of its people during the suspension of foreign commerce commonly attendant on war, is in a position to invite attack from those which are better situated. The war for independence found the British colonies in North America at a great disadvantage in this respect. They had a poor supply of arms and gunpowder, without the materials needed for tents, clothing, and shoes. The blood which marked the tracks of the men on the wintry roads, the terrible suffering from nakedness and frost in the Valley Forge encampment, were

the fruit of the nation's industrial dependence and gave point to Washington's exhortations to Congress to put the country in a position to defend itself by establishing its own manufactures. Yet the war of 1812-15 found the republic nearly as ill-fitted for a great war, there being neither tents nor gunpowder nor blankets in any adequate quantity. The sufferings of the soldiers and even their defeat in the first years of the struggle were due to this in large measure. (See Horace Bushnell's article in *Hours at Home*, July, 1870). In the civil war the Southern States were at a great disadvantage in this respect, as their dependence on slave labor had resulted in their securing hardly any manufacturing industry as the outcome of the protective tariffs of the U. S. Jefferson Davis congratulated the Confederate Congress on the growth of a few manufactures, and if the Confederacy had achieved its independence, it probably would not have been able to abide by the free-trade provisions of its constitution.

It is notable that whatever tends to awaken a strong sense of nationality tends also to the protectionist feeling about national industry. All the periods of strong national feelings have been periods in which the policy of promoting home industry by collective action has been popular. On the other hand, periods of decay in this feeling have been the free-trader's best opportunity. Richard Cobden was quite right, from his standpoint, in regarding nations as necessary evils, and wishing all boundary-lines effaced from the map of Europe.

III. What may be called the biological school of economists was founded by Henry C. Carey, of Philadelphia. He points out that at the starting-point of economic development man is isolated and feeble, his first need being association with his fellows for the conquest of nature. Until he attains this he is occupied with a struggle for bare existence. With the growth of numbers and of association this struggle becomes easier, and sets some free to provide for less primary but not less real wants. Hence the rise first of the artisan or manufacturing class, and afterward of classes which serve the intellectual needs. At each step onward production grows faster than numbers, nature rewards more largely the toils of her conqueror, and the share of each individual in the joint product increases. At the same time the industrial order passes from its primitive simplicity to one of constantly increasing complexity through the growth of association. In the earlier stages in the development, when population is still scanty and the different classes of producers are separated by distance, a check to the freedom and the profit of their exchanges is offered by the power of the trader, who is able to levy a heavy tax on production. With the increase of population in density the artisan and the farmer naturally come into closer neighborhood, so that they can exchange their products directly, if necessary, and thus dispense with his services. Wherever this result is not attained, and commerce in the necessities of existence continues to be transacted at long distances, the trader still reaps a high profit at the expense of the producers. Especially the farmers and other producers of raw materials suffer from the necessity of having to pay the cost of carrying their bulky products to distant markets; and farming suffers in quality through the forced monotony of its cropping, and the loss of opportunities to make returns to the soil, which the neighborhood of manufactures offers. The farmer so situated is constantly injuring a valuable instrument instead of improving it. This, however, must be the result of some obstacle to the operation of natural law, interposed by the selfishness of peoples or of individuals, or by the currency of false theories. To remove obstacles of the former class is the work of the statesman; of the latter class that of the economist. The power of highly developed nations to check the industrial growth of those less advanced than themselves he was obliged by the evidence of facts to recognize. That power he would check by legislation to lay duties on imports, not in order to contravene natural law or find a substitute for it, but to remove an obstacle to its operation. He thus held strongly to the conception of natural economic law, which the current reaction against the abuses of that conception has thrown out of vogue for a time.

IV. Among protectionists there has been a tendency to treat the development of domestic industry in this way as a branch of the great social problem, which presses upon us from all quarters. The policy is defended as securing juster and more adequate remuneration to the laboring classes of the U. S. George Gunton and Erastus B. Bigelow might be regarded as representatives of this view. It can not be as-

serted, of course, that a protective tariff works directly to raise wages. It contains no specifications to that effect. Where it secures the producer a fairer price for his product it does not provide that part of the difference between this and the lower price he would have got under free trade shall go to raise the wages of his workmen; but its indirect operation does raise wages, and has done so in America, France, and Germany. One reason of this is that the demand for labor more nearly approaches the supply in countries of diversified industry than in those where there is but one kind of employment. Another reason is seen in the fact that agriculture calls for little else than unintelligent and ill-paid labor, while manufactures demand intelligence and skill, and must pay for them.

It has been rightly indicated by Francis A. Walker that the public opinion of a country plays a great part in determining the rate of wages. In aristocratic countries, this works to the disadvantage of the working classes, as requiring that they shall "know their place," and be content with such a standard of living as social tradition permits them. In democratic countries, like the U. S., the same social force works to elevate the standard of comfort for the working classes, requiring that all citizens shall be housed, clothed, and fed in a manner becoming their place as a part of the sovereign people. This, however, would be impossible in the absence of all restrictions on international commerce, as the products of depressed labor, if freely admitted to the markets, would make it impossible to pay home labor at a properly American rate. The difference between the rates of the U. S. and those of Great Britain is shown by a report of the Massachusetts Bureau of Labor Statistics for 1884, which also proves that the tariff does not "take from labor with one hand"—in prices—"what it gives with the other"—in wages. In the industries pursued both in Great Britain and Massachusetts the average of wages was 62 per cent. higher in the latter, while the cost of living was but 17 per cent. higher, and of this 11 per cent. was due to the higher outlay for housing, leaving 6 per cent. for the higher cost of food, clothing, etc. The standard of living, the report shows, was 50 per cent. higher in Massachusetts. If the U. S. workman chose to live as the British workman does, he could save three-eighths of his income, while the British workman can save but 2 per cent. That this difference is not due to the abundance of land open to settlement, or other local advantages peculiar to North America, is seen from the wretched condition of laborers in the U. S. in the earlier decades of the history of the nation, as Prof. Macmaster describes this in the first and second volumes of his *History of the People of the United States*, and Matthew Carey in his *Letters on the Charities of Philadelphia* (1829). It is rather due to the more favorable conditions for the operation of public opinion which the protective policy has created, especially during the last thirty years. The census of 1880 showed that the average wages of the skilled workman in the U. S. had risen in twenty years from \$460 to \$720 a year, while the price of all the staple articles he buys had fallen at a rate varying from 26 to 46 per cent. In fact, the wages of 1880 had about twice the purchasing power that the wages of 1860 had, and the census of 1890 showed that this advance had been sustained, both in the rise of wages and the cheapening of commodities.

It is not necessary, however, to the vindication of the protective policy to show that in no case is the price of an article higher to the workman than it would be under free trade. To "buy in the cheapest market and sell in the dearest" is good policy only when you are sure of having a good market to sell in. It is not a question, especially for the workingman, merely of the price at which he is to buy what he needs, but of the relation of that price to his wages. The immense immigration of European workmen to share what free-traders call the "burdens of protection" is a practical comment on the workings of the system.

The protective policy finds an exact parallel in the laws to prevent the importation of coolie and contract labor into the U. S. There would, however, be no justice in excluding such laborers if the products of their labor were admitted freely. It would be grossly unfair to compel the American employer to hire his labor in a close market and sell his product in an open one. The abandonment of the protective principle would carry with it, as in Great Britain, the removal of all restrictions on the importation of labor.

Objections brought by the Free-trade School against Protection.—1. The first is that "protection is an artificial system, like the forcing of plants in a hothouse. It creates a

mushroom growth of industries, which are unable to stand the free open air of competition, and which, by their constantly increasing demand for higher duties, show that they become weaker instead of stronger with the lapse of years. Free trade stands for the principle that a thing shall keep its place by the vitality it possesses, and not by governmental support or bolstering of any sort."

Protection is artificial in the sense in which clearing away the forests, inclosing and reclaiming farms, building houses, constructing roads, canals, and railroads, and educating the young are artificial, but in no other. To seek the establishment of industries for which the abilities of the people, the resources of the country, and the climatic conditions are all favorable, is to move on the lines of natural law.

That industries thus established by the aid of protective legislation will not attain the vigor which secures their permanence is an assumption contradicted by nearly every page of the world's industrial history. The silk-manufacture of France, the woolen, iron, and cotton industries of Great Britain, the linen industry of Ulster, the cotton-growing of the U. S., are striking instances of well-established industries which owe their very existence to protection. It would be difficult, indeed, to point out a single great manufacture which is now competing for the markets of the world that did not make its beginning in the same way.

That protected industries demand ever higher rates of duty is not the truth. It is true that in some cases such industries have made a start under a protection, which experience proves to be inadequate, and which has to be increased. It is true also that the facilities for cheap transportation in other cases have so altered the conditions of trade as to make the earlier duties ineffective; but in every case there is reason to expect a gradual reduction of protective duties, and finally their abolition with the consent of the manufacturers themselves. The former is illustrated by the successive reductions of the duty of the U. S. imposed on Bessemer steel and other articles; the latter by Great Britain's adoption of free trade after a long course of protection.

2. It is objected that "protection is an anti-social policy, seeking the good of classes at the expense of the people at large. It aims at making certain commodities dearer for the benefit of their producers, who constitute only a class in a community, while the interest of the consumer is always in cheapness, and the consumers are the whole community." The object of protection is not dearness, but to bring up the home production of some important staple to the measure of the national demand. In no case is the increase in price a permanent one, unless the conditions are such as to forbid the development of that line of production up to the national demand, as in the case of the duties on sugar imported into the U. S. In such cases the application of a protective duty is a questionable measure. Moreover, the interest of "the consumer" is not separable from that of "the producer." An illustration of this is the condition of the consumer in "hard times." Abstractly considered, he is well off, but the actual human beings who consume find those times not at all to their liking. It is not necessary that every form of production should be protected in order that all may share in its benefits. It is the freedom of the laboring men to choose between the protected and unprotected industries that puts up the wages paid them.

3. To much the same effect, protection is challenged as "a scheme of taxation" which enables the producer to levy a tax on the whole community for his private benefit. So much of a protective duty as falls upon the imported article goes into the public treasury; but a tax of the same rate is levied also upon the home-made equivalent by its maker, and goes into his pocket. The duty is added to the price, and the tariff is a tax.

A tariff duty generally secures its end by offering a special inducement to capitalists to turn their capital into that line of production. It offers them a chance of profits above the average, and a certain security in possession of their market. In the earlier stages of the manufacture these hopes are fulfilled; but profits above the average rapidly attract other capital, and domestic competition for the market pulls down prices to the level which permits of an average profit. At no stage can the home producer "add the duty to the price" simply. To do so would be to forego the advantage the duty offers, and keep the market open to his foreign competitor. Besides this, the foreigner commonly prefers to forego a part of his former profits rather than lose his hold

on the imperiled market. The profits of the home manufacturer therefore are limited both by the amount of this sacrifice of profits by the foreigner and the margin needed to give his own product an advantage in price. Even this, after a time, is cut down by the rise of domestic competition, as McCulloch and other free-traders admit: for in no line of production that is not guaranteed by a patent or some similar monopoly can profits remain above the average for any length of time. It is noteworthy that very few of the great fortunes in the U. S. have been made in manufacturing. On the other hand, as Mill points out, the transfer of an industry to an entirely new set of conditions is generally attended by great improvements of method, which tend to reduce the cost of that product to the country and ultimately the whole world. This was seen in the establishment of the cotton-manufacture in Great Britain and of cotton-growing in the U. S. In the same way protection in the U. S. has led to the improvements which have cheapened cutlery, silks, earthenware, Bessemer steel, cottons, nails, and many other staples to all consumers.

4. It is objected that "protection is a wasteful use of a country's capital, since it diverts it from the more profitable into less profitable lines of production." No country can produce more than it has the capital to undertake; but no country has attained the amount of production that it has the capital for. The establishment of new industries by protection is effected not so much by a diversion of active capital into new channels as by awakening dormant capital to flow in them. It is not safe to assume it is always worth while for some individual to do whatever it is the common interest to have done. This assumption of the absolute identity of private and public interest is untrue in many matters. The destruction of the forests of the U. S. is illustration sufficient. So a country may have need of new industries which no person would find profitable to initiate.

5. It is objected that "protection is hostile to commerce. It seeks to destroy that division of labor among the nations by which each produces what it can to the best advantage, and exchanges this with what the others produce in similar circumstances. It aims at making every nation self-contained and self-sufficing, by fostering on its soil even those kinds of production for which it has less fitness, and refuses to allow it to benefit by the natural advantages of the rest. It is typified by the great Chinese wall, built to restrict intercourse to the utmost with all the neighboring states. If it were consistent, Bryant once objected, instead of digging harbors it would fill them up, would grow tea, coffee, and spices under glass, and make imports to cease altogether."

Commerce, as protectionists understand the word, is the interchange of services and productions between persons of different industrial function, whether these are of the same or of different countries. The protectionist policy certainly aims chiefly at the development of domestic commerce. To this end it seeks to secure the greatest possible diversification of industrial function at home. Protectionists hold, with Adam Smith, that this home commerce, "the trade between town and country," is by far the most profitable to the country. They see in its extent and prosperity the truest test of national well-being. They deplore the wretchedness of those countries in which uniformity of occupation prevents this commerce, as in Ireland, India, and Japan since the treaties of 1868. Their people are thus unfitted to render industrial services to each other. Foreign trade flourishes at the expense of commerce at home.

Protection not only favors the freest development of trade at home, but cherishes the freest trade with foreign countries in those products which can not be produced at home. It forbids such duties on tea, coffee, spices, and the like, as make up the schedules of the tariff of free-trade countries like Great Britain and Norway. It thus favors the commerce which moves along the meridians, exchanging the products of different climates. On the same principle it fosters the commerce which grows out of different industrial capacity. By its preference for specific duties—a preference also shown by Great Britain, but not by the free-traders of the U. S.—it favors the exchange of the more valuable and highly elaborate products, which represent the best-trained productive capacities of sister nations. At the same time the policy fits the country to supply its less developed neighbors with manufactures they are not capable of making for themselves, as well as farm products not produced in their climates. In this way the tariff law of 1892 secured the U. S. twenty-four reciprocity treaties which gave special advantages to its commerce in return for

the free admission of sugar and other tropical or semi-tropical products, an advantage which was abandoned by levying a revenue duty on sugar in the much less protective tariff of 1894. The fields the protectionist policy thus leaves open to foreign commerce are so extensive that the progress of the U. S. has been as rapid in this department as that of any of its rivals since 1864.

Bryant's illustration suggests the question whether, on his principles, government should create or maintain harbors. If it has nothing to do with industrial development, as free-traders contend, why should it concern itself about commerce any more than manufactures? He once admitted his inability to justify the construction of the Erie Canal by the State of New York, instead of leaving such work to private enterprise; why not leave the harbors of New York and Liverpool to the private enterprise of the ship-owners and commercial firms, and trust to the identity of private and social interest in this matter, as in the growth of manufactures?

6. "The protectionist policy has driven the U. S. flag from the ocean by making it costly to build ships in U. S. dock-yards and by refusing leave to the people of the U. S. to buy them from the ship-builders of other countries." Statements of this kind are still current, but the only fragment of truth in them is that the higher wages paid under protection makes it costlier to build ships in the U. S. The decline of ship-building in the U. S. began under the tariffs of 1847 and 1857. It was begun by the withdrawal of subsidies to steamship lines in 1855, at a time when all rival countries were paying them. It was accelerated by the civil war, which cost the loss of many vessels, caused the transfer of others to foreign registration, and checked the building of merchant ships. To remove all complaints on that score, protectionists enacted the admission of ship-building materials free of duty, but without any marked result. They did not place shipping inside the protective system, as was done in Washington's time with the best result. They left the merchant marine absolutely to the chances of free trade, charging foreign vessels with neither tonnage dues nor lighthouse dues, nor discriminating duties on their cargoes, while they left them free to bring in the produce of all the world. Citizens of the U. S. are free to buy and own ships of foreign build to any extent they please, as they are refused nothing but U. S. registration, and are exempted from the specially severe requirements of the laws of the U. S. as to the care to be taken of its seamen. If ship-building and ship-owning have declined in the U. S., this has been chargeable not to protection, but to free trade.

7. Protection is charged with being "a selfish policy, in that it leaves out of account the well-being of all countries but one, and teaches its people indifference to the depressions of trade and loss of markets which it may inflict upon other peoples."

Protection is distinctly a less selfish policy than is free trade, which teaches each individual to regard simply his own self-interest as a consumer and to practice entire indifference to welfare of the producing classes. Protection is a declaration of national interest in the welfare of the laboring classes, while free trade tells them they must shift for themselves. As *The Spectator*, a strongly free-trade paper, said in 1884, "Protection appeals to men on the side of their duties, free trade on that of their interests." As to the injury done to other countries by a shift of markets, that is not chargeable to the protective policy. A market which can exist only so long as other countries fail to produce that article for themselves must result from a bad economic management in the country affected, and the total of the injuries thus inflicted is trifling compared with those inflicted by free trade on Ireland, India, China, Japan, and in the U. S. in 1783, 1817, 1837, and 1857. (On this point, see Kirk-up's *Study of Socialism*.) The ultimate object of the protective policy is the maximum of national life throughout the world, through each nation attaining the largest measure possible to it. Besides, the best the U. S. can do for the working classes of other countries is to establish and maintain the highest possible level of comfort for itself. Thus it will furnish them the best fulcrum for raising their own condition and beating down the social prejudices against them.

Of works on the protectionist's case, the most important are the Abbé Antonio Genovesi's *Lezioni di Commercio* (Naples, 1757); the Abbé Ferd. Galiani's *Dialogues sur le Commerce des Blés* (Paris, 1770); J. B. Say's *La Législation et le Commerce des Grains* (Paris, 1775) and *Éloge*

de Colbert (Paris, 1773); Alexander Hamilton's Treasury Report for 1791; Matthew Carey's *The New Olive Branch* (Philadelphia, 1820); John Rae's *New Principles of Political Economy* (New York, 1834); Willard Phillips's *Propositions concerning Free Trade and Protection* (Boston, 1850); Henry C. Carey's *The Past, the Present, and the Future* (Philadelphia, 1848), *The Harmony of Interests* (Philadelphia, 1851), and *System of Social Science* (Philadelphia, 3 vols., 1858-59); Friedrich List's *National System of Political Economy*, with introduction by Stephen Colwell (Philadelphia, 1856); E. Peshine Smith's *Principles of Political Economy* (New York, 1853); Francis Bowen's *Political Economy applied to the Condition and Institutions of the American People* (Boston, 1884); Judge Byles's *Sophisms of Free Trade* (London, 1849; 10th ed. Philadelphia, 1872); Andrew W. Young's *National Economy: a History of the American Protective System and its Effect on the Several Branches of American Industry* (New York, 1866); Dr. Friedrich Stöepel's *Freihandel und Schutzzoll* (Frankfurt, 1867); Sir Edward Sullivan's *Protection to Native Industry* (London and Philadelphia, 1870); David H. Mason's *How Western Farmers are benefited by Protection* (Philadelphia, 1875); Henry M. Hoyt's *Protection versus Free Trade* (New York, 1886); R. W. Thompson's *History of Protective Tariff Laws* (New York, 1888); Henry V. Poor's *Twenty-two Years of Protection* (New York, 1888); R. E. Thompson's *Elements of Political Economy* (Philadelphia, 3d ed. 1882), *Protection to Home Industry*, *Harvard Lectures* (New York, 1885), and *Ireland and Free Trade, an Object-Lesson in Political Economy* (Philadelphia, 1888); Albert S. Bolles's *Financial History of the United States* (3 vols., New York, 1879-83); George Basil Dixwell's *Review of Sundry Free-trade Arguments* (Cambridge, 1882); Ellis H. Roberts's *Government Revenue* (New York, 1884).

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Proteids: See ALBUMINOIDS.

Proteine [from Gr. *πρωτος*, first]: a term applied by Mulder to a product of the metamorphosis of ALBUMINOIDS (*q. v.*), which is produced by the action of caustic potash, and which he believed to constitute the basal molecule of all the proteids, whence the name. Its formula, according to him, is $C_{55}H_{26}N_4O_{10}$. Although this theory is obsolete, the name *proteids*, being very convenient, remains still in use.

Proterozoic Era [Gr. *πρότερος*, earlier + *ζῶον*, animal]: the earliest of the great divisions of geologic time based on life. The co-ordinate succeeding divisions are Paleozoic, Mesozoic, and Cenozoic, and the Proterozoic era was theoretically preceded by an Azoic or lifeless era. No faunas and floras of this era have been discovered, and only a few traces of organic forms. The life of the Paleozoic periods is shown by fossils to have been varied and highly organized, and, in accordance with the doctrine of evolution, it is inferred that long periods were necessary for its development. It has been suggested that a full record of Proterozoic life has not survived because the animals of that period were pelagic, rather than littoral, and were not furnished with shells and other hard parts. Consult Bulletin 86 of the U. S. Geological Survey.

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Protest: See BILL OF EXCHANGE and NOTARY PUBLIC.

Protestantism [from Lat. *protes'tans*, pres. partic. of *protestari*, declare in public, bear witness; *pro*, before, forth + *testari*, to witness, deriv. of *testis*, a witness]: the religious tenets of Protestants; the liberal influences and tendencies of the Protestant movement. This began with the second Diet of Spire (Speyer), when the Lutheran members of the diet, on Apr. 25, 1529, *protested* against the action of the Roman Catholic members in condemning the innovations Luther had introduced, and in forbidding, on pain of the imperial ban, any further reformation until the meeting of the general council promised for 1530 by Charles V. and the pope. (See REFORMATION.) This protest was a renewal and expansion of Luther's at Worms, Apr. 17 and 18, 1521. At the suggestion of the Landgrave of Hesse a protest was also made against the diet's repudiation of the Zwinglian doctrine of the Eucharist. (See Gieseler, *Ecclesiastical History*. The term Protestantism as used to-day, however, has the broader meaning of opposition to the Roman and Greek Catholic Churches. Protestants oppose the Roman Church chiefly because it (1) raises tradition to the level of Scripture as source of doctrine; (2) denies justification by faith alone; (3) makes the pope the spiritual ruler of the entire Christian Church. The first two counts hold against the Greek Church,

but, because the Greeks reject the pope, have done less to prevent the circulation of the Scriptures, and do not insist on sacerdotal celibacy, there is more friendly feeling for them on the part of Protestants, and the Church of England and the Protestant Episcopal Church of the U. S. contain many influential members who labor for some sort of union between their communions and the Greek Catholics.

SAMUEL MACAULEY JACKSON.

Pro'teus [Mod. Lat., from Gr. *Πρωτεύς*, a sea-god fabled to assume many forms]: a genus of tailed batrachians (see URODELA). *Proteus anguinus*, the only known species, is found in the caves of Southern Europe. It is whitish, about 6 inches long, has rudimentary eyes, and large external gills. Its only relatives are the water-dogs (*Necturus*) of the U. S.

Proteus (in Gr. *Πρωτεύς*): in classic mythology, a subject, or according to some versions a son, of Poseidon, whose flocks of seals he tended on the island of PHAROS (*q. v.*), off Egypt. He was gifted with the power of foretelling the future, but, as he disliked prophesying, he used to escape from those who succeeded in catching him when he came up from the depths of the sea to sleep among the rocks, by assuming the most horrible or disgusting shapes. The conflict of MENELAUS (*q. v.*) with Proteus is narrated in Homer's *Odyssey* (4, 351, seq.). Revised by J. R. S. STERRETT.

Prothallium: See FERNWEBS.

Prothorax: See ENTOMOLOGY.

Protista [Mod. Lat., from Gr. *πρώτος*, first]: a term introduced by Haeckel to include the simplest forms of life, both animal and plant, since it is impossible to draw the line between these two kingdoms of nature. The division is not generally recognized.

Protocoe'cus [Mod. Lat., Gr. *πρώτος*, first + *κόκκος*, berry]: a poorly defined genus of minute unicellular algae, of the family *Palmellaceæ* and order *Protococcoidæ*. The cells are globose, solitary, or aggregated into loose masses; the walls are thin, and the protoplasm is stained with chlorophyll (green); and this, when old, may be replaced with red coloring-matter. Under favorable conditions the cells may divide, each into two, and these may again divide, and so on. By a subdivision of the cells zoöspores, also, are produced, which, in related genera at least, unite to give rise to new cells. About twenty species are admitted to the genus as limited, among which the best known is *P. viridis*, very common on the bark of trees and the surface of damp walls. Formerly many more species, now referred to *Pleurococcus*, *Stichococcus*, *Hæmatococcus*, etc., were included in the genus.

The name *Protococcus* is often applied in a general way to any unicellular green plant, and in this sense protococci constitute the so-called gonidia of lichens. Finally, it is probable that *Protococcus* in the narrower sense is composed of younger states of higher algae. CHARLES E. BESSEY.

Protogene: See GRANITE.

Protog'enes: painter; b. at Caunus, Caria, in the middle of the fourth century B. C.; lived mostly at Rhodes, and was one of the most celebrated painters of his time. When Demetrius Poliorcetes besieged Rhodes he refrained from attacking one of the weakest points because here was kept the masterpiece of Protogenes, *Ialysus*. This picture was still at Rhodes in the time of Cicero, and later it was brought to Rome. Another celebrated work of his was *The Satyr*. Nearly all that we know of him is contained in Pliny's *Natural History*. He is thought to have died about 300 B. C.

Pro'tophytes [from Mod. Lat. *Protophy'ta*; Gr. *πρώτος*, first + *φυτόν*, plant]: the *Protophyta*, the lowest branch or division of the vegetable kingdom. The plants collected here consist of single cells, or loose chains of cells, with little, if any, differentiation of the cells. They reproduce by the division of cells and by the asexual production of spores or cysts. No sexual reproduction is known. Most of the species are of some shade of green, as blue-green, smoky green, brownish green, reddish green, etc., but never chlorophyll-green. The coloring-matter is regarded as a modification of chlorophyll, and is distinguished as phycoeyanin. The parasitic and saprophytic species (*Bacteria*) are colorless.

Protophytes may be all grouped under one class—*Schizophyceæ* (or *Cyanophyceæ*), and under this two orders may be distinguished—viz., *Cystiphoræ* (or *Chroococcaceæ*) and *Nematogenæ* (or *Nostochineæ*). See PLANTS, FOSSIL.

CHARLES E. BESSEY.

Protoplasm [Gr. *πρώτος*, first + *πλάσμα*, anything formed or moulded, deriv. of *πλάσσειν*, form, mould]: a substance,

or, better, a group of substances, of varying chemical composition known only in connection with, and as products of, life. It is semi-fluid, will not dissolve in water, refracts light more strongly than water, and varies in appearance as minute particles—microsomata—are more or less abundant in the ground substance (hyaloplasm), which under lower powers of the microscope appears homogeneous. Much attention has been given to the minute structure, and it is now known that protoplasm is far more complex than the "drop of jelly" to which it is frequently compared. With the use of stronger and better microscopes it has been shown to consist of a small amount of firmer substance combined with more fluid matter, and that these differ in chemical as well as physical properties, but it is not yet certain as to how these parts are arranged. Passing over the hypothetical micellar theory of Nägeli, the view of Heitzmann, Fromman, and Leydig first demands attention. According to this the firmer portions are in the shape of fine fibrillæ which interlace, forming a network, in the interstices of which the fluid portions are contained. In other words, the whole might be compared to a sponge; but, as Bütschli has pointed out, the different supporters of the fibrillar or sponge theory have not all been looking at the same things. Flemming, on the other hand, thinks that protoplasm consists of extremely fine threads imbedded in a ground substance, but is not certain whether each thread is distinct throughout or whether it interlaces here and there with others. Bütschli advocates the view that the firmer portions have a foamy nature, and that they bear the same relation to the fluid parts that the comb does to the honey, a condition which would also explain the observations of others, their threads and networks being optical sections of the foam fibers. He has imitated these conditions by a foam of thickened sweet oil and carbonate of potash or salt or sugar, in which the oil lamellæ represent the firmer framework of the protoplasm, and the intersection of the lamellæ the microsomata. Especially interesting is the fact that, like its prototype, this imitation protoplasm is capable of spontaneous motion. Satisfactory as it is in some respects, this foam theory is open to certain objections. It does not allow room for the spindles of the dividing cell; and, further, the nucleus of the cell presents several conditions which are greatly unlike a foam. Last in order is the granula theory of Altmann. According to this the elementary parts of protoplasm are minute particles—granula—imbedded in a ground substance, either isolated or arranged in rows or threads. Protoplasm therefore is a colony of these granula, bound together by indifferent substance. Altmann's views, which go much further than we can indicate here, have attracted few supporters. He has ascribed the most important position to those parts which others regard as secondary and in some cases adventitious substances.

Concerning the chemical nature of protoplasm even less is known than of its physical structure. Here it is most clearly shown that protoplasm is at least a collection of different substances in varying proportions, so that the word must be understood as implying not a compound of fixed and definite composition, but rather as a group of compounds which exhibit certain physical properties. The analysis of these offers extreme difficulties, for all ordinary processes transform the living into non-living matter, a change which may be accompanied by chemical alterations of more or less complexity, "so that the bodies we identify as components of protoplasm may be simply alteration products, or fragments of the larger and more complex molecules resident in living matter." Of these supposed components most numerous are the phosphorus-containing nucleo-albumens; next come the globulins, lecithin and cholesterin; and certain phosphates and chlorides are always present. Some of these are substances of extreme complexity, with hundreds of atoms in the molecule. These substances are unstable, are easily broken down, and that development of energy which is one of the characteristics of protoplasm is due to the chemical action involved.

In the remaining matters to be mentioned we are on firmer ground. Protoplasm exhibits certain phenomena. As was said above it always occurs in connection with life, and all the phenomena of life are those of protoplasm. Protoplasm has the power of spontaneous motion, as shown not only in the motion (cyclosis) of the plant-cell, but in the less evident but no less real motions of all cell-contents. It is irritable and responds to stimuli of various kinds. It has powers of assimilation; it can take non-living matter and build it into a substance like itself. It grows by the operation and is capable of reproducing its kind. These various

phenomena—motion, construction (anabolism), etc.—call for an expenditure of energy, and this is developed by the oxidation or breaking down of the higher compounds into lower and more stable substances. As we know it, homogeneous protoplasm does not occur in nature. It is always aggregated into individual particles or cells, and in each of these different portions—all protoplasm—may be recognized both by physical and chemical tests.

LITERATURE.—Besides the older works of Beale, Huxley, etc., see especially Altmann, *Die Elementarorganismen und ihre Bedeutung zu den Zellen* (Leipzig, 1896); Bütschli, *Investigations on Microscopic Foams and on Protoplasm* (London, 1894); Flemming, *Zellsubstanz, Kern und Zelltheilung* (Leipzig, 1882); Nägeli, *Theorie der Abstammungslehre* (Leipzig, 1884); Chittenden (Chemistry), *American Naturalist* (Feb., 1894); Wendt (Chemistry), *Jenaische Zeitschrift* (1893); Heidenhain, *Kölliker Festschrift* (1892).

J. S. KINGSLEY.

Protop'terus: one of the three living genera of the dipnoan fishes. See DIXON.

Prototh'e'ria [from Gr. πρῶτος, first + θήρ, beast, i.e. lowest or most generalized mammals]: a term used by Gill as equivalent to *Ornithodelphia* or egg-laying mammals (see MONOTREMATA), these being considered as one of two grand divisions of mammals, the other being the *Eutheria*, or viviparous mammals. By other authorities the term is employed as an equivalent of *Promammalia* to designate the supposed ancestors of the monotremes.

F. A. L.

Protozo'a [Mod. Lat., from Gr. πρῶτος, first + ζῷον, animal]: one of the grand divisions or branches of the animal kingdom which receives its name from the fact that its members are simplest in structure and therefore come first in logical order. Each protozoön consists of a single cell, or, in those cases where several-celled protozoa are found, each cell performs all the functions of life without assistance from its fellows. In other words, there is no differentiation of the cells into tissues or organs. In all (except the doubtful *Monera*) each individual consists of a mass of protoplasm, with an internal nucleus. In some no cell-wall is present; others may secrete an external or internal horny, calcareous or siliceous skeleton, frequently of wondrous beauty and complexity. In the protoplasm there are usually spaces or vacuoles, and some of these (contractile vacuoles), which rhythmically expand and contract, are supposed to be excretory in function. The protoplasm in the *Rhizopoda* is capable of protrusion in temporary lobes or pseudopodia; in the *Infusoria*, on the other hand, there may be either long, hair-like slowly vibrating outgrowths (flagella), or shorter, more numerous, quickly moving cilia. These processes serve for locomotion and for obtaining food. Food may either be taken in at any part of the body surface, or there may be specialized regions for its admission. There is no alimentary canal, but the nourishment contained in the food is extracted and metabolized by the protoplasm of each cell. There is no true sexual reproduction, but instead a propagation of the species by division of the individuals, in which all of the material of the parent persists in the second generation. There is thus, as Weismann has pointed out, no natural death in the protozoa. Accompanying the processes of reproduction is an occasional temporary union (conjugation) of individuals, in which an exchange of nuclear protoplasm takes place. The protozoa are all minute, and but few can be seen by the naked eye. They live abundantly in both fresh and salt water, and a few live in moist earth or as parasites on or in other living organisms. Notwithstanding their minute size, they play an important part in the world. Some are scavengers, some cause diseases (hay-fever is said to be caused by an infusore), while the dead skeletons of others form extensive beds of rock.

The *Protozoa* are divided into the following classes: 1. MONERA; 2. RHIZOPODA; 3. INFUSORIA; 4. SPOROZOA, which should be referred to for further accounts of these organisms. See also PARASITOLOGIA.

J. S. KINGSLEY.

Protracheata: See ONYCHOPHORA.

Proudhon, proo'dōn', PIERRE-JOSEPH: socialist; b. at Besançon, France, July 15, 1809; became a printer; employed all his spare time in study, and in 1838 received from the academy of Besançon a stipend of 1,500 francs yearly for three years as a reward for an essay on general grammar. He went to Paris, and in 1840 wrote *Qu'est-ce que la propriété?* In this he assumes that simply by being born into the world every man has a right to a share of what the world

contains of necessities, comforts, and enjoyments. From this assumption he develops his famous definition of property: "La propriété, c'est le vol." The academy withdrew the stipend, and even threatened him with a prosecution, from which, however, it was restrained by Blanqui, who declared the essay to be perfectly innocent. From 1843 to 1847 Proudhon lived in Lyons, but his two large works from this time were published in Paris, *De la Création de l'Ordre dans l'Humanité* (1843), in which he gives a new theory of political organization; and *Système des Contradictions économiques, ou Philosophie de misère* (1846). When the revolution of February broke out in Paris, he immediately repaired to that city, and (Apr. 1) began the issue of a daily paper, *Le Représentant du Peuple*, in which he set forth the most radical opinions, and which in a short time made him immensely popular. He was elected a deputy to the Constituent Assembly, but he soon discovered that he could do nothing there with his ideas, as nobody would hear him when he spoke, and he consequently returned to the press, editing in succession three daily papers. He was fined for his outrageous sarcasms and personalities against his adversaries, but his readers paid the fines. He started a people's bank in which he tried to reduce his theories to practice, but the project failed and the bank was closed by the authorities. In Mar., 1849, he was sentenced to three years' imprisonment for illegal publications, and he fled to Geneva. Shortly after, however, he returned and delivered himself up to the police. During his imprisonment he wrote *Confessions d'un Révolutionnaire*, *Gratuité du Crédit*, and *La Révolution sociale démontrée par le Coup d'état*. After his liberation he went to Belgium, where he published from time to time works embodying his peculiar theories. D. in Paris, Jan. 19, 1865. Proudhon was the founder of that school of political philosophy which is known as scientific or individualistic anarchism. In *Qu'est-ce que la propriété?* he holds that while property in its existing form is the cause of all social evils, it is so closely connected with the state that the only way to prevent the evils is to destroy the state itself. To communism he was as hostile as to the state, the only proper basis of society being, in his opinion, a voluntary contract between its members. He wished to abolish money as a medium of exchange, substituting for it a sort of bank-paper based on products, in application of his theory that "services should exchange for services and products for products."

F. M. COLBY.

Prout, Father: See MAHONY, FRANCIS.

Provençal (prō vāñ saal') **Language** [*Provençal* = Fr., deriv. of *Provence* < Lat. *Provin'cia*, liter., the Province, the part of France anciently constituting a separate Roman province]; the group of dialects spoken in Southern France in the Middle Ages, which are of great literary importance, and both in the mediæval and the modern forms of high philological interest also, on account of the intermediate position they occupy among the Romance languages and for other reasons. The name Provençal is commonly and conveniently applied to these various dialects, not only covering Provence, but also other territory, as Languedoc, Auvergne, Limousin, Gascony, etc., a rough division from the French dialects being made by a line running from the mouth of the Garonne so as to leave on the S. the greater part of the departments Gironde, Dordogne, Haute-Vienne, Creuse, and also parts of Allier and Loire. E. of Lyons is a considerable territory, with Geneva about in the middle, roughly covering the departments Isère, Ain, Jura, Doubs, Savoie, Haute-Savoie, and also Western Switzerland; in this the so-called Franco-Provençal or Middle-Rhonish dialects are spoken, which agree in some respects with the French dialects, in others with Provençal. The Gascon dialects in the southwest may also be considered as a group by themselves, though they are generally included under Provençal. Another name for the language is preserved in the geographical designation Languedoc (originally "language of yes," from the Provençal word for "yes," just as the French of Northern France has been occasionally called *langue d'oïl* from the Old French word for "yes"). The number of speakers of Provençal has been estimated at about 10,000,000, but this includes, in part, the Franco-Provençal dialects, whose territory has a population of about 2,500,000. For the subject of dialect divisions and for an historical view of Old Provençal phonology and inflexions, see Suchier's article in Gröber's *Grundriss der romanischen Philologie*, i., 561 ff. (or the French translation, *Le Français et le Provençal*, by Monet, 1891), and the maps at the end of the same volume.

In several respects Provençal diverged less from late spoken Latin than was the case with French, or even with Italian or Spanish. Its most obvious distinction from French is that it retains Latin accented *a*, and (in its old form) the *a* of Latin final syllables, while French changed the former under certain conditions into *é* and the latter into *e*. In modern Provençal the older final unaccented *a* has generally become *o*. The Latin diphthong *au* remained unchanged in Provençal. The simple sounds of Provençal in the twelfth century were probably very nearly the same as those of the French of the same period, but the nasal vowels of French do not appear. The sound of *th* in *that* seems to have changed pretty early into *z*, and the palatalized *l* has in the modern dialects generally lost the *l* sound, becoming an *i* or rather *y*, as in modern standard French. The Latin pluperfect indicative was, as in very old French, retained for a time as a simple past tense, but it commonly took in old Provençal the sense of a conditional, as it has done in Spanish.

It is remarkable that we have in Provençal grammatical works on the language itself belonging to the thirteenth century. See Stengel, *Die beiden ältesten provenzalischen Grammatiken* (1878). In modern times Provençal has generally been looked upon as a group of vulgar *patois* until the nineteenth century, when a certain literary standing has again been acquired.

Besides the books mentioned already, the following, among others, are of use (see also ROMANCE LANGUAGES):

For the older language: Raynouard, *Choix des poésies originales des troubadours* (6 vols., 1816-21) and *Lexique roman* (6 vols., 1838-44; still useful, but Raynouard's grammatical and comparative work is antiquated); E. Levy, *Provenzalisches Supplementwörterbuch* (1892, seq.); Mahn, *Die Werke der Troubadours* (1846-82) and *Gedichte der Troubadours* (1856-73); Bartsch, *Chrestomathie provençale* (4th ed. 1880); P. Meyer, *Recueil d'anciens textes bas-latins, provençaux et français* (1877); H. Suchier, *Denkmäler provenzalischer Literatur und Sprache* (i., 1883); V. Crescini, *Manualetto provenzale* (1892-94).

Mostly for the modern dialects: F. Mistral, *Loutresor d'ou felibrige ou Dictionnaire provençal-français* (2 vols., 1879-86); Chabaneau, *Grammaire limousine in Revue des langues romanes*, ii.-viii.; Mushacke, *Geschichtliche Entwicklung der Mundart von Montpellier in Französische Studien*, iv.; Koschwitz, *Grammaire historique de la langue des félibres* (1894); also articles in the *Revue des patois gallo-romans* (1887-93), the *Revue de philologie française et provençale*, and other periodicals. E. S. SHELDON.

Provençal Literature: the literature written in the language or dialects of the south of France; one of the most interesting, though least extensive, of the group of Romance literatures. Though born at the same time as French literature, and but little earlier than the Italian and Spanish literatures, Provençal literature is peculiar in that it has not had an uninterrupted history down to the present day. The conquest of Southern by Northern France in the thirteenth century, and the destruction of the former's political autonomy thereby, led to the entire decay of independent Provençal culture and to the decline of the Provençal tongue to the level of a mere dialect. In the nineteenth century there have been efforts toward a revival both of the languages and the literature, efforts that have engaged men of great ability and given rise to excellent literary works; but it can not be said that a new Provençal literary language, fully unified and regulated, like French, for example, has been attained. While it lasted, however, Provençal literature was accepted universally in Europe as the most refined of all. It served as a model for the first Italian, the first Spanish, and the first Portuguese lyric poets; it gave rise to one of the chief poetic schools of Northern France; and hardly any literature in Europe fails to show numerous traces of ideas and poetical forms that had their origin in this.

First Period (950-1100).—None of the first scanty monuments of Provençal verse and prose contain clear indications of the ideas that were later to become dominant in Provençal poetry, and as a consequence they are of interest chiefly to the philologist. The earliest monument of all is a fragment of a poem by some moralizing clerk, based on the story of the Roman philosopher Boethius, and showing an uncritical use of his *De consolazione philosophice*. This was written toward the end of the tenth or early in the eleventh century. Likewise the work of clerks are several

fragments of lives of saints and religious lyrics, whose precise dates can not be fixed, but which undoubtedly belong to this time. The earliest monument of Provençal prose is a fragment of a translation of the Gospel of John (ch. xiii. xvi.) in the Vaudois dialect. Much more interesting to the student of literature is a fragment of 105 octosyllabic verses on the legendary Alexander the Great, written by a certain Albéric of Besançon (or Briançon) early in the eleventh century. This is based on the fabulous life of Alexander, written in the second century A. D., and known as the *Pseudo-Callisthenes*. It is the first monument of the extensive literature of mediæval Europe devoted to Alexander, and, if we may judge by the indications of the *Alexanderslied* of the German Pfaffe Lamprecht (twelfth century), which was partly based on it, must have been one of the most interesting.

Second Period (1100-1226).—The first name in this period introduces us to that form of poetry that is most characteristic of Provence. It is that of William VII., Count of Poitou (IX., as Duke of Aquitaine), who ruled from 1087 till 1127, and was one of the most famous persons of his time. He was the first of the troubadours (Prov. *trobeaire*, acc. *trobador*), as the mediæval lyric poets of Provence called themselves. In him we have the earliest exponent of the new society, with its new ideals of conduct and of art, which had at last come to replace the Roman society that the barbarians had destroyed. This new society had doubtless for some time been forming itself at the feudal courts of Southern France, and had been elaborating its peculiar theories of life. It was an aristocratic society, and the very words by which it expressed its social conceptions are those of a rich and elegant upper class. Such are *cortesia*, or what is suitable at courts; *valor*, or the high spirit of the perfect gentleman; *mesura*, or due self-restraint in demeanor and action; *largueza*, or unbounded liberality; *jovens*, or the gayety and grace of the young in spirit; *joï*, or the glad energy of the heart intent on deeds of excellence and renown. One other conception, the most important of all, was that of *amor*, or chivalrous love, which for Provençal society was not merely the subjective passion universal in the race, but rather a form of conduct, an ideal of excellence, which was at once the source and the criterion of all other excellences. Essentially, the poetry of the troubadours deals with very little of interest besides this chivalrous love; and this was the chief contribution made by them to the poetry and the society of other countries. Indeed the whole modern conception of love has been profoundly modified by it, and that, too, despite the fact that it contains elements at first sight highly repugnant to modern feeling on the subject. Based upon an idealization of woman that was a reaction against the unhappy consequences both of the low idea of her common among the clergy and of the degradation of her caused by the necessities of feudal marriage, the love of the troubadours was avowedly antagonistic to the conventions both of society and of the Church. It was declared by them that love was impossible between husbands and wives, or between persons who might expect to enter into this relation with each other. In general, the lover must serve a lady already married to another; and it was obligatory in a lady thus served to return the love, without regard to her marital obligations. As runs one of the rules of the amorous jurist André le Chapelain, whose *De arte amandi* (circa 1200) embodies the theorizings of the time, *Causa conjugii non est ab amore cæsusatio*. Clearly love of this kind, if it remained honorable, must be a social function rather than a personal passion. Clearly, also, the danger was great that this would not always be the case; nor, in point of fact, was it. Still, it is clear that for a considerable period such relations between men and women were held to be not merely permissible, but in the highest degree ennobling to both. The essentially troubadour love of Dante for Beatrice, wife of Simone de' Bardi, and the high consequences that proceeded from it, are proof enough of this.

During the whole twelfth century the elaboration and discussion of this theory of chivalrous love went on in Southern France, and with it went on the development of the poetical art of the troubadours. The extreme variety and intricacy of the forms of this art were natural results of the essentially external and formal character of the subject-matter; yet these lyric varieties, which are too numerous even to name in a brief article, served as models for the first modern poets of the rest of Europe, and have powerfully affected the history of all modern poetical literature.

The vogue of the new poetry in and out of Provence was very great, and even kings were proud to be counted among the troubadours. The great nobles, like Richard Cœur de Lion, the Count of Poitou, and later King of England; Raymond V. and Raymond VI. of Toulouse; Alfonso II., Count of Provence; William VIII., Lord of Montpellier; Robert, Dauphin of Auvergne; Henry I., Count of Rodez; Barral, Viscount of Marseilles; Ermengarde, Countess of Narbonne; and many others, welcomed the singers to their courts and heaped them with favors. Beyond the borders of Provence they fared no less well, as at the courts of Aragon, Leon, and Castile, in Spain, and at those of the Emperor Frederick II., Marquis Boniface II. of Montferrat, and the Marquises Azzo VI. and Azzo VIII. d'Este in Italy.

The list of troubadours of the twelfth and thirteenth centuries contains no less than 412 names, of whom the great majority belong to the period we are now treating. Of many of these, however, we have but scanty remains and little biographical information. After William IX., mentioned above, there was in the first half of the twelfth century a small group of poets who were felt by the later troubadours to have belonged to an older school, but whose art is not for us markedly different from that of their successors. Chief of these were Cercamon, Marcabrun, and Jaufré Rudel, Prince of Blaya, whose romantic passion for the Countess of Tripoli was long famous. Whatever the change of style was, it seems to have taken place about the middle of the century; and the name given as that of the first really excellent troubadour is Peire d'Alvern. Another innovator, according to tradition, was Guiraut de Bornelh, who first used the lyric form called *cansos*, or canzone. Practically contemporary, however, or little later, were all the most famous troubadours: Bernart de Ventadour, the best singer of love; Guillem de Cabestaing, whose passion ended in a tragic death; Arnaut de Marueilh, more simple in style than most, and more delicate in sentiment; Pons de Capduelh, eagerly sincere in his service of love; Peire Vidal, a fantastic spirit, but truly a poet; Peire Rogier, in whom theory overbalances art; the flippant Rambaut III., Count of Orange, and Beatrice, Countess of Die, whose avowed passion for him has obtained for her the name of the Provençal Sappho; Folquet de Marseilles, somewhat later, whose amorous youth was followed by the stern zeal of the fanatic bishop; Rambaut de Vaqueiras, who carried his art into Italy; Peirol, the passionate crusader. Still more noted than any of these were Bertran de Born, who sang more of arms than of love, and Arnaut Daniel, whom Dante thought the best of all the troubadours (*Purg.*, xxvi., 118, *seq.*). In the latter, however, art was carried to the point of extreme artificiality, for the poet even prided himself on the unintelligibility of his difficult style (*gens corts et obscurs*).

In the thirteenth century a change began to come over the spirit of Provençal song. The political situation in Provence became ever more threatening. The Church had become uneasy about the heretical sects so numerous there—Albigenses, Cathari, Vaudois—while the Northern French were looking with greedy eyes upon the fair lands of the south. In 1207 the tempest burst, and for nearly forty years the Albigensian crusades continued, devastating the land, destroying the courtly life, dispersing the poets, and finally merging Provence itself in France. The culmination of the tragedy may be said to have been reached in 1226, when the last revolt in Toulouse, the center of Provençal resistance, was crushed. For the next quarter of a century the conquerors were busy with the last details of their task. The Inquisition, established for this purpose, hunted down and destroyed the few surviving heretics; and so far did the violence of the Church go that in 1245 Pope Innocent IV. issued a bull declaring the Provençal language heretical and forbidding students to use it. With the same ruthlessness the French crushed all those, whether nobles or commoners, who desired political independence.

The necessary result of these disasters was a falling off in the art of the troubadours. Though we have many names from the first quarter of the thirteenth century, they are not of the first rank. Love was sung with less of high conviction, and political passions usurped a larger place. We may name from this time Gaucelm Faidit, a man of many loves; Savario de Mauleon; Uc de Saint Circ, from whose pen several brief biographies of earlier troubadours have descended to us; Aimeric de Pegulhan; Cadenet; Perdigon. The two most characteristic poets, however, are Peire Cardinal and Guillem Figueira, the former of whom,

in grave and noble fashion, denounced the vices of his day, especially those of the clergy; while the latter, a scorner of all gentle practices, lived like a roysterer, making mock of the pretensions of noble and churchman alike.

One or two other kinds of literature, though not esteemed like the lyrics of the courtly poets, afford monuments of interest. The first of these is the historical or popular epic, like the *Chansons de Geste* of Northern France. Though it is certain that these were never produced in Provence in the profusion formerly imagined (e. g. by Fauriel), they certainly existed, especially in the region nearest France. Several specimens are extant, in whole or part, and one of these, the poem of *Girart de Rossillon*, is one of the finest epics of the Middle Ages. Here, too, should be mentioned several historical poems, of which the most important is that on the *Crusade against the Albigenses* (early thirteenth century). Probably as early as the twelfth century, also, romantic narrative poems began to be written, but our examples are chiefly from the next period. Of great interest are several didactic poems, particularly those known as *ensenhamens*, in which the ideals of conduct of the time were discussed. These, too, flourished more in the thirteenth century.

Third Period (1226-1323).—The successful termination of the crusade against the Albigenses produced almost a cessation of lyric poetry in Provence proper. A few names of unimportant troubadours of the latter part of the thirteenth century are known to us, but we have only scanty remains of their work. Chief of these poets is Guiraut Riquier, who was, however, little more than *laudator temporis acti*. The real life of the troubadour poetry was at this time to be found in Italy and the Spanish Peninsula. In the former the vogue of this poetry was so great that native Italians began to write it, and the Mantuan Sordello, the Venetian Bartolomeo Zorzi, and the Genoese Bonifacio Calvo deserve honorable mention in the list of troubadours. As is well known, this Provençal poetry served as a model for the first Italian verse. In the Spanish Peninsula, as has been mentioned above, there were several courts frequented by the troubadours during the thirteenth century; and also, especially in Catalonia, not a few poets who employed the Provençal tongue.

In Provence itself there was in this period a considerable development of literature other than lyric poetry. Romances and novels after the French style became popular, and in the *Roman de Jaufré* we have a work of some interest. The poetical novel of manners *Flamenca* gives us important information about the customs of the time. Didactic literature increased greatly in extent, and gives us several *ensenhamens* and treatises of a moral kind. We have a number of scientific or pseudo-scientific works also, and the extensive encyclopedia of Matfre Ermengaud, entitled *Breviari d'amors*, illustrates the speculations on the constitution of the universe then current. Historical poetry is cultivated to some extent. The religious literature is much larger in amount than in the preceding period, and includes legends, in both verse and prose, connected with the life of Christ and of various saints, prayers, sermons, etc. Of special interest are several versions of parts of the Bible, chiefly of heretical origin. Toward the end of this period we get the first example of the Provençal drama, the mystery entitled *L'Esposalizi de nostra dona sancta Maria verges e de Josep*.

Fourth Period (1323-1500).—By the end of the thirteenth century the aristocratic poetry of Provence had entirely come to an end; but here, as elsewhere in Europe, an attempt was made in the *bourgeoisie*, now become rich and prosperous, if not to revive it, at least to imitate it. In short, mastersong succeeded minnesong. In the year 1323 a group of *bourgeois* of Toulouse associated themselves together under the name of the *Sobregaya companhia dels VII. trobadors de Tholoza*, and in order to promote poetic composition appointed for May 1, 1324, a poetical contest—the first of the long series of Floral Games of Toulouse. The prize offered was a golden violet for the best canzone; and we learn that a certain Arnaut Vidal de Castelnau d'Arri was the first to obtain it. In 1355 the contest was still further developed, and other flowers of gold or silver were offered for excellence in other forms of verse. At the same time the chancellor of the consistory (for so it was then called), Guillem Molinier, was instructed to draw up a treatise on the poetic art. He did this in his famous *Lays d'Amors*, which, though fantastic in the extreme, has great interest for the student. The most remarkable thing

about this bourgeois poetry is the fact that though the forms and even phrases of the troubadours were scrupulously preserved, the old meaning had been entirely lost. It was not permitted these new troubadours to address their lyrics to real ladies; they had to write canzoni, ballades, albas, pastourelles, etc., to the Virgin Mary, and to a certain abstraction, *Clemenza* by name, who became almost a goddess. We know the names of about 100 winners in these contests, reaching down to 1498.

Beyond these lyrics this period affords little of interest, except a certain number of mysteries and miracle-plays. Some considerable body of religious literature there is, but of so slight consequence that little of it has yet been published.

Fifth Period (1500-1825).—This is really not a literary period at all, but an interregnum. Not that all versifying had ceased in Southern France, but the language had so degenerated as no longer to deserve the name of literary language, and what was written in it was merely the rude utterance of local dialects. Interest in the troubadours was indeed not entirely lost, especially after the appearance of the romantic, lying book of Jean de Nostradamus, *Vies des plus célèbres et anciens poètes provençaux* (1575). Others, more truly scholars, like the Italians Castelvetro and Crescimbeni, and the French La Curne de Sainte-Palaye, did much in the way of investigating the history of Provençal song. Still no permanent and fruitful restoration of the decayed tongue took place, and it rapidly sank to lower and lower depths.

Sixth Period (1825 to the present).—After the nineteenth century had well begun, two influences combined to make possible a renaissance of Provençal poetry. The first of these was interest aroused by the studies and publications of the French historian Raynouard, the German philologist Diez, and their numerous followers both in France and Germany. The other was the appearance in Provence of several dialect poets of unusual powers. Chief of these was the barber-poet of Agen, Jasmin (1798-1864), the appearance of whose *Charivari* in 1825 may well be taken as the starting-point of the movement. Contemporaries of Jasmin were Diouloufret, Cabanes, Azaïs, Morel, and, above all, Roumanille. In 1854 an important step was taken by the last named with six other poets—Mathieu, Tavan, Aubanel, Mistral, Brunet, Giera. This was nothing short of the re-establishment of the dead consistory of Toulouse, under the name, however, of the Society of Félibrige, and not limited to Toulouse, but extended to all Provence and even Catalonia. Curiously enough, the title thus assumed was one whose exact meaning was unknown to the associates, and remains even to-day without certain explanation. The poet Mistral had heard at Maillane a poem in honor of the Virgin Mary, which contained the phrase *li sèt félibre de la lèi*. The poets were seven; they proposed to be a law to the other poets of their region; the word *félibre* they were willing to accept on faith as meaning doctors or expositors. The society thus established has extended itself over the whole region in which Provençal and Catalan were once spoken, and is organized in the greatest detail. It has undoubtedly, by the poetical contests it has held, stimulated the production of much verse; but it may be doubted whether it has evoked many great poets. After all, Jasmin, Roumanille, Aubanel, and Mistral remain the chief figures of the new Provençal poetry, and the appearance of all of these antedates the society. On the other hand, the latter has undoubtedly done much for the study of Provençal literature and the Provençal tongue, not so much by its annual pronounciamento, in the form of a poetical almanac, *Armana provençau* (1855, seq.), as by fostering learned societies, like the Société pour l'étude des langues romanes, whose organ is the *Revue des langues romanes* (Montpellier, 1870, seq.).

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Provence': an old province of France; bounded E. by the Alps and S. by the Mediterranean, and now divided into the departments of Var, Bouches-du-Rhône, Basses-Alpes, and Vaucluse. It derived its name from the Latin *Provincia*, by which the Romans pre-eminently designated it. After the fall of the Roman empire Provence was overrun by the Goths and the Saracens, and during the Middle Ages it was ruled by independent counts. In the twelfth century this land, celebrated for its climate, its sky, and its fruit, produced the famous Provençal songs. In 1481 it was annexed to the French crown by Louis XI.

Proverbs [from Lat. *proverbium*; *pro*, for + *verbum*, word]: popular wisdom, often expressed by "the wit of one," always concentrated in a handy sentence, and actually in use by the people. The last of these limitations is important. For example, many of the sayings of Mrs. Poyser, in George Eliot's *Adam Bede*, would be good proverbs, if they were proverbs. Metaphor and alliteration, though not essential, are common in the proverb, and show origins akin to those of the oldest poetry; for, contrary to the current ideas about didactic verse, proverbs are now regarded by critics as belonging, together with choral song (the later ballad) and popular tale (*Märchen*), to the oldest phase of primitive poetry. The proverb is a general statement which fits a number of particular cases; it is the wisdom or wit of the masses, and therefore flourishes best among unlettered folk—like the ballad and the popular tale. Like the latter, moreover, it is often imported, and is particularly at home in the Orient. These are general proverbs. Others attach to place or person, but spread far beyond original limits—as, "to go round [by] Robin Hood's barn." Proverbs often give a lively notion of the popular attitude in regard to certain classes or institutions; although historical estimates based on such evidence are, to say the least, uncertain: for example, the saws and quips about the mediæval clergy—in particular, monk and nun—or the ever-youthful jibes at medicine and law. Here, again, we have an interesting parallel with popular songs, and as we must distinguish the latter from individual lyric, so should all possible care be taken to sunder a real saying of the people from the incisive phrases of speaker or writer. Moreover, the distinction between the humorous and the didactic must always be kept in view.

Collections of proverbs were attempted even among the Greeks, but modern interest in the subject was awakened and led by Erasmus. His *Adagia* were published in 1500, and found speedy imitation in several countries. The Germans were among his most successful followers, and they have outdone all competitors for later times, with the single exception of Spain. On the other hand, for whatever reason, witty as the Celtic folk is known to be, but scant harvest of proverbs has been gleaned from Irish fields. English proverbs, however, are fairly plentiful, and proverbial poetry has always been popular with Germanic races. A peculiar form of this poetry is preserved in the so-called gnomic verses of the Anglo-Saxon. (See Grein-Wülker, *Bibliothek der Angelsächsischen Poesie*, i., 338 ff.). Other collections of the same character are found in the Old English period, but later proverbs increase in wit, terseness, and subtlety. Chaucer, like Shakspeare, had a liking for proverbs, and collectors have gathered good spoil from many old plays, sermons, pamphlets, tales, and the like.

Of the numerous collections the following may be mentioned for the general subject: Rheinsberg-Düringsfeld, *Sprichwörter der germanischen und romanischen Sprachen* (1872 ff.), and Bohn, *Polyglot of Foreign Proverbs*; for English, Bohn, *A Handbook of Proverbs*, and W. C. Hazlitt, *Eng-*

lish Proverbs and Proverbial Phrases (London, 1869). The Germans have an excellent work by W. Wander's *Deutsches Sprichwörter-Lexicon* (5 vols., 1863-80).

FRANCIS B. GUMMERE.

Proverbs, Book of: a title which comes through the Vulgate from its Greek equivalent, *Παροιμία*, in the Septuagint, and which must be taken in its widest acceptation in order to make it embrace all the varieties of expression comprised in the collection. The original Hebrew term (*maschal*) means properly a "comparison;" but as every utterance of a truth involves a comparison, we find included in the book apophthegms, maxims, enigmas ("dark sayings," in the English version of Prov., i. 6), and sometimes longer connected discourses of the same didactic nature.

It is said in 1 Kings v. 12 that Solomon spoke 3,000 proverbs, and it is probable that many of these are found in this book, as the superscription prefixed to each of their three main divisions assigns it to Solomon. The first division (chs. i.-ix.) is devoted to a description of wisdom and an exhortation to its pursuit. The second (chs. x.-xxiv.) contains individual proverbs, and in its latter part brief proverbial discourses. The third (chs. xxv.-xxix.) was a compilation by "the men of Hezekiah." In chs. xxx. and xxxi. we have three appendices. The first is by an author known to us only by the name Agur, given to him in ch. xxx. 1; the second (ch. xxxi. 1-9) contains precepts for a King Lemuel, given by his mother. *Lemuel* ("one belonging to God") is clearly only a symbolical name, and a general resemblance in style has led some to infer that this, as well as the final section (ch. xxxi. 10-31), was also written by Agur.

The Proverbs exhibit the results of reflection upon the moral and spiritual value of its precepts in the concerns of life. It is noteworthy that they do not once mention the priest nor exalt the externals of worship, nor allude to any conflict between the worship of Jehovah and that of idols. There are good commentaries in English by C. Bridges (London, n. e. 1859), W. Arnot (Edinburgh and New York, 1869), F. Delitzsch (1875), and in *The Expositor's Bible* by R. F. Horton (1891). Revised by S. M. JACKSON.

Providence [viâ O. Fr. from Lat. *providentia*, foresight, provision, deriv. of *providere*, foresee, provide; *pro*, for, before + *vide're*, see]: in theology, the doctrine which teaches that God upholds, preserves, and governs the entire universe which he has created. The scriptural doctrine affirms at the same time the omnipotent power of God and the liberty and responsibility of man. It is removed equally, on the one hand, from Stoicism and the rigid doctrine of Fate, and on the other from the Epicurean affirmation that it is an unworthy condescension of the Deity to concern himself about the affairs of men. (Pliny, *Hist. Nat.*, iii., 4, *seq.*) It includes the two essential ideas of preservation and of government. Modern philosophy, which is increasingly monistic, emphasizes the *immanence* of God, and tends to resolve all matter, in its ultimate essence, into a manifestation of the present agency of God. Hence preservation differs from creation only as the beginning of an agency differs from the continuance of the same agency. The scriptural affirmation is, that God upholds all things by the word of his power—that his agency is everywhere seen in the continued existence of his creatures and in the operations of nature. "By him all things consist," Col. i. 17; "In him we live and move and have our being," Acts xvii. 28. The *extent* of providence is unlimited. It includes all the creatures of God, intelligent and non-intelligent, since nothing is so high as to be above his control, nor anything so minute as to be beneath his notice. The *end* of providence is the realizing of the divine plan in the universe. The end is infinitely wise, holy, and beneficent. The *means* are such as are best adapted for the certain accomplishment of this end. Instead of chance, or necessity, or inexorable fate, to which gods and men are equally subject, the doctrine of the Scriptures substitutes the intelligent control of the omnipotent and omnipresent Jehovah, in accordance with designs as gracious as they are vast and inscrutable. The *method* of providence—how it is that God governs the world consistently with the liberty of rational beings—is not a subject of revelation. The employment of motives to govern human action in many cases is plain. The difficulty of the problem lies in the reconciliation of divine foreknowledge and government with human freedom.

That there are powers, unseen and supernatural, operating to sustain and control both nature and man seems to be the instinctive faith of the race, aside from the special

teaching of revelation. This imparts a deep significance to many fables of ancient mythology. The belief in a providence of some kind seems well-nigh universal. It is affirmed or implied in the writings of ancient classical poets and philosophers, although disfigured with crude and unworthy conceptions of the divine nature or character. Cicero in his dialogues, *De Nat. Deorum*, states at considerable length the speculations of the most distinguished philosophers among the Stoics and Epicureans on the existence, attributes, and providence of a Divine Being. In lib. ii., while allowing the principle of pantheism—that God is the Universe and the Universe is God—he affirms the existence of minor deities, and then argues in favor of the divine government and providence—(1) from the existence of the gods, which implies their actual control of the world; (2) from the laws of nature—nature, properly interpreted, being another name for God; and (3) from the order, harmony, beauty, and wisdom manifested in the works of creation. Although not very complete or satisfactory, the argument shows the tendency of philosophic thought unaided by revelation. See also *Tusc.*, Disp. i., 49, et al.

The doctrine of providence was affirmed with great unanimity by the most distinguished early Christian Fathers, and maintained with equal subtlety of discrimination and strength of argument. The objections, too, early brought against the doctrine, were nearly the same as those revived and reaffirmed in our day. By some it was held to be unnecessary, or an implication of imperfect work on the part of the Creator, rudely supplemented afterward. Others "maintained that God concerned himself only about the genus, but not about the species," distinguishing between a general and a special providence—*gubernatio generalis* and *gubernatio specialis*. Still others held it to be derogatory to the Supreme Deity to suppose that he would condescend to notice the small concerns of men. Origen represents Celsus as affirming that God interferes as little with the affairs of men as with those of monkeys and flies. The opposite and Christian view of this article of faith was eloquently maintained in the East and the West by Chrysostom and Theodoret, by Augustine and Salvian. Augustine especially objects to the comparison of God to a master-builder, whose work remains though he himself withdraws. "The world would at once cease to exist," he says, "if God were to deprive it of his presence." Nearly two centuries earlier, about A. D. 230, Minucius Felix, in his apologetic dialogue entitled *Octavius*, in a passage of singular beauty, says: "We are not only under God's eyes, but we even live in his bosom."

The doctrine of providence is not inconsistent with the idea of a government of law. The Scriptures affirm that God is the creator of the universe. He is the author of what we call the laws of nature, and can surely change or suspend or overrule them. But he does not govern the world arbitrarily, but according to a fixed plan and for a great end. The laws of nature are the ordinances of God, but a man even may use some powers of nature to control or limit other powers. So, in a far higher sense, and with a method infinitely more perfect, may the Creator control that which he has made. Nor can we deny that he may act directly upon the rational mind, as one finite mind may seek to modify another; or upon both nature and spirit by methods to us now, and perhaps always, incomprehensible.

Some theories of evolution have been used against the doctrine of providence. The laws of the development of living forms being reduced to few, and their rigid and invariable application being assumed as the process of all the modifications resulting in the existing life of the planet, it has been argued that there is no place for providence. But evidently there is no new problem added by a new view of the nature of the laws under which providence must proceed to that given by the idea of natural law in general; and this problem is simply that of the personality of God.

Some of the proofs of the doctrine are the following: (1) It is inferred from the idea of a personal God, infinite in intelligence, wisdom, goodness, and power; (2) from the evidence of intelligence and design in nature; (3) from the evidences in history of moral order and law. History would otherwise be a tangled skein without beginning or end, without significance, and incapable of harmony or intelligent interpretation. The story of races and nations, the epochs which seem to mark the movements of society and the progress of civilization, would lose their importance, and our hope for the world would vanish, if we destroy the reality and the end of providential control.

(4) From the experience of individuals, which may be misinterpreted, but can not be overlooked altogether. (5) The proofs from the Holy Scriptures: (a) in the passages which indicate or declare the government of God over nature, over irrational animals, over men and nations; (b) in the lives of eminent men—e. g. Abraham, Moses, Elijah, Saul, David, Daniel, Paul; (c) in the Jewish history, conspicuously everywhere; (d) in passages which affirm the truth of prophecy; (e) and in those which affirm the efficacy of prayer.

The literature of this subject is voluminous. Some of the most important works which treat of the history of opinion are (a) in philosophy: Ritter's *History of Philosophy* (12 vols.); *History of Ancient Philosophy* (4 vols.), translated from the first volumes of the general history by A. J. W. Morrison; Ueberweg's *History of Philosophy*, translated by Prof. G. S. Morris (2 vols.). (b) In theology: Neander's *General Histories of the Christian Religion and Church*, translated by Prof. Torrey (5 vols.); Hagenbach's *History of Doctrines*, translated by Prof. H. B. Smith (2 vols.); Van Oosterzee, *Christian Dogmatics* (2 vols.), in Theological and Philosophical Library, edited by Prof. Smith and Prof. Schaff; Knapp's *Christian Theology*, translated by President Leonard Woods; and Rev. Dr. Charles Hodge's *Systematic Theology* (3 vols.). Revised by FRANK H. FOSTER.

Providence: city (founded in 1636); one of the capitals of Rhode Island and capital of Providence County; at the head of navigation on Narragansett Bay; on the Providence and Springfield, the N. Y. and New England, and the N. Y., N. H. and Hart. railways; 30 miles N. by W. of Newport, 44 miles S. W. of Boston (for location, see map of Rhode Island, ref. 8-N). Two small rivers meeting divide it into two parts, the east and west sides. At the junction of these rivers was formerly the Cove, now filled in. With the promenade which surrounded it the space, amounting to 1,585,134 sq. feet, is devoted to the use of the railways. Of public parks the most important is the Roger Williams (102 acres). It contains a fine statue of Roger Williams (see WILLIAMS, ROGER), the founder of the city and State. The surface of the city is very uneven. Many of the best business blocks rest on "made land," while parts of the residence portions rise 200 feet above tide-water. These inequalities add much to the picturesqueness. The streets are remarkably well cared for. Those in the business portions are paved, the others macadamized. All are clean. The electric and cable railways are owned by one company. The city is noted for its large private houses. Its most important public buildings are the State-house (1762), Providence County court-house (1877), and the city-hall. This last was built in 1879 at a cost of over \$1,000,000. Among the business blocks should be noted the Arcade (1828), a three-storied structure, connecting the two principal business streets; the Butler Exchange (1872), the buildings of the Rhode Island Hospital Trust Company (1891), and the Industrial Trust Company (1894). All these buildings front on Westminster Street, the chief business thoroughfare. There are 119 churches and other places of worship. Of these the Baptists have 20; Episcopalians, 13; Congregationalists, 9; Methodists, 14; Roman Catholics, 16; Unitarians, 4; Universalists, 3; and Presbyterians, 3. The most noted is the First Baptist meeting-house, built in 1775 "for the public worship of Almighty God, and also to hold commencements in." It is of wood, and has a very beautiful spire. The largest edifice is the Roman Catholic cathedral (1885). The principal educational institution is BROWN UNIVERSITY (*q. v.*). The Rhode Island School of Design furnishes the art instruction needed in a great manufacturing community. The chief private school is the Friends Yearly Meeting Boarding-school, opened in 1818. Here is also the State Normal School. The public schools in 1893 had 18,772 pupils, 451 teachers, and 66 buildings. The most important hospitals are the Rhode Island (1868), the Homeopathic, and the Butler Hospital for the Insane (1847). The last is situated on the east bank of the Seekonk river in a park of 140 acres, and accommodates 200 patients. The Dexter Asylum for the Poor was founded in 1827; its grounds comprise 39 acres. The city is especially rich in public and private libraries. Besides that of Brown University (80,000 volumes) should be noted the Public Library, 64,000 volumes, the Athenæum Library, 55,000 volumes, and the library of John Nicholas Brown is unequaled in its Americana. The city debt Sept. 30, 1893, was \$11,733,679.27; assessors' valuation of real and personal estate, \$159,812,560; rate of taxation, \$16 per \$1,000. Providence

is especially noted for its manufactories of cotton and woolen goods, jewelry (167 establishments), silverware, tools, locomotives, boilers, steam and electrical engines, screws, files, sewing-machines, etc. The census of 1890 showed that 1,883 manufacturing establishments representing 154 industries reported. These had a combined capital of \$54,274,227, employed 37,955 persons, paid \$18,789,500 for wages and \$36,674,398 for materials, and had products valued at \$71,810,173. The city is a great distributing-point. Immense quantities of coal are transhipped from its wharves. Its wholesale merchants transact a very large business. The commerce is mostly coastwise. Lines of steamships run to Baltimore, Philadelphia, and New York. It has 33 banking institutions with an aggregate capital of \$30,000,000. The deposits in the savings-banks exceed \$40,000,000. As a seaport for 200 years the town grew slightly, even though its commerce reached not only to Europe and the West Indies, but also to Africa, India, and China. With manufactures came marvelous development. Since 1860 the population has increased three-fold. Pop. (1880) 104,857; (1890) 132,146; (1895) 145,472. WILFRED H. MUNRO.

Provincetown: town; Barnstable co., Mass.; on the northern extremity of Cape Cod and the N. Y., N. H. and Hart. Railroad; 55 miles by water and 120 by rail S. E. of Boston (for location, see map of Massachusetts, ref. 5-K). It is noted as the first landing-place of the Pilgrim Fathers in America; as the birthplace of the first child born in New England of English parents; and as a popular summer resort. It has a deep and commodious harbor on the inner side of the cape, almost entirely landlocked, and free from obstructions. The principal industries are whaling and cod and mackerel fishing. The town has a national bank with capital of \$200,000, a savings-bank, a public library, several hotels and summer boarding-houses, and a weekly newspaper. Pop. (1880) 4,346; (1890) 4,642; (1895) 4,555.

Proviso: a clause or provision introducing a condition, as into a contract, a statute, or a will; a conditional stipulation. See **CONDITION**.

Provo: city; capital of Utah co., Utah; on the Provo river, and the Union Pac. and the Rio Grande West. railways; 3 miles E. of Utah Lake, 48 miles S. E. of Salt Lake City, near the western base of the Wasatch Mountains (for location, see map of Utah, ref. 4-M). It is in an agricultural region; contains the Utah Insane Asylum, Brigham Young Academy (Latter-Day Saints, opened in 1876), Proctor Academy (Congregational, opened in 1887), a national bank with capital of \$50,000, a savings-bank, 2 private banks, a semi-monthly, 2 daily, and 2 semi-weekly periodicals; and has manufactories of flour, leather, woolen goods, and lumber. Pop. (1880) 3,432; (1890) 5,159; (1895) 5,992.

Provoost, prō'vōst, SAMUEL, D. D.: bishop; b. in New York, Mar. 11, 1742, of Huguenot ancestry; graduated at King's College, New York, 1758, and the University of Cambridge, England; entered the Church of England ministry 1766, and in same year became assistant minister of Trinity church, New York; espoused the popular side at the breaking out of the war, and retired to his country home during the struggle; became in 1783 rector of Trinity church, chosen by the patriot churchmen of New York, and in 1787 was consecrated Bishop of New York at Lambeth, England; was chaplain of Congress in 1785, and in 1789 chaplain of the U. S. Senate; read prayers at St. Paul's chapel on occasion of the presence of Washington and the Congress directly after the inauguration exercises in 1789; resigned the care of Trinity church in 1800, and in 1801 received a coadjutor. During the closing years of his life he retired from all public offices. D. in New York, Sept. 6, 1815.

Revised by W. S. PERRY.

Provo River: a river of Utah which rises on the west slope of the Uinta Mountains, flows westward in a deep, wild cañon through the Wasatch Mountains, and empties into Utah Lake, which is tributary to Great Salt Lake. It is about 100 miles long, and of sufficient volume without storage to irrigate 100 sq. miles of land. The upper portion of the stream was formerly a branch of Weber river, but was turned from its original course by debris deposited by the stream itself in Kawas valley. It was one of the principal tributaries of Lake Bonneville, and built the large delta on which the town of Provo now stands. Consult *Report on Arid Lands*, by J. W. Powell (Washington, 1879), and *Lake Bonneville* by G. K. Gilbert (Monograph No. 1 U. S. Geol. Surv.). ISRAEL C. RUSSELL.

Provost-marshal: in the army and navy, an officer who attends to the execution of martial law, the fulfillment of sentences by courts martial, and the like. He preserves order in towns and districts under military control, and has certain summary powers under the articles of war.

Prudden, THOPHILE MITCHELL, Ph. B., M. D.: b. at Middlebury, Conn., July 7, 1849; educated at Yale College, Heidelberg, Berlin, and Vienna, graduating M. D. from the Yale Medical School in 1875; devoted himself to pathology, and was lecturer on normal histology at Yale Medical School, leaving there in 1881 to become director of the pathological laboratory of College of Physicians and Surgeons, New York; in 1892 was elected Professor of Pathology in the latter college. Among his works are *Manual of Normal Histology* (1881); with DeBald, a *Handbook of Pathological Anatomy and Histology* (1885); *Story of the Bacterium* (1889); *Dust and Its Dangers* (1891); and *Water and Ice* (1891). S. T. ARMSTRONG.

Prudentius, AURELIUS CLEMENS: poet; b. in 348 A. D. in Northern Spain; studied law; practiced as an advocate; held several high positions, and received in 394 a military appointment at Rome under the Emperor Theodosius, but retired afterward from public life and devoted himself exclusively to theological studies and religious poetry. The date of his death is unknown. He is last heard from in 405. Of his *Liber Cathemerinon* and *Liber Peristephanon*, two collections of hymns, several pieces became very popular, were translated into other languages, and are still in use. Among his other books, all written in Latin verse, are *Hamartigenia*, on the origin of sin; *Psychomachia*, on the contest between good and bad in the human soul; *Contra Symmachum Libri Duo*, to persuade the Roman emperor not to restore the altar and statue of Victory cast down by Gratian. There are complete editions of his works by Arevalus (Rome, 1788; rep. Migne, lix., lx.), by Obbarius (Tübingen, 1845), and by Dressel (Leipzig, 1860). A new revision of the text is promised by Iluemer for the *Vienna Corp. Script. Eccl. Lat.* An English translation of the *Cathemerinon* and other Poems of Prudentius appeared in 1845 (London). See also F. St. John Thackeray, *Translations from Prudentius* (London, 1890; Latin text and verse translations on opposite pages; notes, introduction on life and times, etc.). See J. Schmitz, *Die Gedichte des Prudentius und ihre Entstehungszeit* (Aachen, 1889), and A. Puech, *Prudence: Étude sur la poésie lat. chrétienne au IV^e siècle* (Paris, 1888). Revised by M. WARREN.

Prudhomme, Conseils de: See **FRANCE (Justice)**.

Prune [viā Fr. from Lat. *prunum*. See **PLUM**]: the dried fruit of certain kinds of plums. The finest sorts are called *prunelles*. The best-known prunes come from France, but Germany furnishes large amounts of a coarse kind. Turkey and Spain also export prunes. They are used as a mild laxative for children, and are extensively employed in cookery. They are sometimes dried by artificial heat and sometimes in the sun, or perhaps more commonly are half dried by stoves, the process being finished in the sun. California is an important prune-producing country. Its product is usually lighter colored than that of France, because the fruit is dried without heating or cooking. The chief variety used there for the commercial article is Prune d'Agen. The plums are shaken from the tree and dipped in lye to facilitate the drying process. Revised by L. H. BAILEY.

Pruning [*prune* < M. Eng. *proinen*, from O. Fr. *provin* > Mod. Fr. *provin* < Lat. *propa* go, *propa* ginis, slip, cutting. Cf. Eng. *propagate*]: the act of cutting off parts of a tree or shrub, either for the purpose of producing a certain shape or of increasing the production of fruit or timber, or improving the size and quality of the fruit and the ease of picking the crop and caring for the plant; also to facilitate the fighting of insects and fungi. Forest trees are pruned to increase the quantity of timber in the trunk by diminishing the side branches, beginning at the lower part of the tree. In fruit trees the branches are thinned out in order to admit the air and light more freely to the leaves, blossoms, and fruits, and to concentrate and increase the nourishment for the branches which remain. In pruning for the purpose of producing fruit it is necessary to know on what branches and buds the fruit grows. The grape generally bears on shoots of the current year (see **GRAPE**), the peach on those of the preceding year, and the apple and pear on wood of two or three years' growth. It is generally considered that early spring or late winter is

the best season for pruning. For explicit directions, see the various fruit manuals. The only special volume devoted to the pruning of fruits in the U. S. is Bailey's *American Grape Training*.
Revised by L. H. BAILEY.

Pruri'go [Mod. Lat., from Lat. *pruri'go*, an itching, deriv. of *pruri're*, itch]: a condition of the skin, characterized by intense itching and by the presence of small points filled with a watery liquid.

Prussia (in Germ. *Preussen*): the principal state of the German empire, comprising almost two-thirds of its entire area.

Boundaries, Area, and Physical Features.—It extends from lat. 49° 6' 45", its extreme southern point in the Rhine province, to 55° 53' 40" N., and from lon. 5° 50' to 22° 50' E. It is bounded by the North Sea, Oldenburg, Denmark, Mecklenburg, and the Baltic on the N., by Russia on the E., the Austrian empire, the kingdom of Saxony, Thuringia, Bavaria, Hesse, and Alsace-Lorraine on the S., and by Luxembourg, Belgium, and the Netherlands on the W. It includes also the detached territory of Hohenzollern. Among the islands belonging to it are Rügen, Fehmarn, and Alsen in the Baltic and the North Frisian islands and Heligoland in the North Sea. Its area is 134,463 sq. miles. The principal part of the kingdom in the north and east belongs to the great northern plain of Europe. In the main it slopes gently to the N., and only in places along the coast is broken by sand-dunes, the highest in Europe. At Rügen chalk cliffs rise abruptly from the sea. The northeast coast of Schleswig-Holstein is high and cut in by numerous fjords. Along the North Sea, however, it has frequently been necessary to build dikes to protect the low-lying land from overflow. In the south and southwest the surface is for the most part hilly or mountainous. The principal mountains are the Sudetic range, including the Riesengebirge (5,255 ft.), on the S. toward the borders of Austria, further westward the Thuringian and Hartz Mountains, and still further to the W. the Teutoburgerwald, the Weser Mountains, the Taunus, and the Westerwald. Hohenzollern lies in the Swabian Alps. The principal rivers are the Rhine, Ems, Weser, Elbe, Oder, Vistula (Weichsel), Niemen, and their affluents. The coast has a number of bays, among them the Kiel, Rügen, and Pomeranian Bays and the great Gulf of Dantzig so called, and some large inlets, the most important of which are the Stettin, Frisches, and Kurisches Hafl. There are small lakes in the north and northeast—in Holstein, Pomerania, West and East Prussia—but they also occur in other parts of the kingdom.

Climate, Soil, and Products.—The climate of Prussia is temperate and on the whole salubrious. The harvest season is short in the northeast, and the higher regions of the west are characterized by raw winds; the more protected parts of the country, however, adjoining the Sudetic range, Saxony, the S. of Hanover, and the middle Rhine, are mild and equable. The mean annual temperature of East Prussia is 6-33° C.; about the confluence of the Moselle with the Rhine it reaches 10-1° C. About the lower waters of the Vistula and the Oder only careful draining carried on through centuries has rendered the land available. The highest parts of this region consist for the most part of sand and clay. The northwestern provinces have in parts dry and barren soil alternative with marsh and turf moor. The most fertile portions of the kingdom are in the province of Saxony, the foot-hills of the Sudetic Mountains, and the Thuringian, Weser, Westerwald, and Taunus uplands. The total productive area occupied by crops and forests is 20,853,532 hectares. The principal agricultural products, arranged in the order of the area occupied in their production, are rye, hay, oats, potatoes, wheat, barley, beetroot, rape-seed, flax, hops, and tobacco. Fruit is grown in the warmer parts of the country. Wine is produced on the Rhine and the Moselle, the Saale and Unstrut, and in Silesia. Stock-raising is extensively carried on. Of minerals there is a large production. The most important are coal, iron, zinc, lead, copper, cobalt, nickel, and rock-salt. Amber is found on the Baltic coast.

Population and Government.—The population of Prussia in 1890 was 29,957,367, divided among the fourteen provinces as follows: East Prussia, 1,958,663; West Prussia, 1,433,681; Pomerania, 1,520,889; Posen, 1,751,642; Brandenburg, 2,541,783; Berlin, 1,578,794; Saxony, 2,580,010; Silesia, 4,224,458; Hanover, 2,278,361; Schleswig-Holstein, 1,219,523; Westphalia, 2,428,661; Hesse-Nassau, 1,664,426; Rhine province, 4,710,391; Hohenzollern, 66,085. With respect to

nationality 26,438,070 are Germans, 2,872,197 are Poles, 164,162 are Czechs, 139,399 are Danes, 121,345 are Lithuanians, 89,786 are Dutch and Frisians, 67,967 are Wends, and 64,441 are of other nationalities. With respect to creed 19,232,449 are Evangelical, 10,252,807 Roman Catholics, 372,058 Israelites, and 95,349 belong to other denominations. The Roman Catholics are settled principally in the Rhine province, Silesia, Westphalia, and Posen. In 1895 the population was 31,349,795. The government is a hereditary constitutional monarchy administered by the king and the Landtag. The latter consists of two chambers—the Herren-haus, or House of Lords, and the Abgeordneten-haus, or House of Delegates, with 433 members elected for three years. The king is the German emperor. As the principal state in the empire, Prussia has 17 representatives in the Bundesrath and 236 members in the Reichstag. See GERMAN EMPIRE.

Army, Finance, and Education.—The Prussian army forms the principal part of the army of the empire. Including the contingents of the minor states, but exclusive of the armies of Saxony, Bavaria, and Württemberg, its peace footing consists of 376,841 men in the different branches of the service, with 19,382 officers, surgeons, etc. The state of its finances, according to the budget of 1893-94, was as follows: Total receipts, 1,893,313,260 marks, the principal items of which were direct taxation, 135,166,000; indirect taxes, 71,164,000; mines and salines, 138,361,229; railways, 938,732,081; domains and forests, 88,773,734; total national debt, 6,243,773,430 marks, with a sinking fund of 17,079,453 marks. The public educational system has reached a particularly high standard of development. Education is general, and in the elementary schools compulsory. There were (1891-92) 34,742 public elementary schools, 606 public middle schools, 315 gymnasiums, pro-gymnasiums, and Real pro-gymnasiums, 122 schools for the training of teachers, 10 universities (with 14,635 matriculated students), and various institutions for special and technical training.

Manufactures, etc.—Prussia is one of the greatest manufacturing countries of Europe. Its iron industry is among the foremost in the world; it also yields about half of the world's product of zinc. The principal manufactures are metallic wares, machinery, cotton goods, silk, velvet, linen, cloth, paper, and leather. Its exports include manufactured goods of great variety, grain, timber, wool, live stock, etc. In 1893 Prussia had 18,367 miles of railways, about 90 per cent. of which is the property of the state. Of internal waterways all the rivers named are navigable, and there are in addition several canals.

History.—A Prussian people (Pruzi, Prutheni), akin to the Letts and Lithuanians, first appeared in history near the end of the tenth century in the region to the E. of the Vistula. In that same century Adalbert, Bishop of Prague, endeavored to convert them to Christianity, but was killed by them in 997. In the eleventh and twelfth centuries they were involved in conflicts with the Poles, who failed to effect a conquest; but in 1283 the Teutonic Order conquered the country. In 1309 Marienburg became the headquarters of the order. For more than 200 years the Teutonic Order ruled the country, but ultimately it broke down through the enmity of Poland and Lithuania and its own internal deterioration. By the peace of Thorn (1466) the whole country W. of the Vistula was ceded to Poland, and her sovereignty was acknowledged over the remainder. In 1511 Albrecht, Margrave of Brandenburg, of the family of Hohenzollern, was elected grand master and in 1525 he dissolved the order and transformed the greater part of East Prussia and a small part of West Prussia into a temporal hereditary dukedom. The connection between the dukedom and Brandenburg thus begun was not, however, finally accomplished until after the death of Duke Albrecht Friedrich (1618), and the consequent extinction of the lateral line, when the dukedom fell to the electoral house of Brandenburg. It continued, however, a fief of the Polish crown until 1656, in the time of Friedrich Wilhelm, the Great Elector, whose long and successful reign (1640-88) marks the real beginning of the Prussian state.

For the subsequent history of Prussia, see GERMAN EMPIRE (*History*), and for further details see the biographies of her kings—Frederick William I., II., III., and IV., Frederick II., William I., and the articles on the SEVEN YEARS' WAR, the FRANCO-GERMAN WAR, and NAPOLEON I.

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1881); Joh. Gust. Droysen, *Geschichte der preussischen Politik* (5 vols. in 14, Leipzig, 1868-86). Works on special periods: Ranke, *Memoirs of the House of Brandenburg*; and *History of Prussia during the Seventeenth and Eighteenth Centuries* (translated from the German by Sir Alexander and Lady Duff Gordon, 3 vols., London, 1849); and *Denkwürdigkeiten des Staatskanzlers, Fürsten von Hardenberg* (5 vols., Leipzig, 1877); Thomas Carlyle, *History of Frederick the Second, called Frederick the Great* (6 vols., New York, 1858-66); Hillebrand, *La Prusse Contemporaine et ses Institutions* (Paris, 1867); Seeley, *Life and Times of Stein; or Germany and Prussia in the Napoleonic Age* (3 vols., London and Boston, 1849). WILLIAM H. CARPENTER.

Prussian Blue, or **Berlin Blue**: ferric ferrocyanide, $\text{Fe}_4\text{C}_{12}\text{F}_6$, or $\text{Fe}_7\text{C}_{14}\text{F}_9$. It is produced by precipitating ferric chloride or sulphate with potassium ferrocyanide; or by precipitating the ferrous sulphate (coppers) with the same reagent, and oxidizing the product by some convenient method. It is intensely blue, and is used as a pigment. Its solution in oxalic acid is used as a blue ink and for bluing linen, etc. It is used in dyeing and calico-printing, being formed in the cloth. See CALICO-PRINTING.

Prussian Carp: See GIMEL.

Prussian Language. Old: See OLD PRUSSIAN LANGUAGE and LITHUANIAN, THE.

Prussic Acid: See HYDROCYANIC ACID.

Pruth: a tributary of the Danube. It rises on the north-east side of the Carpathian Mountains in Galicia, runs through Bukowina, forms the boundary between Roumania and Russia, and enters the Danube at Reni, 13 miles below Galatz, after a course of about 520 miles. It becomes navigable from near Jassy.

Prutz, ROBERT EDUARD: poet; b. at Stettin, Prussia, May 30, 1816; studied philology, philosophy, and history at Berlin, Breslau, and Halle, and afterward edited with Arnold Ruge the *Halleschen Jahrbücher*, a periodical which advocated liberal ideas in science, religion, and politics. Owing to his radical views he was for a long time excluded from the academic career until in 1849 he became Professor of Literature at the University of Halle. He soon resigned this position, and devoted himself entirely to literary and scientific pursuits. As a poet Prutz belongs to the patriotic bards who, previous to 1848, fought for greater political liberty in Germany. Besides the *Gedichte* (1849), *Aus der Heimat* (1858), *Herbstrosen* (1865), he published several dramas filled with the same patriotic spirit (*Moritz von Sachsen*, *Erich der Bauernkönig*), and a number of novels that disclose a great talent for satire. His researches in the history of German literature, which are embodied in the monographs *Der Göttinger Dichterband* (1841), *Geschichte des deutschen Journalismus* (1845), *Vorlesungen über die Geschichte des deutschen Theaters* (1847), have insured Prutz a permanent position in the history of literature. He also exerted great influence on the literary production of his time as a critic in the *Deutsche Museum*, a literary periodical which he edited 1851-66. D. at Stettin, June 21, 1872. JULIUS GIMBEL.

Prynne, WILLIAM: Puritan writer and agitator; b. at Swanswick, Somersetshire, England, in 1600; studied at Oriel College, Oxford, and graduated 1620; studied law at Lincoln's Inn; was converted to Puritanism by Dr. John Preston, lecturer at that inn; in 1633 issued his celebrated *Histrie-Mastix*, the *Player's Scourge*, which was construed into a libel upon the queen; was brought before the Star Chamber, fined £5,000, expelled from the University of Oxford and from Lincoln's Inn, set on the pillory at Westminster and Cheapside, had both ears cut off, and was sentenced to imprisonment for life. Having issued from his prison a tract entitled *News from Ipswich*, he was again fined and pilloried, had the letters S. L. ("Seditious Libeler") burned upon his cheek, was imprisoned in close confinement in Caernarvon Castle, and afterward in the castle of Mont Orgueil in the island of Jersey. In 1640 Prynne was released by warrant from the House of Commons. Elected a member of Parliament for Newport, he conducted the proceedings against Laud; became recorder of Bath 1647; took an active part in favor of the Presbyterians in their struggle with the Independents; advocated a reconciliation between Parliament and the king; was arrested for denying the supremacy of Parliament in a pamphlet entitled *A Brief Vindication* (1648); was with others ejected from Parliament by the army Dec. 6, 1648; attacked Cromwell and the army in

his writings; was again imprisoned in 1650 and 1651; advocated the restoration of Charles II.; was elected to the new Parliament 1660; was made keeper of the records in the Tower; was reprimanded by the House of Commons 1661 for new offenses in his writings; published a vast number of political, legal, and antiquarian treatises. D. in London, Oct. 24, 1669.

Pryor, ROGER ATKINSON, LL.D.: lawyer; b. near Petersburg, Va., July 19, 1828; graduated at University of Virginia 1848; studied law; became connected with the press at Petersburg 1851; was an editor of the *Washington Union* 1852 and of the *Richmond Enquirer* 1853; went as special commissioner to Greece 1855; edited a newspaper entitled *The South* 1856-67; sat in Congress 1857-59; was again elected in 1860, but did not take his seat on account of the secession of Virginia; was chosen to the provisional congress of the Confederate States at Montgomery, and to the first regular Confederate congress; entered the Confederate army as colonel of the Third Virginia Regiment; was made brigadier-general after the battle of Williamsburg; was taken prisoner Nov., 1864, and imprisoned in Fort Lafayette, but was released after four months' detention. In 1865 began the practice of law in the city of New York, devoting himself to his practice until in 1890 he was appointed judge of the court of common pleas, to which office he was elected in 1891 for a term of fourteen years. By virtue of the revised constitution of 1894 he becomes a justice of the Supreme Court on and after Jan. 1, 1896, for the remainder of his term of fourteen years, the court of common pleas being then abolished. Revised by F. STURGES ALLEN.

Przemysl, pzhem'is'l: town; in the province of Galicia, Austria; on the river San, an affluent of the Vistula; 61 miles by rail W. of Lemberg (see map of Austria-Hungary, ref. 3-J). It is the see of a Roman Catholic and a United Greek bishop, has many educational and benevolent institutions, and manufactures of spirits, machinery, etc. Since 1874 it has been strongly fortified. Pop. of the commune (1890) 35,619.

Psalmanazar, GEORGE: the assumed name of a literary impostor, whose real name and early history have remained unknown. He is supposed to have been born in the south of France in 1679; received a good education under Jesuit instructors; led for some time a vagrant life, roaming through France, Germany, and the Netherlands; ultimately attracted the attention of Mr. Innes, chaplain of a Scotch regiment at Sluys, Holland, who succeeded (as he supposed) in converting Psalmanazar to Christianity, took him to London, and presented him to Bishop Compton and others as a native of Formosa. It is uncertain whether Innes was a dupe or an accomplice in this affair, but he received promotion for his missionary zeal, and Psalmanazar was encouraged to draw up a *History and Description of the Island of Formosa off the Coast of China* (1704), illustrated with many engravings and with copious specimens of the pretended Formosan language, into which he translated the Catechism of the Church of England. Psalmanazar was sent to Oxford, but soon repented of and confessed his imposture, applied himself to study, became skilled in Oriental history and literature, and spent nearly half a century in London, chiefly occupied in writing for the booksellers. He completed Palmer's *History of Printing*, wrote several volumes of the *Universal History*, and led an exemplary life. D. in London, May 3, 1763. His autobiographical *Memoirs* appeared in 1764.

Psalmody [viâ O. Fr. and Lat., from Gr. ψαλμῳδία, liter., singing of psalms; ψαλμός, psalm + ᾠδή, song, singing]: as usually defined, the act, art, or practice of singing psalms; but properly, in a wider sense, not only the vocal rendering of the songs used in public worship, but also the study of their origin and history, as well as of the tunes to which they are sung. Psalmody may be considered as ancient and modern. In the former the songs were all rhythmical, and necessarily performed in the chanting or recitative style.

That God was worshiped publicly in song before David's time is clear, not only from the inherent probability of such praise, but also from the readiness and facility with which the responsive hymn of male and female voices was sung after the passage of the Red Sea. No direction, however, was given for such worship in the Law. It was David, the Psalmist as well as the Psalmist of the Old Testament, who instituted the formal, stated, liturgical services of praise. He had a trained choir of 4,000 Levites, who, however, came out in full force only on great occasions. Over

these were three leaders—Heman, Asaph, and Ethan or Jeduthun—who directed them by beating time upon cymbals. The treble (*Alamoth*, 1 Chron. xv. 20) was led by the harps ("psalteries" in the English version), and the bass (*Sheminith*, 1 Chron. xv. 21), not in harmony, but simply an octave lower, by lyres or citharas ("harps" in our version). Many, though not nearly all, of the Psalms of David and his followers were composed partly for use in this service, and the superscriptions of a considerable number have reference to this design. In some of these allusion is made to the musical instruments by which they were to be accompanied; in others to the pitch (treble or bass) in which they were to be sung; and in a few to some familiar tune to which they were to be adapted. Some of the Psalms give evidence of adaptation to responsive singing, which was usually done by the two divisions of the choir, though sometimes, as in Ps. xxiv., the service was probably divided between the Levites and the people. The latter did not commonly join in the singing, except, apparently, in refrains and familiar formulas of praise, where they were enjoined to come out in full chorus. Some alterations in matters of detail were made in the service of praise in the second temple, the system being extended also, so as, for example, to have one psalm appropriated to each day of the week.

As to the musical system of the ancient Jews, nothing definite is known. The primary design of the accents in the Hebrew Psalter is that of musical notation, but these are no longer understood except in their secondary use of interpunction. It is possible that the synagogue-worship of later times and the old Christian chants retain traces of the simple recitative melodies of the ancient temple.

In the New Testament little is said of praise in public worship. The temple-service was of course maintained, with gradual modifications, until the dispersion. Hearty and unrestrained singing, being a necessary part of Christian worship, is often enjoined in the Epistles. The services were no doubt a selection from the temple-psalms, with the old tunes, which held a place far into the history of the early Church. To these were gradually added Christian hymns, which were at first modeled after the psalms, and were doubtless set to the same simple music. The Syrian Church had a larger hymnology and more elaborate music than its sister churches.

The development of psalmody in modern times in accordance with the needs of the Church has been due chiefly to two causes—the gradually increasing and ultimately predominant use of metrical songs as supplementing the old rhythmical forms, with a corresponding change in the tunes, which improved with the progress of musical science, and the growth of an hymnology in which the manifold experiences of Christians have found full expression. Still, many of the psalms have always been retained in essential substance, and have remained the best source of inspiration and culture for good hymn-writers. Music became a regularly constituted portion of church-service in the fourth century. Its early development in the Western Church was largely due to Ambrose, Bishop of Milan, and its progress during the Middle Ages to the improvements effected by Pope Gregory I. From them the names of the two old standard styles of chanting have been derived. Until the Reformation sacred music was under the control of the clergy. Metrical psalmody with harmony probably arose long before that era in Germany, but had not made much general progress. The efforts of Luther and many of his helpers, by the adaptation of secular airs and the composition of new tunes, resulted in a widespread enthusiastic interest in sacred music among the Protestants in that country. Ever since, also, it has been from Germany that the greatest influence and the healthiest tone have been given to the musical department of psalmody. In those lands where the influence of Geneva has had chief control, as most conspicuously in Scotland, this part of worship has been largely influenced by a tendency to plainness and severe simplicity in both words and music; yet congregational singing is hearty and general.

J. F. McCURDY.

Psalms [M. Eng. *psalm*, *salm* < O. Eng. *scalm*, *salm*, early loan-word from Lat. *psalmus* (cf. Fr. *psaume*) = Gr. *ψαλμός*, song to the harp, deriv. of *ψάλλω*, twitch, play a stringed instrument]: the title given in the Septuagint version to the book in the canon which the Hebrews called the Praise Songs, and in English the Psalter. They are sometimes called the Psalms of David, as if all or the majority of the 150 had

been composed by him. In the Hebrew Bible we find the whole collection divided into five books (i.-xli.; xlii.-lxxii.; lxxiii.-lxxxix.; xc.-cvi.; cvii.-cl.)—a division which assumed its final shape before the completion of the Old Testament canon, but was only accomplished after several hands at various periods had helped toward the permanent arrangement. This partition is doubtless a designed correspondence with the five books of the Law. In the places assigned to the several psalms also there is evidence of careful arrangement according to principles more or less obvious, such as a tendency to place in the same group compositions of the same individual, or of the same period, or upon the same general subject, or written in the same style, or for a similar liturgical purpose.

As to the *authorship* of the several poems the superscriptions traditionally attached to many of them are the only guide. Seventy-three of the psalms are thus assigned to David, and in nearly every case the correctness of the title is attested by strong evidence in their matter and style. The same criteria enable us to assign with great confidence a certain number of the anonymous psalms to the same author, making his whole contribution to be about eighty. Twelve are ascribed to the singer Asaph, which designation also included certain of his descendants who inherited his poetical and musical gifts. Thirteen or fourteen proceeded from the "sons of Korah." Two were written by Solomon (lxxii., cxvii., in whose superscriptions we should read "of" and not "for," as in the Revised Version). One, Ps. xc., is accredited to Moses. It is difficult or impossible to assign the remaining psalms with certainty to their true authors. The dominant school of Hebrew critics questions the correctness of these traditional ascriptions, and assigns almost all the psalms to a period long after David—indeed, some scholars set the whole collection in the Maccabean era.

As to the *matter* of the Psalms, it must suffice here to say that they were the outflow of the spiritual life of the most highly endowed natures of a long period of Israel's history. Thus they contain a record of their adoration, confessions, petitions, and aspirations as these were conditioned, on the one hand, by their conceptions and knowledge of God and of his dealings with men, and on the other by their own inner history and outward circumstances. We find in the Psalms a vital appreciation of the ideas of God and Providence that had been unfolded in the teachings of the Law, and the most practical illustrations of the duty and privilege of worship and obedience. And so fresh, various, just, and profound are their views of the spirituality, holiness, and goodness of God, and their representations of the yearnings, conflicts, and triumphs of the earnest soul, that the Psalter has not only prompted and made valuable all the hymnology of the Church, but has always been the chosen consoler and counselor of the Christian heart. See **PSALMODY**.

LITERATURE.—Of modern commentators in English on the Psalms may be recommended J. A. Alexander (3 vols., New York, 1850); J. M. Neale and R. F. Littledale (4 vols., London, 4th ed. 1884, rich in patristics); J. J. S. Perowne (2 vols., 6th ed. 1886, the best, on the whole); C. H. Spurgeon (7 vols., 1870-84, strong in Puritan and pithy comment); A. Maclaren (in *Expositor's Bible*, 3 vols., 1894).

Revised by S. M. JACKSON.

Psalms of Zoroaster: designation of the *Gāthās* or metrical selections in the *AVESTA* (*q. v.*), containing the teachings, exhortations, and revelations of Zoroaster, the prophet of ancient Iran. The *Gāthās* are five in number, and they comprise seventeen short psalms, averaging about a dozen stanzas each. The fivefold grouping is based upon the meters in which they are composed. The pith of Zoroastrianism is contained in these psalmodic selections; the prophet exhorts men to eschew evil and choose the good, the kingdom of light rather than the kingdom of darkness, and their reward shall be eternal. He enunciates the doctrine of dualism in a sort of Iranian Sermon on the Mount. The *Gāthās* are the oldest part of the *Avesta*, and the language in which they are written is more archaic than that used elsewhere in the ancient sacred books of the Persis. See **ZOROASTER**.

A. V. WILLIAMS JACKSON.

Psammetichus I. (Egypt. *Psemthek*): the first king of the twenty-sixth Egyptian dynasty (666-612 B. C.). By marriage he gained alliance with the Ethiopians of NAPATA (*q. v.*), and by the aid of Ionian and Carian mercenaries he overthrew the Assyrian governors of the Delta region who

had been installed by Assurbampal of Assyria. His ambition was to make Egypt strong at home, hence he encouraged Greek immigration (see NACCRATS and TAMPHOUS, giving the colonists exclusive trade privileges). He built largely at various places, such as Heliopolis, Mendes, Memphis, Abydos, and Thebes, and during his reign a very remarkable renaissance in art occurred. He was succeeded by NERO (q. v.), who continued the same policy. Psammetichus II. and Psammetichus III. were rulers of small importance. The latter was defeated at Pelusium by Cambyses, who set up the twenty-seventh or Persian dynasty in 527 B. C.

CHARLES R. GILLET.

Psa'ra, or Ip'sara: a small island in the Grecian Archipelago, W. of Scio, belonging to Turkey. It is rocky and barren, but was densely peopled and very prosperous before the Greek revolution, but having been taken by the Turks in 1824 its commerce was destroyed, its agriculture fell into decay, and its population decreased very much. At present its inhabitants live mostly by fishing.

Pseudepig'rapha [Mod. Lat. = Gr. *ψευδεπίγραφα*, neut. plur. of *ψευδεπίγραφος*, falsely inscribed or ascribed: *ψεύδης*, false + *ἐπιγράφειν*, inscribe; *ἐπί*, on + *γράφειν*, write]; those writings which bear the names of Old or New Testament characters as authors or principal subjects, but which never formed part of the canon, either Hebrew or Christian. They were produced between 300 B. C. and 300 A. D. Those which antedate Christ are to be distinguished from the APOCRYPHA (q. v.) of the Old Testament, which have a place in the Septuagint translation and in the canon of the Greek and Latin Churches, and were formerly printed along with the canonical Scriptures in English Bibles. These books are: I. and II. Esdras, Tobit, Judith, The Rest of Esther, Wisdom, Ecclesiasticus, Baruch with the Epistle of Jeremiah, The Song of the Three Children, The Story of Susanna, The Idol Bel and the Dragon, The Prayer of Manasses, I. and II. Maccabees. As no distinction is made between the New Testament Apocrypha and Pseudepigrapha, since all alike are and have always been uncanonical, both will be treated in this article under the term "Apocrypha." These pseudepigrapha are worthless as history of the time they pretend to date from, yet have a certain value as specimens of the thought of the times in which they were produced. They were surely not written by the authors they claim, yet are not on that account to be classed as forgeries, in the modern sense of the term, since it was allowable then to issue writings under the name of some well-known man of a past age. Thus in the Hebrew canon the name Solomon is attached to writings or parts of writings with which he had nothing to do. So, in the nearly unanimous judgment of Hebrew scholars, is it with the names Moses, David, Isaiah, Zechariah, and others. The object of such attribution was to gain the wider currency for the real author's views. The device was of a very naïve kind.

I. PSEUDEPIGRAPHIA OF THE OLD TESTAMENT.—The best collection is still that of J. A. Fabricius, *Codex pseudepigraphus Veteris Testamenti* (2d ed. Hamburg, 1722). O. F. Fritzsche, as appendix to his *Libri apocryphi Veteris Testamenti Græce* (Leipzig, 1871), gives these Pseudepigrapha: The Psalms of Solomon, the Fourth and Fifth Book of Esdras, the Apocalypse of Baruch, and the Assumption of Moses. Migne devotes the greater part of the first volume of his *Dictionnaire des Apocryphes* (Paris, 1856, 2 vols., small folio) to the Old Testament Pseudepigrapha, and gives annotated French translations of the Book of Adam, the Book of the Conflict of Adam, the Book of Enoch, Third and Fourth Esdras, the Ascension of Isaiah, the Book of Joseph, Third and Fourth Maccabees, Prayer of Manasses, the Testament of the Twelve Patriarchs, the Psalms of Solomon, Odes of Solomon, Letters of Solomon. E. C. Bissell, in his commentary on the Apocrypha in the Lange Series, gives a revised English translation of all the Apocrypha mentioned above, and an account of Fourth and Fifth Maccabees, the Book of Enoch, the Sibylline Oracles, the Apocalypse of Baruch, the Psalms of Solomon, the Assumption of Moses, the Ascension of Isaiah, the Book of Jubilees, and the Testaments of the Twelve Patriarchs. The Five Books of the Maccabees in English translation were edited by Henry Cotton, Oxford, 1832 (but still in print). A translation of the Ethiopic Apocrypha, which will include some Pseudepigrapha, into French has been begun (Paris, 1893, *seq.*). The variations in the numeration of Esdras, or Ezra, comes from the fact that the Roman Church, following the Vulgate, calls Ezra and Nehemiah respectively I. and II.

Esdras. It also classes as canonical some books which Protestants call apocryphal. The Pseudepigrapha, as a whole, have been recently studied by W. J. Deane, *Pseudepigrapha* (Edinburgh, 1891), who discusses the Psalter of Solomon, the Book of Enoch, the Assumption of Moses, the Apocalypse of Baruch, the Testaments of the Twelve Patriarchs, the Book of Jubilees, the Ascension of Isaiah, and the Sibylline Oracles, and by J. E. H. Thomson, *Books which Influenced our Lord and his Apostles, being a Critical Review of Apocalyptic Literature* (Edinburgh, 1891), which is a study of the Book of Enoch, the addition to Daniel, the Apocalypse of Baruch, the Psalter of Solomon, the Book of Jubilees, and the Assumption of Moses. Of many pseudepigraphical works we know only the names. (See list in Migne, l. c.) The better and fuller known may be divided into—

A. *Liturgical Writings.* (1) *The Psalms of Solomon*, eighteen psalms of a Messianic character, dating about 75-63 B. C., designed to cheer the drooping hopes of the Jews. The place of composition is Palestine, and the language was Hebrew. They throw much light upon the Pharisee opinion in the time of Christ. Best edition, with English translation, by H. E. Ryle and M. R. James, *Psalms of the Pharisees, commonly called the Psalms of Solomon* (Cambridge, 1891).

B. *Prophetical Writings.*—(1) Numerous apocalypses in the general style of the genuine prophets, and, like their writings, giving a picture of the future greatness of Israel. Of these may be mentioned (2) *The Book of Enoch*, particularly noteworthy because quoted by Jude (vv. 14, 15) and frequently in the Christian Fathers. (3) *The Assumption of Moses*. Latin translation in Fritzsche, l. c. (4) *Fourth* (or *Second*) *Esdras* is found among the Apocrypha of the English Bible, but has no proper place there. It dates from the time of Domitian (close of the first century), and consists of seven visions in the style of Daniel. English translation in the Apocrypha, revised by Bissell, l. c. (pp. 641-664). Cf. R. L. Bensly, *The Missing Fragment of the Latin Translation of the Fourth Book of Ezra, Discovered and Edited with an Introduction and Notes* (Cambridge, 1875). Its general purport was to foretell that the Romans would be overthrown. It was written in Greek, but by a Jew. (5) *The Apocalypse of Baruch*. Cf. J. J. Kneucker, *Das Buch Baruch* (Leipzig, 1879). It was written in Greek and in Palestine by a Jew soon after the destruction of Jerusalem by Titus. In it Baruch so completely supplants Jeremiah that God makes to him the revelation of the future and the consolatory speeches. It closes with a letter to the nine and a half tribes in the Babylonian captivity. It was apparently used by PAPIAS (q. v.), but not much known in the early Church. (6) *The Rest of the Words of Baruch*. Cf. edition by J. Rendel Harris (Cambridge, 1890); not the same as the preceding, though similar. It closes with an account of Jeremiah's martyrdom, caused by his persistence in praising Jesus as the Son of God. This fact marks it as a Christian apocalypse, at least in its present form. It is dated by Harris in 136 A. D. (7) *The Ascension of Isaiah*, an account of what Isaiah saw as he was being borne to the seventh heaven, dating from the first Christian century, and essentially a Jewish apocalypse with Christian additions and interpolations. From it comes the patristic references to the alleged fact that Isaiah was martyred by being sawn asunder. There is a Latin translation by A. Dillmann (Leipzig, 1877), and an English translation by G. H. Schodde in the *Lutheran Quarterly* for Oct., 1878.

C. *Testaments or Wills.*—(8) *The Testaments of the Twelve Patriarchs*, English translation by R. Sinkler, in *The Ante-Nicene Fathers* (New York, vol. viii., 1-38). It is the supposed utterances of the twelve sons of Jacob, and is a tissue of moral precepts, prophecies, especially of the Messiah, and various facts about themselves. It was written in Greek in the second century by a Jewish Christian. (9) *The Testament of Abraham*. Greek text, for the first time edited with introduction and notes, by M. R. James, with an appendix, containing extracts from the Arabic version of the Testaments of Abraham, Isaac, and Jacob, by W. E. Barnes (Cambridge, 1892). It was known to the early Church, and apparently popular. It has come down in two forms, but may be dated from the second Christian century. It purports to give the sights seen by Abraham in the future world. Perhaps the most remarkable single trait is Abraham's flat refusal to die when God requests him to do so, and the pains God took to overcome his aversion. (10) *The Testaments of Abraham, Isaac, and Jacob* (see just above). That of Abraham is similar to the one just noticed. The Testament of

Isaac is an account of the death of Isaac and the ethical discourse which preceded it, and of the experiences in the future world which followed it. Of the same nature is the Testament of Jacob.

D. *Historic and Haggadic Literature*, or tendency writings on the basis of genuine canonical Scriptures. (11) *The Book of Jubilees*, or *Little Genesis*, essentially the history of the chosen people down to Sinai, as contained in Genesis and the first part of Exodus, with legendary and haggadic additions, written originally in Aramaic by a Jew in Palestine in the first Christian century. It pretends to be revelations made to Moses on Mt. Sinai. In complete form it only exists in Ethiopic, in which language it was edited by A. Dillmann in Ewald's *Jahrbücher der biblischen Wissenschaft* (1849-51). There is an English translation by R. H. Charles, in the *Jewish Quarterly Review* (1893, *seq.*), and another by G. H. Schodde (Oberlin, 1888). Cf. H. Rönisch, *Das Buch der Jubiläen* (Leipzig, 1874). (12) *The Book of Adam and Eve*, also called *The Conflict of Adam and Eve with Satan*, probably written in Arabia by an Egyptian Christian, perhaps as late as the fifth century. It goes over the history as given in Genesis, down to the call of Abraham, with much haggadic matter of an interesting character. There is an English translation by S. C. Malan from the Ethiopic text as edited by E. Trumpp (London, 1882). (13) *Life of Adam and Eve*, in Latin, edited by W. Meyer (*Vita Adæ et Evæ*, Munich, 1879). It gives in rather an interesting manner an account of the adventures of the pair after their expulsion from paradise, the difficulties they had to get food, their journeys, etc. (14) *The Testament of Adam*, edited and translated into German by C. Bezold, *Die Schatzhöhle* (Leipzig, 1883-88, 2 parts). (15) To the same general class belong *The Sibylline Oracles*, a collection of pseudoeptigraphical poems of various dates, written in hexameters in Greek, studied imitations of Homer in meter and diction. The oldest part is the third book, which was apparently produced in Alexandria by some Jew of the second pre-Christian century who worked up current fragments of the old Greek and Latin Sibylline books for the purpose of the Jewish propaganda. But the present work, in twelve books, contains pagan and Christian elements, and is from the second or third Christian century. It was much quoted by the early Fathers as inspired, particularly its allusions to the advent of Christ, which they took to be prophetic. In contents it combines history and prophesy, rebukes heathen idolatry, and exhorts to repentance before it is too late. It was lost to sight during the Middle Ages, but regained and first printed at Basel in 1545. The best editions are by C. Alexandre (2d ed. Paris, 1869) and Aloisius Rzach (Vienna, 1891). There is an English translation by M. S. Terry (New York, 1890).

II. APOCRYPHA OF THE NEW TESTAMENT.—Unlike the Old Testament Apocrypha, the New Testament Apocrypha have never had a place in the canon. They are also of decidedly minor importance. The most of them are found collected in English trans. in vol. viii. of *The Ante-Nicene Fathers*, ed. Cox (New York, pp. 349-598), and are divisible into A. Gospels; B. Acts of the Apostles; C. Apocalypses; D. Epistles; E. Apostolic Liturgies; F. Didactic; G. Apostolical Canons and Constitutions; H. Apostolic Church Directory. The best editions of the original texts are those of J. A. Fabricius (2d ed. Hamburg, 1719), and by C. Tischendorf, *Acta apostolorum apocrypha* (Leipzig, 1851); *Evangelia apocrypha* (1854); *Apocalypses apocryphæ* (1866).

A. *Gospels*.—(1) "The Protevangelium of James the Lord's brother," or "the birth of Mary the holy mother of God, and very glorious mother of Jesus Christ." It gives an account of the conception, birth, and infancy of Mary and the same facts concerning her son. (2) "The Gospel of Pseudo-Matthew." It has substantially the same matter as the preceding by way of introduction, but contains an account of the flight into Egypt, and of the youth of Jesus full of miracles. (3) "The Gospel of the Nativity of Marv." It includes the betrothal of Mary and the conception. (4) "The history of Joseph the carpenter." It is supposed to be told by Jesus Christ, and mostly relates to the death of Joseph. (5) "The Gospel of Thomas": confined to the childhood and youth of Jesus, and a tissue of miracles. (6) "The Arabic gospel of the infancy of the Saviour." (7) "The Gospel of Nicodemus": Part i., the acts of Pilate—the events of the Passion; part ii., the descent of Christ into hades. (8) "The letter of Pontius Pilate" which he wrote to the Roman emperor concerning our Lord Jesus Christ. (9) "The report of Pilate the procurator concerning our Lord Jesus Christ," sent to Augustus Cæsar in Rome. Two Greek forms are extant.

(10) "The giving up of Pontius Pilate"—i. e. an account of his alleged arrest and transportation to Rome by the Cæsar as a punishment for the "darkness and the earthquake which had come over the whole world" after the death of Jesus. Pilate shifts the blame of the deed upon the Jews, is, however, beheaded, but not before a heavenly voice assured him that all the generations and families of the nations would count him blessed, because under him had been fulfilled the things prophesied of Christ. (11) "The death of Pilate, who condemned Jesus." In contradiction of the preceding, this Apocrypha attributes Pilate's death to suicide, and tells how malignant spirits forced the transportation of the body from Rome to Lausanne. It is a late production. (12) "The narrative of Joseph of Arimathea, that begged the Lord's body; in which also he brings in the cases of the two robbers." One of the most popular Apocrypha, limited in time to the death day of Jesus. (13) "The avenging of the Saviour." This is a combination of two distinct legends—the embassy of Nathan from Judæa to the Emperor Tiberius to carry the treaty of the Jews to Rome and the story of Veronica. (14) "The Gospel of Peter." A fragment of it, in Greek, was discovered by Ulysse Bouriant in a tomb at Akhmim, Upper Egypt, in 1886, but not published till 1892. It relates only to the passion and resurrection history. It is one of the best of the apocryphal gospels, and was believed in the early Church to be authentic. The original text has been edited by several scholars—e. g. Adolf Harnack (Leipzig, 1893), J. Armitage Robinson and M. R. James (London, 2d ed. 1892), H. von Schubert (Eng. trans. Edinburgh, 1893). English translations are given by the last two.

B. *Acts of the Apostles*.—There exist Acts of Peter and Paul, Paul and Thekla, Barnabas, Philip, Philip in Hellas, Andrew, Andrew and Matthias, Matthew, Thomas, Thaddeus, John, Consummation of Thomas, Martyrdom of Bartholomew.

C. *Apocalypses*.—There exist Apocalypses of Paul, John, and Peter. The last was found in the same MS. which contained the Gospel of Peter, mentioned above. It is the merest fragment, but revolting in its gross conception of the future world. There is also an apocalypse entitled "The Book of John concerning the Falling Asleep of Mary" and another on the "Passing of Mary."

D. *Epistles*.—(1) One by Jesus in reply to Abgarus, King of Edessa, who wanted Jesus to come and cure him. It is given by Eusebius, *Church History*, i., 13 (Am. trans. ed. McGiffert, pp. 100, 101). Jesus promises after his ascension to send one of his disciples to heal the king. In the "Acts of Thaddeus" the correspondence is alluded to, and there is added that Jesus sent Abgarus his portrait miraculously stamped upon a towel. Cf. R. A. Lipsius, *Die edessenische Abgarsage kritisch untersucht* (Brunswick, 1880). (2) Three by the Virgin Mary—viz., to Ignatius, urging him to constancy; to the Messinians of Sicily conveying a blessing; and to the Florentines an exhortation to faith, prayer, and patience. These epistles are of the briefest, being only 11, 17, and 5 lines long respectively in the annotated edition of Fabricius, *Codex Apocryphus N. T.*, 2d ed., pp. 834-852. (3) A letter of Paul to the Laodiceans (Fabricius, *l. c.*, 873-879), another to the Corinthians (*id.*, 918, *seq.*), and the famous correspondence with Seneca—six letters of Paul and eight of Seneca. Cf. Teubner, ed. of Seneca, by F. Haase (Leipzig, 1872-74, vol. iii.), and Fabricius, *id.*, 880-904. The best discussion of the matter is by J. B. Lightfoot, *Com. on Philippians*. The genuineness of the correspondence was widely accepted from very early times, but it is now considered a clumsy forgery. (See for text and discussion also, E. Westerburg, *Der Ursprung der Sage, dass Seneca Christ gewesen sei*, Berlin, 1881.) (4) A letter of Peter to James (Fabricius, *id.*, 907-913), in which among other things secrecy is enjoined upon him as respects his preaching. (5) A letter of John in reply to a dropsical man who had asked him to heal him, or rather a single sentence, ordering in the name of the Trinity a cure. This was wrought on receipt of the letter, and the man out of gratitude sought John and was baptized. Cf. Fabricius, *id.*, 926-928. There are other similar forgeries known by title. By far the most elaborate publication upon the whole subject of these apocryphal remains of the apostles was produced by Richard Adelbert Lipsius, *Die apocryphen Apostelgeschichten und Apostellegenden* (Brunswick, vol. i., 1883; vol. ii., 1st part, 1887; vol. ii., 2d part, 1884 (*sic*); supplement, 1890).

E. *Apostolic Liturgies*.—These are alleged to be the work of Mark, James, and the blessed apostles collectively. They are translated into English in *The Ante-Nicene Fathers* (New

York, vol. vii., 529-572). Another liturgy is attributed to the apostles in the Apostolical Constitutions, *id.*, pp. 470, *seq.*

F. Didache, or *The Teaching of the Twelve Apostles*.—Found by Bryennios in 1873, but not published till 1883. It is one of the earliest Apocrypha and the most respectable. It doubtless embodies much genuine apostolic teaching, and throws welcome light upon the primitive Church usages. It is one of the most precious relics of the post-apostolic age. The best edition in English, with translation and notes, is by Philip Schaff, *The Oldest Church Manual* (New York, 1885; 3d ed. 1889).

G. Apostolic Canons and Constitutions.—See APOSTOLIC CANONS AND CONSTITUTIONS. Edg. IRMS, in *The Anti-Nicene Fathers* (New York, vol. vii., pp. 387-508).

H. Apostolic Church Directory, independent of, yet similar to, the seventh and eighth books of the Apostolic Constitutions. Greek text and German trans. by J. W. Bickell, *Geschichte des Kirchenrechts* (Giessen, 1843, pp. 107-132).

SAMUEL MACAULEY JACKSON.

Pseudo-Clementines: See CLEMENTINES.

Pseudo-erysipelas: See PHLEGMASIA.

Pseudo-Isidorian Canons: See DECRETALS, FALSE.

Pseudoneuroptera [Mod. Lat., from Gr. *ψευδής*, false + Mod. Lat. *Neuroptera*, an order of insects]: a group of insects, recognized by some entomologists, which contains the dragon-flies, day-flies, and stone-flies. See ODONATA and PLECOPTERA; also ENTOMOLOGY.

Pseudopodia [plural of *pseudopodium*, Mod. Lat., from Gr. *ψευδής*, false + *πούς, ποδός*, foot]: the temporary variously shaped processes given off from the body-substance of various protozoans, as amebas and foraminifers, and serving for locomotion, ingestion, etc. See CILIA.

Pseudoscorpion [Mod. Lat., from Gr. *ψευδής*, false + *σκορπιος*, scorpion]: a group of arachnids or spider-like animals which resemble the scorpions in the general shape of the body, the segmentation of the abdomen, and the large pincer-like first pair of legs, but which differ from them in the absence of pectines, tail (see SCORPIONES), and terminal poison-stings, as well as in the possession of a tracheal respiratory system. All of the species are small and are to be sought in dry places—under bark and among moss and some among old books and papers. They appear to feed upon mites and small insects, and are occasionally found adhering to flies, bees, etc., and in this way they are carried from place to place. The order first appears in the Carboniferous. Some sixteen species are described from the U. S. See Hagen, *Proceedings of the Boston Society of Natural History*, xiii., 1870.

J. S. KINGSLEY.

Pseudotsuga: a genus of coniferous trees established by Carrière in 1867, closely related to the firs (*Abies*) and the hemlocks (*Tsuga*), but differing from the former by having pendulous cones whose scales are persistent, and from the latter by having smooth branchlets after the fall of the leaves. Only one species is known, *P. taxifolia*, the Douglas spruce, mostly known in books and catalogues as *P. douglasii*. It is a gigantic tree of the Oregon, California, and Rocky Mountain region, 200 to 300 feet high, and 8 to 15 feet in diameter. See CONIFERS. CHARLES E. BESSEY.

Psittaci [Lat. *psittacus* = Gr. *ψιττακός*, parrot]: an order of birds containing the parrots (see PARROT), characterized by a hooked and cored beak movably articulated with the braincase, a strong lower jaw, and by having the outer toe turned backward. The tongue is thick, fleshy, and sometimes brushy; the number of primaries and tail-feathers is ten. The furculum is weak, imperfect, or absent. The order is divided into from one to nine families; but a good division is into three families, *Psittacidae*, the true parrots, *Stringopidae*, owl-parrots, and *Cacatuidæ*, cockatoos. F. A. LUCAS.

Pskov, or **Pskoff**: government of European Russia; bounded N. by the governments of St. Petersburg and Novgorod. Area, 17,969 sq. miles. The surface is mostly flat, abounding in small lakes and rivers; marshes are numerous, forests extensive. Agriculture is almost the only branch of industry, with the exception of cattle-rearing; hemp and flax are staple products. Pop. (1890) 1,019,000.

Pskov, or **Pleskov**: capital of the government of Pskov, Russia; 160 miles S. S. W. of St. Petersburg (see map of Russia, ref. 6-C); 9 miles N. W. is Lake Pskov, 50 miles long by 13 broad. Pskov is the see of an archbishop, and has a cathedral, numerous churches, and considerable manufactures, and a trade in fish and flax. Pop. (1890) 23,488.

Psocidæ [Mod. Lat., from Gr. *ψάχειν*, rub to pieces]: a family of insects, the sole representatives of the order *Corrodentia*. They are small forms with incomplete metamorphosis, with biting jaws, sometimes without wings, but when these are present, having the fore wings the larger. All of the species feed on dry vegetable matter, and several species (winged) occur on many of the forest trees of the U. S. through the summer. Among the wingless forms are the so-called book-lice, minute light-colored forms occurring in neglected books, etc., where they may do considerable damage.

J. S. KINGSLEY.

Psophi'idæ [Mod. Lat., named from *Psophia*, the typical genus, from Gr. *ψόφος*, an inarticulate noise]: a family of birds represented by the trumpeters of South America. The form is heron-like; the neck comparatively short; the bill short, compressed, and curved toward the tip, which is prolonged over the lower mandible; the nostrils inserted in a membranous groove, large and oblique; the wings short, concave, and rounded; the tail very short, the tarsi long and slender, covered with transverse scales; the toes moderate, the three in front united at the base, the hind one small and somewhat elevated; the claws curved and acute. Only a single genus is known (*Psophia*), containing five species, found in various parts of Brazil and the northern portions of South America.

Revised by F. A. LUCAS.

Psori'asis [Mod. Lat., from Gr. *ψωρίασις*, itch, deriv. of *ψώρα*, itch, scurvy, mange]: a skin disease in which there are at first elevated red patches upon which large scales of epidermis appear, the skin between the patches often cracking and bleeding. There are many varieties distinguished by writers, but, except in the case of the syphilitic diseases called psoriasis, the causes are very obscure. There seems to be some connection between psoriasis and the rheumatic habit or chronic rheumatism. Fortunately, syphilitic psoriasis can often be distinguished from true psoriasis. For the former the appropriate remedies for the specific disease are to be employed. For the latter the best treatment appears to be the use of vapor-baths, followed by strong alkaline applications, and then by tarry ones, with the internal administration of arsenic. These means will very much mitigate, but will scarcely cure, the disease, which tends to linger, relapse, and become chronic.

Revised by W. PEPPLER.

Pso'rosperms [from Gr. *ψωρός*, scab (in allusion to the sores they make on fishes) + *σπέρμα*, seed]: parasitic protozoa, allied to the GREGARINIA (*q. v.*), which occur on and in fishes, where they make sores or cysts, and at times are so numerous as to cause extensive mortality.

Psyche, sī'kē [= Lat. = Gr. *ψυχή*, liter., soul]: in a Greek legend preserved by Apuleius, a lovely mortal, the daughter of a king. Venus was jealous of her beauty, and ordered Cupid, her son, to inspire Psyche with desire for the basest of men, but the god of love, on beholding her, himself loved her. Thenceforth he visited her every night, requesting her never to see him or inquire who he was. But from curiosity, and the dread lest he should prove to be a monster, as her sisters told her he was, she came to him with a lighted lamp while he slept. Overcome with joy at his loveliness, she carelessly allowed a drop of hot oil from her lamp to fall upon his arm. Cupid therefore left her with reproaches. After many calamities she became the menial slave of the jealous Venus, who treated her with great cruelty; but her lover invisibly assisted her, and finally, having secured her immortality, made her his wife. The myth is plainly allegorical, and is a figure of the progress of the soul, by the aid of divine love, through the calamities of this life to a happier life hereafter. In art she is represented as a tender virgin with the wings of a butterfly, or as a butterfly itself, for the word *ψυχή* means butterfly as well as soul. The group of Psyche and Cupid in the Capitoline Museum is greatly admired for its beauty, as is also that of Canova.

Revised by J. R. S. STERRETT.

Psychology [Gr. *ψυχή*, soul, mind + *λόγος*, discourse, reason]: the science of the mind.

Historical.—Modern psychology has had its principal development in Great Britain, Germany, and France. Germany has undoubtedly had greatest influence in this movement considered in all its branches. The two main currents of development previous to the rise of the new so-called "scientific" psychology, designated as respectively "speculative" and "empirical," had their initial impulse, as well as their fruitful pursuit, respectively in Germany and

Great Britain. German psychology down to the rise of the Herbartian movement was a chapter of deductions from speculative principles. English psychology was a detailed analysis of the experiences of the individual consciousness. Kant, Fichte, and Hegel may sufficiently represent the succession in Germany; James Mill, John Stuart Mill, Hume, Reid, and Bain, that in Great Britain.

The work of Herbart and his school tended to bring a more empirical treatment into German thought, and its significance was twofold. It excited opposition to the speculative method; and it prepared the Germans for the results of English analysis. It is, further, a legitimate supposition that the spirit of experimental inquiry which has swept over Germany in the nineteenth century was made more easily assimilable by workers in this department, also, by the patient and extraordinary attempt of Herbart to construct a "mechanic" and "static" of mind in his *Psychologie als Wissenschaft* (1824).

To German thinkers also belongs the credit which is due to originators of all new movements which show their vitality by growth and reproduction, in that the experimental treatment of the mind was first advocated and initiated in Germany. This is treated of more fully below.

The contribution of France to psychology has been decidedly of less importance, yet the work of these writers has also illustrated a fruitful and productive movement. It has been from the side of medicine that French work has influenced current widespread conceptions of consciousness. Mental pathology and the lessons of it for the theory of the mind have come possibly most of all from France, or at any rate—not to disparage the admirable recent work of English and German investigators—the tendency, so to speak, of the French treatment of consciousness has been to approach mental operations from the abnormal side.

In the U. S. the influences which have tended to control psychological opinion have been mainly theological on one side and educational on the other. The absence of great native systems of speculative thought has prevented at once the rationalistic invasions into theology which characterized the German development, and the attempts at psychological interpretation which furnished a supposed basis of fact to the idealistic systems. In Germany various "philosophies of nature" sought to find even in objective science support for theoretical world-dialectic, and psychology fared even worse, since it is, *par excellence*, the theater for the exploitation of universal hypotheses; but in the U. S. men did not speculate much, and those who did were theologians. So, naturally, the psychologists were theologians also. Jonathan Edwards had a doctrine of the agent, because free will was a question of theology.

The educational influence was auxiliary merely to the theological. The absence of large universities with chairs for research; the nature of the educational foundations which did exist under denomination control; the aim of education as conceived in the centers where the necessity for supplying growing towns with pastors was urgent; the wholesome fact for civilization that the Puritans had traditions in favor of the school and the religious school—all these things made it only necessary that books sound in their theological bearings, or affording homiletic lessons in living, should be written in a topic of such central importance. Even the term "psychology" is only now becoming domesticated; "mental" and "moral" philosophy were the titles of courses of instruction on the "soul."

The type of philosophy which these conditions encouraged was, it may easily be imagined, realistic; and it is probably for the reasons which have been indicated that the Scottish natural realism was the North American type of thought, and is now, except in the great university centers where systematic philosophy has become an end in itself, apart from its duty to theology and education. As far as psychology was concerned, this realistic tendency was a great good. It led to a magnification of mental reality, to a reverence for the "utterances of consciousness," to a realistic interpretation of the "immediate knowledge of self," to a firm settling of the great "intuitions," cause, time, space, God, etc.; and in as far as this led to the direct examination of consciousness and to the testing of philosophical claims by consciousness, it prepared the way for a better and broader method. This tendency is marked even in the more influential works in theology. Channing and Emerson, no less than Henry B. Smith and Charles Hodge, lay the corner-stone of argument again and again in the proof "from consciousness."

This tendency to a psychological view of philosophy and

its basis in the religious motive is seen also in Scotland, the home of realism; and it is there a part of the British method of thought which has already been spoken of. The works on psychology written in the U. S. up to 1880 were, as would be expected, from the hands of theologians and educators, usually both in the same person; for it is a further proof of the association of psychology and theology that the mental and moral philosophy in the colleges was almost without exception put in the hands of the president of the college, and he was by unanimous requirement a preacher. Edwards's *Freedom of the Will* (1754); Tappan's *Review of Edwards* (1839) and *Doctrine of the Will Determined by an Appeal to Consciousness* (1840); Hickok's *Rational Psychology* (1848) and *Empirical Psychology* (1854); Porter's *Human Intellect* (1868) and *Moral Science* (1885); McCosh's *Psychology* (1887) and *First and Fundamental Truths* (1889)—these and similar books, all works of the highest value, show the psychology of the U. S. up to about 1880.

Coming to the present state of psychological thought, the writer's task is made easier by reason of the divorce which has been forced between psychology as a science on the one hand and metaphysics on the other. As was said above, Herbart, while failing in his attempt to apply mathematics to mental "permutations and combinations," yet prepared the way for a new treatment of mental phenomena. After his attempt it began to be seen that the facts of conscious life were first in order of importance, and were capable of treatment in a detailed way quite independently of the questions of Being, the Absolute, and the like. The works of Volkmann, *Lehrbuch der Psychologie* (4th ed. 1894), and Lipps, *Die Grundthatsachen des Seelenlebens* (1883), illustrate this.

This was only to begin to do what had been doing in England since Locke; but the Germans went further: they asked the question—which had been groped upon before by Descartes, by Leibnitz, and by Reid—how can psychology be a science when one of the evident conditions of the flow of mental states, of their integrity and their trustworthiness, the brain, is left quite out of account? What is the law of connection of mind and brain? Is it possible to modify the brain and so to modify the mind? If so, then that great instrument of scientific work, experiment, may perform a part for the psychologist, also, and his resources be magnificently enlarged. This is the question of experimental psychology. It was answered in Germany in the affirmative. Lotze, in the author's view, deserves the credit of it; and Wundt is the founder of the science in the sense that he first realized the expectations of Lotze's genius by actually planning and executing experiments on a large scale, which made the affirmative answer an irreversible fact of history. Lotze's *Medicinische Psychologie* appeared in 1852, Wundt's *Grundzüge der physiologischen Psychologie* in 1863. Between the two came Fechner, whose theoretical construction of the new work and its methods shows all the exactness of treatment of similar discussions of natural-science principles by electricians and chemists, and published the formulas in which he attempted to give universal statement to the discoveries of E. H. Weber on the intensity of sensation-states. Fechner's *Elemente der Psychophysik* appeared in 1860. Apart from the actual development of this new method—a point to be spoken of later on—it has profoundly modified the general conception of psychology, even where its validity as a method has been denied. There has been nothing less than a revolution in the conception of psychology since the publication of the works just named. One of the motives of this revolution came thus from Germany. The other—for it has two great phases—is due to English thinkers, the evolutionists, of whom Herbert Spencer (*Principles of Psychology*, 1855) is the chief. These two influences are seen in two great points of contrast, easily made out between the psychology of to-day and that of yesterday in the U. S. The two main characteristics of the latter, for purposes of the present contrast, are, first, its character as so-called "faculty-psychology," and, second, its character as holding to what may be called a "ready-made" view of consciousness—technically an "intuition" view of consciousness. In opposition to these characters, current psychology is "functional," holding to mental functions rather than to mental faculties; and finds this function to be genetic rather than intuitive—the functions "grow" instead of being "ready-made."

The old conception of "faculties" made the different phases of mental process in large measure distinct from one another. Its earliest and most defensible statement was by Aristotle. Memory was a "faculty," a "power" of the

mind; thought was another, imagination a third. The new functional conception asks how the mind as a whole acts, and how this one form of activity adapts itself to the different elements of material which it finds available. The old terms "memory," "thought," etc., are retained; but with the distinct understanding that they do not stand for divisions in the mind, or different processes, one of which may be held in reserve when another is acting, etc. On the contrary, the process in consciousness is one, and it is a psycho-physical process as well. The particular way in which this one function shows itself is a matter of adaptation to the changing conditions under which the activity is brought about. This transition is due in part also to the insight of Herbart and to the demand for unity insisted upon by the evolutionists. The other point of contrast is equally plain. The "genetic" point of view, in current discussion, is opposed to the older "intuitive" point of view. The mind is looked upon as having grown to be what it is both as respects the growth of the man from the child and as respects the place of man in the scale of conscious existences. The understanding of mental facts is sought in the comprehension of their origin as well as their nature; and the question of the validity or worth of "intuitive" beliefs in consciousness is subordinated to the question as to how the mind came to have such beliefs. Both of these points of contrast have been further defined by the progress of general philosophy in the U. S. The demand for unity in mental interpretation has not come from naturalistic evolution alone (John Fiske, *Outlines of Cosmic Philosophy*, 1874; Thompson, *System of Psychology*, 1884); an equally pressing demand has come from idealistic metaphysics, which seeks for continuity in the natural series as zealously as does the advocate of evolution. The influence of Hegel, as interpreted in the works of Green of Oxford, and later in those of Edward Caird, has been potent in effecting this transformation. It is easy to see also that the same union of forces is quite feasible as respects the genetic development of consciousness, although the new idealists have not done justice to this growing tendency in modern psychology.

The line of cleavage, in the current discussions of general psychology, is drawn on the question of the interpretation of mental "function," both sides claiming the same full liberty of genetic research and the same resources of analysis and experiment. The "associationists," on one hand, carrying on the tradition of the British empiricists, construe mental function after analogy with the ordinary interplay of forces in the objective world; the "apperceptionists," on the other hand, hold that mental function is a form of irreducible cosmic process. Apart from original monographs on special topics, no work on psychology to-day commands much attention, either from psychologists or from students of philosophy, which does not show itself alive to this main issue. In the U. S. the works of Lotze and Wundt have had great influence in the direction of this general statement of the problems of psychology, and it is especially the philosophy of Lotze which is replacing by a reasoned and critical realism the earlier theological dogmatic view so long prevalent in the U. S. by inheritance from Scotland.

On the literature of present-day psychology the following passage is translated from a German work, itself fully representative of the state of knowledge, *Grundriss der Psychologie*, by Prof. O. Külpe, of the University of Leipzig (pp. 27, ff.): "About the middle of the nineteenth century experimental and psycho-physical psychology began its course in Germany. While Herbart recognized a threefold influence of the body upon the mind . . . it was Lotze who made a thorough beginning in the employment of the data of physiology. Lotze, indeed, began his work with certain metaphysical expositions after the manner of the older German writers, and is very far from the recognition of a universal psycho-physical parallelism; but he does not hesitate to speak of the nervous conditions of mental processes, and he had the good fortune to suggest hypotheses of value where exact knowledge was wanting. The real foundation of experimental psychology was laid, however, by G. T. Fechner, who sought to carry out in a thorough-going way the conception of a functional relation between mental and physical processes. Although the mathematical form which he gave to this relation does not hold, yet he gave to the exact science of psychology an extraordinary impulse by reason of the new conceptions which he introduced, the methods of procedure which he both formulated and applied, the working over which he gave the material he had in hand, and the observations and researches which he himself

carried out. . . . The union of the experimental and psycho-physical was finally accomplished by Wilhelm Wundt . . . in his classical *Grundzüge der Psychologie* (1874; 4th ed. 1893). By this unity of conception and his comprehensive treatment of all mental phenomena . . . he has made the current phrase 'modern psychology' applicable. . . . Wundt gave a further important impulse to the cultivation of experimental psychology by founding the laboratory in Leipzig in 1879, and establishing the *Philosophische Studien*, a journal devoted mainly to the publication of researches in his institute.

"Additional works may be mentioned of very recent date which must be reckoned in their character as belonging to the modern psychology thus founded by Wundt, although they differ more or less essentially in system and in theory from him and from one another: Höfding, *Psychologie in Umrissen* (2d ed. 1893; German trans. from the Danish; English trans., 1891); Ladd, *Elements of Physiological Psychology* (1887; Sergi, *La Psicologia Physiologica* (trans. from the Italian); W. James, *The Principles of Psychology* (1890); Ziehen, *Lehrbuch der physiologischen Psychologie* (1891; Eng. trans., 2d ed. 1894); Baldwin, *Handbook of Psychology* (2d ed., 1891; 1st ed. 1889-90); J. Sully, *The Human Mind* (1892)."

It will be seen that of the seven works thus cited by Külpe three are by U. S. writers, and to them must be added *Psychology: Descriptive and Explanatory* (1894), by George T. Ladd, and the journal, *The Psychological Review*, edited by J. McK. Cattell and J. Mark Baldwin (vol. i., 1894). Another important French work of recent date is *La Psychologie des Idées-Forces*, by A. Fouillée (1893). Other important contributions to experimental psychology—apart from the long series of monographs and research articles published in Germany and the U. S.—are Helmholtz, *Physiologische Optik* (1867; French trans., 2d ed. 1890, ff.) and *Tonempfindungen* (1863; English trans.); Stumpf, *Tonpsychologie* (1883, 1890); and Münsterberg, *Beiträge zur Experimentellen Psychologie* (parts i.-iv., 1889-93).

The contribution from the side of mental pathology has become important on account of the *rapprochement* which has obtained in recent years between the alienist and the psychologist. The works of Pierre Janet, *Automatisme psychologique* (1889) and *L'État mental des Hystériques* (1892-93); and of Bernheim, *Suggestive Therapeutics* (English trans., 1889) and *Études de la Suggestion* (1892), are most important. To them should be added the works of Ribot, *Diseases of the Will* (English trans.; 5th French ed. 1889); *Diseases of Memory* (English trans.; 5th French ed. 1888); *Diseases of Personality* (2d ed. 1888; English trans. 1891), together with the many original contributions on the subject of hypnotism and aberrations of personality published in the *Revue Philosophique*, edited by T. Ribot (vols. i.-xxxvii., 1876, ff.), and summed up in part in *Les Altérations de la Personnalité* (1893), of A. Binet.

Further, the treatment of psychology, in accordance with the British tradition, from the point of view of description and analysis, has been carried forward by Ward in the article *Psychology* in the *Encyclopædia Britannica*, 9th ed. This type of research has also had its organ of publication in *Mind: a Journal of Psychology and Philosophy*, edited by G. Croom Robertson (vols. i.-xvi., 1876, ff.) and by G. F. Stout (new series, vols. i.-iii., 1892, ff.).

Finally, the genetic treatment of consciousness has been advanced by the works of Spencer, *Principles of Psychology* (1855; 3d ed. 1880); Romanes, *The Origin of Human Faculty* (1884-88); Morgan, *Animal Life and Intelligence* (1891); and Galton, *Inquiries into Human Faculty* (1883) and *Natural Inheritance* (1889).

Experimental Psychology.—The present age is the age of science because it is the age of devotion to science and of the results in science. But it is a very different thing to say that this is the age of scientific method. Former ages have seen devotion to science and results in science, but no former age has, as an age, realized a scientific method. In general philosophy what has been called scientific method is better known, as has been said above, in a twofold way—as empirical and critical. Retrospectively, what we have to rejoice at in philosophy is due about equally to two traditions, represented by Hume and Kant. The burden of current idealism, as far as it is worthy of consideration in our time, is to purify and conserve the work of Kant; and the burden of empiricism, under the same restriction, is to refute Kant with the only weapons which he himself considered of worthy temper. The battle is drawn at these close

quarters, and round them both is thrown a common ring of scientific procedure.

In psychology the modern transformation comes most strongly out. Here we find an actual department of knowledge handed over to a new class of men for treatment, so remarkable is the demand for scientific method. It is no longer sufficient that a psychologist should be familiar with general philosophy and its history or capable of acute logical criticism of systems; it is necessary, if he would deal successfully with the new problems and gain the ear of the advanced philosophical public, that he should reason from a basis of fact and by an inductive procedure. In short, he must not bring his philosophy as speculation into psychology, but must carry his psychology as fact in its connection with physiology, ethnology, etc., into general philosophy. To illustrate this change and its effects on general theories, recent discussions of the idea of space may be cited in comparison with its earlier and more speculative treatment. The reasoning of James, Wundt, Bain, and Spencer differs so essentially from the argumentation of Kant and earlier men that it is almost impossible to find common ground between them. No one among those who accept Kant's results depends, in our day, very largely upon his reasons; the question is shifted to another field. The physiologist has as much to say about it as the psychologist, and the speculative philosopher must recognize them both. This tendency in philosophy may be expressed by a chemical figure as a "precipitating" tendency. We are endeavoring, and successfully, too, to throw all questions which are capable of such treatment to the bottom as a precipitate—a psychological precipitate—and are then handing them over to the psychologist for positive treatment. As long as the data remained in a solution of ninety parts water (which, being interpreted, means speculation) it was difficult to handle them scientifically. While admitting the utility and necessity of ontology in its place, psychology claims that its place must be better defined than formerly, and that whenever a sediment, a residuum, a deposit, apart from a speculative solvent, can be secured, this is so much gain to positive science and to truth.

One of the ideas which lie at the bottom of the so-called new psychology, therefore, is the idea of *measurement*. Measurement (determination in quantity and time) is the resource of all developed science, and as long as such a resource was denied to the psychologist he was called a scientist only in his function of description and classification; not in the more important functions of explanation and construction. And the justification of the application of measurement to psychological facts has come, not from theoretical considerations—for they were all opposed, and still are in many of the books of the new idealism—but from practical attempts to do what philosophy declared to be impossible; that is, experiment has been the desired and only reagent. It is true that theoretical justifications are now forthcoming of the application of experiment to consciousness, but they are suggested by the actual results, and were not in sufficient currency to hinder the influence of Kant's ultimatum, for example, that a science of psychology was impossible.

By experiment is meant experiment on the nervous system, with the accompanying modifications it occasions in consciousness. Efforts have been made in earlier times to experiment upon states of consciousness directly. Descartes deserves credit for such efforts, and for the intimation he gives us in his theory of emotions of an approach to mind through the body; but the elevation of such an approach to the place of a recognized psychological method was not possible to Descartes, Kant, or any one else who lived and theorized before the remarkable advance made in the nineteenth century in the physiology of the nervous system. Even as it is, many questions which will in the end admit of investigation from the side of the organism are in abeyance till new light is cast upon obscure processes of the brain and nerves.

A little further reflection will show us that the employment of experiment in this sphere proceeds upon two assumptions which are now generally admitted and are justified as empirical principles, at least, by the results. They are both assumptions which the physical scientist is accustomed to make in dealing with his material, and their statement is sufficient to exhibit their elementary importance, however novel they may sound to those who are accustomed to think and speak of mind as something given to us in entire independence of its organic basis. The first

of these assumptions is this: That our mental life is always and everywhere accompanied by a process of nervous change. This is seen to be necessary to any method which involves the passage of mind to body or the reverse by the interpretation of effects. Which is cause and which effect, the mental or the physical change, or whether they both are effects of an unknown cause, is immaterial; to consider such a question would be to introduce what has been called the speculative solvent. It is sufficient to know that they are always together, and that the change in one may be indicated in symbols which also represent the change in the other. The second assumption is based upon the first, viz., that this connection between mind and body is uniform. By this is meant what in general induction is called the uniformity of nature. Any relation sufficiently stable to admit of repeated experiment in the manipulation of its terms is in so far uniform. Experiment would be useless if the relation it tends to establish were not stable, since the result of such experiment would give no antecedent likelihood as to the result of others under similar circumstances. Experimental psychology, therefore, rests upon the assumption that a relation of correspondence—be it coexistence or causation—once clearly made out between a mental and a nervous modification, it must hold good under any and every repetition of the same experiment under the same conditions. These two assumptions made, we have at once the possibility of a physical approach to the facts of consciousness. The result is a relative measurement of such facts in terms of the external stimulation of the nerves, in regular and normal conditions of the activity of attention.

The need of experiment in psychology is exceedingly great. When we remember that, in the search for causes in the natural world, the difficulties are vastly enhanced by the fact that single causes are never found at work alone, and that it is the function of experiment so to eliminate elements in a causal complex that isolated agencies may be observed at work; and when we further reflect that no single function of mind is ever found operating alone, but that all accompany and modify each—the inadequacy of simple observation in this field becomes apparent. A sense-stimulation, for example, may arouse an intellectual train, an emotional outburst, a course of action; are all these the effects of a single cause? A course of action, conversely, may result from an emotion, a thought, a memory, an association, a sensation, an inspiration; can the simple description of the resulting action indicate which is its cause? Antecedents and consequents are thrown into the mental life in inextricable confusion. External or bodily causes—an odor, a spoken word, a pain, an internal organic movement—may start a train. This train may be hindered or advanced by a thousand considerations or emotions; other bodily or mental causes may modify it. And all together make up the cause or complex antecedent state; while vague analogies of thought and feeling, such as temperament, heredity, education, make variations between individuals, and the present condition of the brain and nerve centers make variations in the same individual. How can we single out the cause, in this network, by observation? It is as vain as to discover the cause of a conflagration from examining the blaze; was it a match, lightning, friction, chemical composition? Only one step can determine: The reconstruction, under artificial circumstances, of the conditions, and the endeavor to exhibit a single isolated cause. This is experiment.

Further, it is apparent that such a means of experimentation may become available either under artificial or under natural conditions, according as the nervous stimulation is due to an external excitation, or arises from some unusual condition of the organism itself. All cases of brain or nervous disease, on the one hand, offer opportunities for boundless observation, the unusual manifestations being changes due to the organic disturbances of disease. Here nature has arranged and actually performed the experiment for us, the only difficulty being the physiological one that the cerebral disturbances are as obscure as the mental states which they are used to explain. All such cases of mental changes due to internal organic changes are classed together under the name of *physiological psychology*. On the other hand, experiments may be arranged for the normal stimulation of the sense organs—skin, muscles, special senses—under artificial conditions. This is, strictly speaking, *experimental psychology*. See PSYCHO-PHYSICS, PSYCHOMETRY, MEMORY, VISION, and SENSATION, for some of the detailed results.

Physiological Psychology.—This branch of psychology includes all the matter covered by such topics as HYPNOTISM, ILLUSION, LOCALIZATION (*Cerebral*), and PHYSIOLOGY of brain and nerves). It aims to discover all the facts of the connection between mind and body, and to propound theories of the central nervous processes of thought, feeling, etc. The methods of this science are largely those of experimental physiology, the results of experiments upon living animals being the most direct aid to it. Its contributions to the welfare of man through the practical work of the brain surgeon, the oculist, the aurist, and the alienist, are of the highest importance.

Race or Folk Psychology.—The science of the mental traits of races and peoples and of the mental development of man; the study of mind in its social characteristics, and in its products in society, the state, religions, customs, and institutions. It accepts all the results of ANTHROPOLOGY (*q. v.*), and views them as the manifestations of the mind. It examines ancient philosophies, cults, and civilizations; literatures, history, laws, mythologies, traditions, the sources from which the human mind has drawn its culture in all ages. It values the reports of travelers in respect to savages, heathen, and degenerate races; the conditions of social life everywhere. For in all these manifestations of the life of the human mind we have direct information respecting its nature and capacities.

Animal or Comparative Psychology.—As might be expected, the study of animals is of extreme importance for the science; for animals show striking evidences of the phenomena of consciousness both in its lower and in many of its higher forms. It is perhaps destined, judging from the contributions it has already made to some departments of research, to throw as much light upon human psychology as comparative anatomy has upon human physiology. As is the case with many physical functions, so certain intellectual states are seen in animals in a less developed and complex state, or in a more sharpened and predominant state, than in man; and thus the necessity for a genetic study of these states is met to a greater or less degree. Instinct, for example, attains its most perfect form in animals, memory is often remarkably developed, and certain of their senses show a degree of acuteness which we would never expect the corresponding human senses to possess. And the study of animals for psychological purposes is not limited to observation of their habits, productive as such observation is; but the physiological method is capable of much more extended use than in experiment upon man. Condemned animals may be directly used for purposes of neurological research under conditions which rule out all pain to the creatures. The variety of problems which may thus be reached is limited only by our ability to state them and our ingenuity in planning the experiments. See INSTINCT, IMPULSE, and LOCALIZATION (*Cerebral*).

Infant Psychology.—The importance of the early study of mind is to be equally insisted upon. By it mental facts are reached, as far as they ever can be, at their origin and in their simplest form. It is more important to know what mind is than what it becomes. The child serves to correct the reports of adult life by opening up object lessons in the growth of mind. At the outset the child mind is lower than the highest animal mind, since, while its human possibilities have not emerged, its instinctive equipment is not as varied as that of animals; but in its rapid development it exhibits the unfoldings of organic mental growth in correspondence with the growth of the bodily system, an advantage found in none of the other fields of observation. See GENETIC PSYCHOLOGY.

Abnormal or Medical Psychology.—As in the former sources of information we deal with mind in health, here we come to consider it in disease—that is, we look to all abnormal or diseased conditions of the mental life for light upon its nature and upon its legitimate operations. It includes all cases of variation from the normal and healthy activity of conscious mind—sleep-walking, dreams, insanity in its multiplied forms, loss of memory, loss of speech, hypnotism, idiocy, hallucination, disturbances of consciousness generally. All these variations afford—as such variations in any science afford—instructive views into the working of mind in its most intimate character. And the reason for this is plain. Such cases offer immediate occasion for the application of the logical method of difference, which consists in removing part of a cause or effect and observing the consequent variations in the corresponding effect or cause. This procedure enables us to attach an effect to its true

cause. One most general result of the study of mental disease, for example, is this: that we have learned to seek its cause in diseased conditions of the body, rather than in obscure mental movements or supernatural influences. It has been well said that a man deprived of one of his senses from birth is a subject especially prepared by nature for the application of the method of difference. The science of mental disease and its cure is called *psychiatry*. See INSANITY.

Social or Collective Psychology.—This department of psychological study endeavors to investigate the mental and moral life of man in its social and collective conditions. The evident need of such subjects as sociology and criminology is the knowledge of the laws of human feelings and action when man is found in crowds, orderly or disorderly, and in organizations, legitimate or criminal. This need is felt in constructing the history of society, both by sociologists and by psychologists.

Individual or Introspective Psychology.—The older psychologists proceeded by introspection or direct observation of the events of the individual consciousness. The various branches of the experimental science now described deal rather with mind in its objective and collective aspects. It must be remembered, however, that all the results of objective psychology must have their final interpretation in terms of the consciousness of each normal man. The method of the old psychology, *internal observation*, must finally be appealed to, therefore, after all is said, for the actual confirmation of all psychological truth.

This final psychological resort, introspection or internal observation, takes on three distinct phases. In the first place, the simple fact of *consciousness*, that inner aspect which makes mental facts what they are, in its primitive form, is at once awareness of the states of self. However vague and indefinite this primitive awareness is at first, it is still a beginning. There is no experience in conscious life which leaves absolutely no trace of itself. Once it is an experience, a modification of subjectivity; then it may become the object of the developed act of inner observation. The first fleeting sensations of the child, when there is no subject or object, no store of memory images, no idea of self, exhibit in isolation the kind of primitive consciousness that lies at the basis of all knowledge of self. In adult life these experiences are assimilated to the developed forms of intellect and their separate meaning is lost. But in this category are included the vast number of first experiences as they pass steadily on in time, something every moment; and all the information we glean from them before we recall, examine, and reflect upon them. Second, the state of mind called *primary-memory*—the lingering in consciousness of an event just after the event itself is gone. The immediate past hangs around us as a line of trailing cloud on the horizon of consciousness. So speedy and involuntary is this presence of the shortly-past that it is sometimes considered the first stage of our inner observation; yet this can not be held in the sense of denying the immediate awareness of the primitive consciousness. For example, a loud noise, or a spoken word, may be unintelligible until its quick recall enables us to recognize it. We have had, in these cases, the "immediate awareness" of the first event, but the examination of the after-image which it leaves adds much to the scientific value of the experience. Third, we reach *reflection*, or conscious observation. By reflection is meant the inspection of the events of the inner world as distinct objects of our knowledge. It is the highest form of internal observation. Thus, by reflection, inner happenings are built up into hypotheses concerning the nature and processes of the mental life. See PERCEPTION, MEMORY, IMAGINATION, THOUGHT, CONSCIOUSNESS, WILL, ASSOCIATION OF IDEAS, SENTIMENT, MOTIVE, MIND, and PHILOSOPHY.

Applied or Educational Psychology.—It is evident that education has two claims to make upon this study. The first of these two duties of psychology to education is this: It should take its place as a factor in liberal collegiate culture in both of the functions which a great branch of learning serves in the university curriculum—i. e. undergraduate discipline and instruction, and post-graduate research discipline. The second great educative function of psychology is this: It should mould and inform educational theory by affording a view of mind and body in their united growth and mutual dependence. Education is a process of the development under most favorable conditions of full personality, and psychology is the science which aims to determine the nature of such personality in its varied stages of growth, and the conditions under which its full development may

be most healthfully and sturdily nourished. One of the first duties of psychology, therefore, is to criticise systems of education, and to point out "the better way" in education.

Pedagogy as a science treats of the application of psychological principles to the development of normal and cultured personality. The ground-work of such a science must be afforded, therefore, by psychology; and inasmuch as the teacher has to do with body as well as mind, and with mind principally through the body, it is experimental or psychophysical psychology to which this duty to theoretical education mainly comes home. It is needless to say that there is no such science of pedagogy in existence. Most of the books on this topic are unworthy of serious attention. Further, the German *a priori* systems of pedagogies find their main value in keeping awake the expectation and the *amour propre* of teachers, not in affording them much empirical assistance in their task. Psychology is aware of this duty, however far she may be from performing it. Children are studied with some soberness and exactness of method. Statistical investigations of the growth of school children, of the causes and remedies of fatigue in school periods, of the natural methods of writing, reading, and memorizing, are carried out. The results of several such inquiries were plotted for exhibit in the department of anthropology at the Columbian Exposition in Chicago. Questions of school hygiene are intelligently discussed. The relative values of different study-disciplines are weighed in view of the needs of pupils of varying temperaments and preferences. Among those who have addressed themselves to this task in the U. S., with information and influence, two names may be mentioned—that of Dr. W. T. Harris, U. S. Commissioner of Education, and President G. Stanley Hall, of Clark University, editor of *The Pedagogical Seminary* (vols. i–iii, 1891–94). Another journal for the application of sound psychology in education is *The Educational Review*, edited by Prof. Nicholas M. Butler, of Columbia College, New York (vols. i–vii, 1891–94).

Relation of Psychology to Philosophy.—The traditional connection with philosophy is not severed by these directions of psychology. The change in psychological methods was due in part, as has been said above, to changes in philosophical conception, and it is only part of the same fact that scientific psychology reacts upon philosophy in the way of healthful stimulus. Both the critical idealistic and the critical realistic methods of philosophy are richer and more profound by reason of the lessons of the new psychology. It was only just that the modern science which owed one of its earliest impulses in the U. S. to a book from an advanced thinker of the former school, the *Psychology* of Prof. John Dewey, should repay the debt by its reconstruction of the Kantian doctrine of apperception in terms acceptable to the later thinkers of that school. And it is no small gain to both schools that their issue should be joined on ground which stretches beyond their old battlefields by all the reach of territory covered by the modern doctrines of naturalistic evolution and the association psychology. Philosophy escapes the charge of Lewes that her discussions are logomachy when the disputants on both sides are able to look back upon those even of the late period of Lewes and admit the essential truth of both of their hotly contested formulas. As far as this is the case, the writer ventures to say that it is due to the progress of psychology in giving content to the terms of the logomachy and in enabling the best men to reach more synthetic and more profound intuitions.

The relation of psychology to theology, also, is close, and must remain so. And the obligation must become of greater mutual advantage as psychology grows to adult stature and attains her social self-consciousness in the organization of knowledge. The benefits which theology might have gained from psychology have been denied in great measure through the unfortunate attempt to impose the theological method upon the treatment of the whole range of mental fact. The treatment of "anthropology," included in the textbooks of systematic theology, bears about the same relation to that of psychologies like Höfding's and James's as the physiology of the traditional philosophy bore to the work of the neurologists and morphologists.

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Histories of psychology are Siebeck's, Carus's, Harmus's, and Dessoir's, each entitled *Geschichte der Psychologie*; see

also the historical sections of Volkmann's *Lehrbuch*, and the histories of philosophy by Windelband, Erdmann, and Ueberweg.

Comparative, Genetic, and Educational Psychology.—Schneider, *Der Menschliche Wille* and *Der Thierische Wille*; Darwin, *Expression of the Emotions*; Baldwin, *Mental Development in the Child and the Race* (London and New York, 1895); Preyer, *The Mind of the Child*; Tracy, *The Psychology of Childhood*; Compayré, *Évolution Intellectuelle de l'Enfant*; Guyau, *Education and Heredity*; Tarde, *Les Lois de l'Imitation*; Sighele, *La Foule criminelle*; Ward, *The Psychic Factors in Civilization*.

Abnormal Psychology.—Lewis, *Textbook of Mental Diseases*; Starr, *Familiar Forms of Nervous Disease*; Ziehen, *Psychiatrie*. J. MARK BALDWIN.

Psychom'etry, or Mental Chronom'etry [*psychometry* is from Gr. *ψυχή*, soul, mind + *μέτρον*, measure]: the science of the measurement of reaction-times, or of the duration of mental acts. It is only since 1860 that anything like exact and scientific efforts have been made to measure the time or duration of mental states. The necessity of some such measurement first arose in astronomy, where the most exact determinations of transit and other periods must be made. A source of error in such observations was early seen to be the time taken up by the transmission of the excitation of the retina to the brain, and the time taken by the impulse given to the hand to record the event, to travel from the brain to the hand. This element of "personal equation" in astronomical work is elevated to a distinct problem in psychometry, and its conditions are extended to include all mental states which have the physical basis accessible for the employment of experiment.

Before the rise of experiment desultory treatment had been given to the comparative rapidity or slowness of our "ideas," such questions as whether all "ideas" were successive or some simultaneous, speculations on the cause of the rapidity of dreams, etc.; but being only general descriptions of fact, and depending on individual experience and testimony, such observations were almost useless in general mental theory. With the positive work now done in psychometry, it is quite astonishing how many side-lights are thrown on other questions and to what unexpected uses time determinations may be put.

Proceeding on the assumptions made in **PSYCHO-PHYSICS** (*q. v.*), we observe that any period of time which is occupied jointly by a physiological and a mental process, and which may be recorded by movements traced by a time-registering apparatus, will involve as one of its factors the time of the mental process considered for itself. If, then, we have means of measuring the time taken by the physiological process alone, we may by subtraction find the mental time. Now these conditions are realized in every instance in which we perform a movement in response or reaction to a sensation from without. For example, suppose one hears a word and then writes it; the sensation of sound is the central link in a chain of nervous processes beginning in the ear and ending in the hand. From the ear the stimulus is transmitted to the brain, and from the brain the command to move is carried to the hand; between these two processes the third or mental fact, sensation and volition, has taken place. Such a chain of events involving any sensation and movement, and a conscious event connecting them, is called a "simple reaction," and the time that it takes the "simple reaction-time." The determination of this time is the first problem of psychometry.

The simple reaction-time is determined for any sense with its reaction in movement (for example, a sound and consequent movement of the right hand) by connecting the hand's movement with a very delicate clock (chronoscope or chronograph) in such a way that there is an instantaneous stoppage of the clock upon the movement of the hand. This is arranged by directing the person experimented upon to press an electric button when he hears a signal, say a bell-stroke. Let the bell-stroke emanate from the clock as it reaches a certain indication upon its dial, and the experiment is ready for trial. The experimenter stands ready to press the button—the bell sounds—he presses—the clock stops. The dial-face indicates the time which elapsed between the actual sound of the bell and the movement of the hand. Calling the time taken up by the nervous process from the ear to the brain "sensory-time" (*S*), that taken by the nervous process from the brain to the hand "motor-time" (*M*), and the time of the mental event between them

"perception-time" (P), the simple reaction-time (R) can be expressed in this equation:

$$(1) \quad R = S + P + M,$$

in which S and M are purely physiological.

This determination has been made by a great number of observers upon three of the senses—sight, hearing, and touch—with remarkable uniformity of result. It varies with different classes of sensations and individuals from $\frac{1}{8}$ to $\frac{1}{2}$ sec.

Experiments of Helmholtz and Dubois-Reymond have determined the velocity of both sensor and motor nerve-transmissions, so that we may substitute known values for S and M in the formula given above, as follows:

$$S + P + M = .15 \text{ sec. (about).}$$

$$S + M = .06 \text{ sec. (about).}$$

$$P = .09 \text{ sec. (about).}$$

The word "about" indicates variations for the different senses. For all the senses the general law will hold that the purely physiological time ($S + M$) is less than half of the entire reaction-time.

Having the simple reaction-experiment arranged, we may vary the conditions in a variety of ways, and thus arrive at the most favorable mental attitudes for quick reactions. In the simple experiment the excitation was expected, but the exact moment of its occurrence was not known. If this exact moment is given to the "subject" by a preliminary signal, the reaction-time is diminished. Again, if neither the kind of excitation nor the time of its occurrence is known, the time is greatly increased. From these two variations we gather that the state of the attention has a great influence upon the reaction. As we would expect from our ordinary experience, when the attention is taken unawares a longer time is required to respond actively to external influences.

Another exceedingly important influence is practice. This is due to the artificial conditions of all experiment, and the increased facility we acquire by personal adjustment. We react a thousand times daily under less artificial circumstances, and since the reaction-time is diminished by practice, it is probable that our customary, habitual responses to stimuli of sense are more quickly performed than the most favorable experiments would indicate.

Having now reached what may be called the "mental" time (P), the question arises: How is this to be divided between the perception or apprehension of the sensation and the volition to respond by movement? Two methods of experiment have been devised for breaking up this period into its elements. The first consists in experimenting on cases of very close physical association—as between hearing and speech, right hand and foot, etc.—where the reaction is almost automatic and the will-element is practically ruled out. The subject agrees beforehand to repeat any familiar word spoken to him as soon as he hears it. Experiments of this kind led Donders and Jaeger to the following principle: The relative times of perception and volition depend upon the degree of physiological association between the receiving and reacting organs; when this association is close, the mental time is largely taken up with perception; when loose, it is nearly all occupied with volition.

The other method, that of Wundt and Baxt, consists in repeating the excitation one or more times before the voluntary impulse for the reaction is given. Thus the perception-element is repeated, and the difference between this time and the simple reaction-time is the time due to the additional act of perception. For example, let two equal and moderate excitations, say bell-strokes, follow each other quickly, the reaction being made only after the second; we then have the equation (here p represents the perception of the first stroke, which carries no volition with it):

$$(2) \quad R = S + p + P + M.$$

On repeating the experiment with only one stroke, we have as before:

$$(1) \quad R = S + P + M.$$

Subtracting (1) from (2), we have:

$$R - R = p.$$

Here R' and R are readings from the clock. This gives a numerical determination for p . The volition-time will then be $P - p$.

From this latter experiment a curious result follows if the successive excitations are of very different intensities. If the more intense really follows, it is, nevertheless, heard first, and the less intense, really first, follows after; or they may appear to be simultaneous, though really successive.

This is the case, in general, whenever the attention is strongly drawn to the second stimulus and follows from the principle already spoken of, that the attention, when concentrated, diminishes the reaction-time. This will be the case in general whenever the diminution in the reaction-time of the second exceeds the real interval between the two. The same phenomenon is experienced often when one is awakened by a loud noise. He hears the noise after he awakes, though it was the noise that awakened him. It simply means that because of the dormancy or preoccupation in dreamland, the reaction-time of the sound is lengthened into his waking consciousness, while the shock to the nervous apparatus was sufficient to rouse him from sleep. This shows also the dependence of the order of associated states of memory upon the movements of attention in the first experience rather than upon the order of external events. The fact is also important in astronomical observation; a new excitation to the eye, such as the appearance of an expected star on the meridian, is anticipated by the attention and given a reaction earlier than its true position would confirm.

The distinction between perception and reproduction—that is, between a direct intuition and a memory-picture—is very artificial, inasmuch as reproduced images enter in all our perceptions and influence their time. We have dealt heretofore with simple perception as if this influence did not exist, but a moment's reflection shows that it should be taken into account in all time-measurements. In the experiments just spoken of, in which attention plays a part—that is, in which the subject knew before he experienced the excitation, its nature and quality—the reaction-time was diminished, for the reason that it was possible to call up a memory-picture of previous experiences and hold it before the attention in such a way that the voluntary impulse could be set in play almost immediately upon the discharge of the sensory centers. For example, if the subject expects the stroke of the bell, he recalls the sensation of a previously heard stroke and the organs are in readiness to respond. So what the writer has called perception-time really results from a diminution due to reproduction. The true time for perception must be obtained by experimenting with excitations entirely unexpected, and the differences between the reaction-time in this case and that of an expected excitation of the same nature due to the influence of reproduction simply is sometimes half the true perception-time.

The problem then arises to determine the reproduction or simple "association-time"—that is, the time which elapses between the full perception of a first image and that of a second which the first suggests. To do this, we must first determine the time of a complete association-reaction—that is, the time which elapses from, say, the hearing of a word, as "storm," and the utterance of a closely associated word, as "wind." The association must be spontaneous with the subject, and the original word a monosyllable and very familiar. The uniformity of result is surprising, considering the variety and indefiniteness of our customary associations. Our equation is (A representing the new element due to association):

$$(3) \quad R = S + P + A + M.$$

Reacting again for the word alone without the associated image, we have

$$(1) \quad R = S + P + M.$$

By subtraction, $A = R' - R$; hence value for A .

The average of experiments gives this value about $\frac{1}{4}$ to $\frac{1}{2}$ sec. These results hold only for close associations established by long habit, especially those dating back to childhood or early life. A third process upon which experiment has been employed is that of discernment—that is, the act of distinguishing between given images and indicating the distinction by choice. The excitation, say a red light, is agreed upon, and is exhibited to the subject indiscriminately with another, say a blue; the subject to react only when he sees the red. In this process, it is seen, two intellectual acts occur: 1, Comparison of the visible light with the reproduced image in consciousness; 2, a judgment as to their identity or non-identity, and these imply, 3, the act, first of all, of simple perception, and 4, last of all, the act of volition, as in preceding cases. Letting D represent the whole distinction-time, we have:

$$(4) \quad R' = S + P + D + M.$$

Reacting simply:

$$(1) \quad R = S + P + M.$$

By subtraction, $D = R' - R$.

Thus arrived at, the time of "distinction" is found to be for two indiscriminate stimuli, $\frac{1}{10}$ to $\frac{1}{15}$ sec. longer than the simple reaction-time. The reason for saying two stimuli is that the time is lengthened, as we would expect, when the possible choices are increased. For example, if we use three lights, red, blue, and green, the time occupied in a true discrimination is longer, and it increases geometrically. Wundt experimented with the letters of the German alphabet, and Cattell with both Roman and German printed characters. Cattell finds that it takes about $\frac{1}{4}$ sec. to see and name a single letter, and that it takes longer to distinguish the German characters than the Roman.

The time of the judgment has entered also into all our measurements heretofore, and it is impossible to isolate it as a distinct intellectual act for the purpose of experiment. As an act in time, it can be viewed only in particular cases and under prescribed conditions, and even then the time is to be considered relatively to that of other processes of necessity involved. Trautscholt has studied the time of the "judgment of subordination," from genus to species. A word is spoken, and the subject reacts as he conceives a word in logical subordination to the given concept, for example, animal—dog. An element of association which it is impossible to eliminate enters largely here. By the same process as before, we find the value of J (judgment) from the equation of the entire reaction to be about 1 sec.—that is, slightly longer than that of the simple association. It varies also with the nature of the logical terms. That is, (1) the time is longest when the subject is abstract, and the predicate a more general notion (virtue—honesty); (2) shortest when the subject is concrete, and the predicate particular (hound—Bruno).

Besides these and other positive results, additional important contributions to psychological science have been made. It may be well, in closing, to indicate some of the more general bearings of these time-measurements.

All this work has tended to the emphasizing and defining of the voluntary side of the mind, as given in acts of the attention. The results here alone more than pay for the entire work the researches involve. That the will is the question of capital importance both in psychology and general philosophy, and that philosophers are hopeful and expectant of results in the theory of our active life as never before under the lead of speculation, are largely due to the new psychology. The experimental work described above has cleared up the problem of the attention in many of its conditions: its relation to the time-sense and the origin of the idea of time, its inseparable connection with muscular activity, its bearing upon intensities everywhere in mental experience, its influence in our perception of the external world and of space—indeed, one can not arise from the study of experimental psychology (see *PSYCHOLOGY*) as it spreads its data out before us without the overwhelming conviction that it is upon the theory of mental effort in attention with feelings of resistance that the general psychology of the future will be erected.

Again, such experiments show both the isolated character of mental states in their dependence on physiological states, and at the same time the clear necessity of a circumscribing, grouping, and arranging consciousness of which they are states; a unity, an individual active self, which the manipulation of single states does not impair. From the work now spoken of, we have the emphatic emphasis of a principle of activity by which alone single, successive, or simultaneous states have any meaning or significance in our mental life.

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Psycho-physic Law: See *PSYCHO-PHYSICS*.

Psycho-physics [Gr. *ψυχή*, the soul + *φύσις*, nature, physics]; literally, the science of the mind considered in its relation to physical nature. The word has been used in this broad sense, i. e. to indicate the general topic of the relation of mind and body. This is, however, better covered by the phrase physiological psychology. (See *PSYCHOLOGY*.) Psycho-physics is accordingly now restricted to a particular kind of research, and so becomes a department of psychology considered as an experimental science.

In this restricted sense, psycho-physics deals with the measurement of the intensity, as it is properly called—the quantity or "mass," as the psychologist uses the words—of sensation. The conception of intensity needs no further explanation; it is simply the difference between the light of one candle and of two or more, the sound of a bell near and far. It is a property of all sensation. The problem which presents itself is to reach a formula for such intensities in terms of the amount of stimulus required at the end organ to produce a given increase or decrease in conscious intensity. To illustrate, suppose a candle illuminates a page to a certain extent, how many candles would illuminate it enough to enable one to see twice as distinctly, or as distinctly at twice the distance? Is there any general law of the ratio of intensity of external stimulus to intensity of internal sensations which will hold good for all the senses? Or is there a different law for each of the different senses? Or, again, is the entire case simply a matter of subjective estimation, varying with the mental and bodily conditions of the individual?

These questions were at one time hotly discussed, but have now been practically answered by the establishment of a single law of relation between stimulus and sensation, which holds good for most of the senses found to be most easily accessible, has been partially proved for other classes of sensations, and is under judgment in default of sufficient experimentation for a remaining group of sense-experiences. Before entering more particularly into details it is well to define and explain several terms of current use among physiological psychologists.

By excitation (or stimulus) is meant the external force which excites a sense-organ, whether it be of sufficient intensity to produce a sensation or not. The feeblest sensation which we are able to experience or feel from any sense is called the perceptible minimum; the theoretical point at which such a sensation, when further enfeebled, disappears from consciousness, the threshold of sensation; and the amount of excitation which is just sufficient for the perceptible minimum of sensation, the threshold excitation for that sense. For example, air-vibrations are the excitation for sensations of sound; the feeblest sound which it is possible to hear under determined conditions is the perceptible minimum, and the number of units agreed upon—bells, notes, etc.—which are needed to produce this perceptible minimum makes the threshold excitation for this sense. Further, the amount of excitation needed to raise or lower the intensity of a sensation by the smallest amount which can be distinguished, and the corresponding difference in the sensation, are called the smallest perceptible difference in excitation and sensation respectively. Thus if 1 unit be the threshold of excitation for sound and an addition of $\frac{1}{3}$ unit is necessary to produce any perceptible increase in the sensation, then $\frac{1}{3}$ is the smallest perceptible difference of excitation for sound.

With these definitions in mind, we may turn to the problem of finding a law of measurement for intensities of sensation. The preliminary question as to a standard of measurement is already answered in the resort to experiment, viz., the standard must be a scale of excitation-values, determined by physical measurement, as pounds, velocities, etc. Given a threshold-value of each excitation, we may double, treble . . . it, endeavoring to find some law of increase in the corresponding sensations whereby a corresponding internal scale may be erected. The first step is seen, therefore, to be the discovery of the perceptible minimum of each sense, which may serve as zero point on the sensation-scale, its exciting stimulus being the unit point on the excitation-scale. This brings the investigator to an actual research on all the sense-organs in turn—experiments to determine the minimum of sight, hearing, touch, etc. The methods by which this is done are simple. Any device by which excitation may be lowered or heightened gradually below or above the threshold may serve the purpose. For touch and the muscular sense small balls of cork may be used—differing so slightly in size that when placed, say on the back of the hand in succession, the difference between the last one which is felt and the next which is too light to be felt is as small as possible. By running the series in the reverse order, from weights too small to be felt to others barely felt, and by an equation and average of errors, the point is determined where the excitation produces the smallest perceptible sensation.

Simple as this procedure seems, the conditions are so complicated in some of the senses as to occasion great embarrassment. The eye, for example, is found to have a

"natural light" of its own, arising from mechanical movement, friction or chemical action, from which it is never entirely free, and the smallest perceptible sensation of light must always include this natural factor. The conditions of the body before the experiment also cause great variations, as is seen in experiments on temperature and smell sensations. The threshold-value for temperature is much higher or lower, for example, according as the earlier state has been one of higher or lower temperature. The following table exhibits the results of Fechner's experiments on the perceptible minimum:

PERCEPTIBLE MINIMA.

Touch.....	Pressure of .002-.05 gramme.
Muscular sense..	Contraction of .004 mm., right internal muscle of the eye.
Temperature....	1-8° centigrade (normal heat of skin 18.4°).
Sound.....	Ball of cork 1.001 gramme falling .001 meter on glass, ear distant 91 mm.
Light.....	Cast on black velvet by candle distant 8 ft. 7 in.

It is not necessary to examine each of these determinations, for the actual numerical values are not of great importance, even where Fechner has not been confirmed by other experimenters. The fact that there is a minimum under normal conditions, and its determination with sufficient accuracy to give ground for further inferences, is all that the theory requires.

So far two points have been gained—i. e. the zero on the sensation-scale and the unit-value, a positive known quantity from the table above, on the excitation-scale. Next in order is the graduation of both scales in an ascending way by relatively equal values.

It is a common fact of experience that excitations and sensations do not apparently sustain the ordinary relation of cause and effect to each other. Two candles do not illuminate a page twice as much as one; two violins, pitched in the same key, do not double the sound of one; and as intensities increase it is a matter of ordinary observation that very little variations are brought about by well-marked changes in the stimulus. This result of general observation recurs to us as we advance in the consideration of the values on our scales, for we would expect, from this rough judgment of daily life, that larger increments would have to be made the higher we ascend on the excitation side to produce regular equal increments on the sensation side.

This is confirmed by a further research undertaken on all the senses in turn, an experimental determination of the amount of increased excitation necessary to produce the smallest perceptible difference in sensations of the same kind. Let us suppose a given excitation for pressure, then increase it slightly until it is judged greater than before, determine the ratio of the increment to the former excitation, repeat the experiment with a much larger excitation, making the same fractional determination, and compare the results. It is found that the fractional increase in excitation necessary to produce a perceptible difference is constant for each sense. This means that the absolute increase is not constant, but becomes greater as the intensity of the initial excitation becomes greater. For example, if the initial excitations in two experiments be 6 and 9 grammes, a relative fractional increase of 1/3 would be in one case an absolute increase of 2, and in the other of 3 grammes.

There are three general methods of determining the smallest perceptible difference for any sense, due in their formal statement and description to Fechner. They are known as the methods (1) of smallest perceptible differences, (2) of true and false cases, and (3) of mean errors. There is a fourth, of especial importance in researches on sight—that of mean gradations (Plateau); but it is not necessary to speak of it further.

1. The method of smallest perceptible differences is most direct. It consists in adding to a given excitation until the difference is barely perceived. The difference between the initial and the resulting excitation is the first determination of the quantity required. A plainly perceived difference is then added to the same initial excitation, and reduced till no longer perceived. This gives a second determination. The averaging of these two results is the correct value, which may be called DE (difference or differential of excitation). Its ratio to the first excitation is expressed by the fraction $\frac{E}{DE}$. The relative degree of sensibility for any sense, it

will be observed, is inversely proportional to the amount of excitation required to give the smallest perceptible difference in sensation, i. e.

$$S (\text{sensibility}) = \frac{1/E}{1/E'} = \frac{E'}{E}$$

2. The method of true and false cases consists in comparing two excitations (say weights), the subject of the experiment judging them to be equal or not. The number of true and false judgments is recorded, and the ratio between them indicates the approach of the difference of excitation to its minimum value. The relative sensibility again varies, as the actual difference between the excitations varies, and also directly as the number of true judgments (in relation to total cases), i. e.

$$S = E \frac{S (\text{= total cases})}{N (\text{= true cases})}$$

3. The method of mean errors consists in comparing two stimuli (weights, etc.) and judging them equal, then in taking their real difference, positive and negative, in a great number of cases, adding these differences without regard to signs, and dividing by the entire number of cases. The mean error is thus arrived at. The sensibility is inversely proportional to the mean error, i. e.

$$S = \frac{1}{D (\text{= mean error})}$$

Proceeding by one or all of these methods, the smallest perceptible difference of excitation for each of the senses is established. The following table gives these values, subject to revision for certain classes of sensation, especially sight, when the conditions of experiment can be made more free from error:

SMALLEST PERCEPTIBLE DIFFERENCES.

Touch.....	1/3
Muscular sense.....	1/17
Temperature.....	1/3
Sound.....	1/3
Light.....	1/100

The values given, it may be well to repeat, represent the amount of a given excitation which must be added to that excitation to be felt in consciousness. For example, if the eye is already stimulated by a light which represents 1,000 candles, at least 10 candles (a fractional increase of 1/100) must be added to produce any perceptible increase in the intensity of the light. Any number less than ten would seem to have no effect on consciousness whatever, and so with the relative values given for the other senses.

To revert to the original problem, it will be remembered that the two determinations already arrived at for all the senses are only steps in a process of measuring the intensity of sensations in terms of external stimuli. So far there have been determined the smallest perceptible sensation (giving the starting-points on the scale) and the smallest perceptible differences of excitation in the upward graduation of the scale. The results of this second research may be stated in general language thus: In order that sensation may increase by successive equal additions, their excitations must increase by a constant fraction of the excitation itself, i. e. by additions which are not equal, but which increase in ascending the scale of intensities. For example, the successive additions to a sound, to be barely perceived, would require the following series of additions to the stimulus:

$$1/3, \frac{1 + 1/3}{3}, \frac{1 + 1/3 + 1 + 1/3}{3}, \text{ etc., or } 1/3, 4/9, 16/27, \text{ etc.,}$$

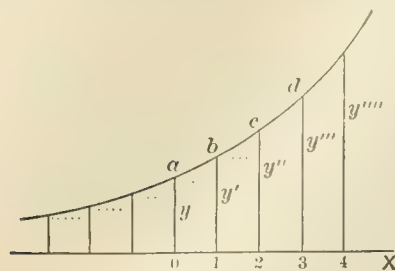
and the actual excitations would be the series

$$1, 4/3, 16/9, 64/27, \text{ etc.}$$

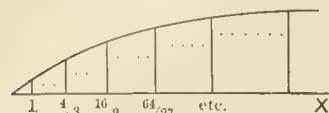
This general principle is called the law of Weber, and may be stated in a variety of ways, of which perhaps the easiest to carry is this: That in order that sensations may increase in intensity in an arithmetical series, their excitations must increase in a geometrical series. This may be exhibited in a linear way to the eye in diagram 1 below.

Let X represent a series of sensations 0, 1, 2, etc., increasing by a constant quantity from the zero-point 0; let the upright lines represent at each point the excitation necessary for the sensation of that intensity. By drawing the dotted lines parallel to X , it is seen that the successive additions made to the vertical are not equal, but grow constantly greater, i. e. for hearing, $y' = y + y/3$, $y'' = y'$

+ $y'/3$, etc. Having erected these vertical lines by the law of increase given in the table, the curve $a b c d$, etc., may be plotted through their extremities, being the "curve of excitation."



sations increasing by a constant quantity. The curve connecting the extremities is the "curve of sensation."



A further mathematical expression has been given to this law by Fechner. As may be seen below, it is open to some criticism; yet it is ably defended, and whatever may be its fate as a mathematical deduction, the law of Weber as given above will not be involved.

Assuming, says Fechner, that the smallest perceptible differences in sensation are equal for any value of the excitation (an assumption which has no proof), and that very small increments of sensation and excitation are proportional to each other, we may throw Weber's formula into the following equation (DS being increment of sensation, DE increment of excitation, and K a proportional constant),

$$DS = K \frac{DE}{E},$$

in which all the quantities have been determined in the tables already given. Considering this as a differential equation, we may integrate it and reach the form

$$S = K \log E,$$

or the sensation varies as the logarithm of the excitation—the celebrated "logarithmic law" of Fechner.

Considered under its more general form, as indicated in the principle of Weber, this law has an unequal application to different sensations. For sight, touch, and hearing it is fully established; for taste and smell it is still in doubt, by reason of the mechanical difficulties which these senses offer to experimental research. It applies under restrictions to estimation of linear distance by the eye, to perception of the passage of small periods of time, and to discrimination of local positions in the skin. In all cases its application is restricted within upper and lower limits of intensity of sensation. When too intense the organism fails under the stimulus, reaching the limit of its vibratory responsiveness, and when too faint, either the stimulus does not excite a conscious reaction, or the attention fails to discriminate the sensation.

It may not be out of place to indicate the principal criticisms which have been urged against Weber's law, both in its general result and in the method of research which it involves.

Both of the assumptions made by Fechner—that the perceptible differences of sensation of the same sense are equal for all intensities of stimulus, and that the increments of sensation and excitation are proportional—are called in question. The results of late physiological work tend strongly in favor of the first assumption, and it is probably safely established. The second with the application of the differential calculus is so plainly subject to criticism that even its strongest advocates only attempt to justify it by the results. Really it is only infinitely small quantities that can be considered differentials or proportional to each other; while by the law of growth, arrived at by Weber, they are shown not to be proportional. This argument, adverse to Fechner's formula, is ably presented by Delbœuf. Another objection is brought also to the doctrine of "threshold." It is claimed that there is not a constant threshold for any of the senses, but that the minimum of sensation varies with the condition of the organism, the concentration of attention, etc. If this criticism should be shown, however, to be valid, it would still be possible to establish a table of variations or a coefficient

of "personal equation" for individuals, and still preserve the principle of Weber. The objection formerly drawn from the fatigue of the organ under prolonged experiment is now met by the principle called by Fechner the "parallel law"; if the experiments are performed at very close time-intervals, the degree of exhaustion may be considered as approximately the same for any two successive excitations. Any modification, therefore, which either excitation undergoes from the element of fatigue is corrected in the ratio between that and the other excitation. For example, the smallest perceptible difference DA above an excitation A , reached by adding a

new excitation B , is expressed by the fraction $\frac{B}{A}$; but any modification which affects both B and A to an equal degree does not alter their ratio.

The philosophical significance of Weber's law is the ground of main interest. That it is an established law of the relation of the mind and body as respects sensation, that it confirms the general assumption that there is a universal and uniform connection between the mental and the physiological—these points must be admitted, whatever may be a more particular interpretation of the law itself. As to its meaning for our theory of the mind, and whether it has any such meaning, there is more room for difference of opinion, and three distinct interpretations are commonly held among psychologists. Each of these is advanced in answer to the question which Weber's law obviously suggests, i. e. why is it that the relation of cause and effect does not hold between sensation and excitation? why is sensation proportional to the logarithm of excitation and not to excitation itself?

The first of these interpretations, that of Fechner, is that Weber's law represents the ultimate principle of connection between mind and body; that they are so constituted as to act upon each other in a logarithmic relation. It is of necessary and universal application wherever mind and body are brought into organic connection. In short, on this view the law is strictly psycho-physical. This interpretation has been very generally discredited, principally because it forbids all further research or explanation. Nothing is ultimate which may be explained, and if physical or mental reasons can be given—as the other two theories hold they can—for the disproportion between sensation and stimulus, then the assumption that it is ultimate is gratuitous. Fechner supports his view by two considerations: first, that the physiological theory, as stated below, is inadequate, and, second, that the law holds in cases of nervous exhaustion. The latter point is met by the consideration that in cases of extreme exhaustion the entire series of stimuli is intensified by a given amount throughout, and when the exhaustion is not extreme it corrects itself by the "parallel law" spoken of above.

Again, it is held, especially by Wundt, that the law is strictly psychological—that is, that the disproportion between sensation and excitation is due to the perception or discrimination of the sensation. On this theory it is not the real sensation which is experimented upon, but perceived sensation, and in the process of taking the sensation up into our apperceptive life it is modified as to its intensity. For example, the single fact of attention to a sensation changes its intensity; what effect might not the act of directing the mind to it, as is required in the above experiments, have upon it? In answer to this interpretation it may be said that it can never be critically established, since there are no means of getting at the true worth of sensation except as it is interpreted in our attentive consciousness. By intensity we mean intensity to us, in our intellectual life, and to speak of the intensity of sensations in a relative way, apart from the apperception and comparison of them, is to become unintelligible. Wundt, however, has an ulterior end in view—the support of his doctrine of apperception—and he himself admits that he would not exclude the physiological interpretation.

The third interpretation, which is probably the true one, makes the disproportion spoken of purely physiological. According to the advocates of this theory the law of cause and effect does hold in this case, as in others, but a part of the internal cause is lost in the transmission by the nerves, so that the true excitation at the brain-center is less than at the peripheral organ, and is in direct proportion to the intensity of the sensation which it causes. Briefly stated the following facts tend to support this view: (1) The phenomenon of nervous arrest would lead us to expect a diminution of the stimulus between the organ and the brain; (2) nerve-action is dissipated in heat; (3) force is lost in the exciting

of the internal organ, hence, by analogy, we would expect the same in the stimulation of the centers; if the general parallel between electricity and nervesaction would indicate resistance to be overcome in the one case as in the other; (5) on general grounds a loss of force may be expected in an extended or complicated mechanism. A decided preference for the last view seems justified by the facts, although Wundt has been recently re-enforced by reliable results. Criticism so far seems to show that Weber's law represents the method of nervous "summation" of stimulations at the centers, but under this term a great many particular influences have to be included.

LITERATURE.—Fechner, *Elemente der Psychophysik* and *Revision der Hauptpunkte der Psychophysik*; Wundt, *Physiologische Psychologie* (4th ed. 1893); Müller, *Zur Grundlegung der Psychophysik*; Külpe, *Grundriss der Psychologie* (Leipzig, 1894); Ladd, *Elements of Physiological Psychology* (New York, 1887); Jastrow, *Critique of the Psychological Methods in The American Journal of Psychology*; Ribot, *German Psychology of To-day* (New York, 1886).

J. MARK BALDWIN.

Psychosis: a mental state considered as subject for investigation, generally in connection with the accompanying nervous condition or NEUROSIS (*q. v.*), which accompanies it.

Psychotheism: See ETHNOLOGY.

Psychrometer: See HYGROMETER.

Ptah (The Opener): "the father of the gods"; perhaps the oldest of the Egyptian deities; worshiped in Memphis from the first dynasty on. He is represented in the form of a mummy, with head and hands free. In his hands was the scepter which stood as the symbol of power, and beneath his feet was the symbol of truth. Among several composite forms in which he appears was that of Ptah-Sokar-Osiris, the god of the resurrection and of the nether world. In this form he was regarded as the first King of Egypt and as creator of the world.

CHARLES R. GILLETTE.

Ptarmigan [(by analogy of Gr. words in *pter-*) from Gael. *tarmachan*: Ir. *tarmochar*]: any grouse of the genus *Lagopus*, the members of which are distinguished by the legs being densely feathered to the claws, the nasal grooves closed over with feathers, and the development of sixteen or eighteen tail-feathers. Ptarmigans are characteristic of the high northern regions of the globe, and, with the exception of one species, assume a white coat during winter; in summer they are of a more or less reddish or brownish gray. They are thus an instance of a double protective mimicry, harmonizing with the snow in winter and the rocky barrens in summer. In winter they seek the shelter of thickets of willows, birches, etc., but in summer they frequent plains. When pursued in winter they frequently dive into the loose snow, in which they work their way with great ease. The female begins to lay her eggs about May or June, and deposits about eight or ten eggs in the nest. A number of species have been recognized, of which *Lagopus albus* inhabits both hemispheres, *L. rupestris* and *L. leucurus* North America, and *L. mutus*, *L. himalaicus*, and *L. scoticus* the Old World. *L. scoticus* is extremely closely related to *L. albus*, and has been even regarded as the permanently dark insular form of that species.

Revised by F. A. LUCAS.

Ptenoglossa [Mod. Lat., from Gr. *πτηνός*, feathered + *γλῶσσα*, tongue]: a name employed in some schemes of classification of the molluscs to include the purple shells (*Ianthinidae*), the sun-shells and mason-shells (*Solaridae*), and the wentletraps (*Scalaridae*).

Pteran'odon [Mod. Lat.; Gr. *πτερόν*, wing + *ὄν*, un-, without + *ὀδός*, *ὀδόντος*, tooth]: a genus of pterodactyls, or extinct flying reptiles, from the Cretaceous of Kansas, distinguished from all previously known genera of the order by the entire absence of teeth, and hence regarded as the type of a sub-order, *Pteranodontia*. The typical *Pteranodon longiceps* has the skull about 30 inches long and the lower jaw nearly 2 feet. The rami of the lower jaw are closely united for more than half their length, as in the skimmers (*Rhynchops*). *P. comptus* is a small species, while *P. ingens* was very large, and the skull must have measured nearly 4 feet.

O. C. MARSH.

Pteridophytes: See FERNWORTS.

Pterocarpus: See KINO.

Pterocletes [from *Pterocles*, the leading genus]: a sub-order of birds, sometimes considered as an order, containing the sand-grouse forming the single family PTEROCLIDÆ (*q. v.*).

Pteroclitide [Mod. Lat., from Gr. *πτερόκλις*, the typical genus, from Gr. *πτερόν*, wing + *κλεις*, *κλειδός*, key, bolt, tongue of a buckle]: a small family of birds peculiar to the Old World, containing the so-called sand-grouse; birds about the size of pigeons and intermediate in structure between them and the grouse, although the balance of characters is rather in favor of the pigeons. The form is as much that of the pigeon as the grouse; the bill is short, compressed, and the culmen curved to the tip; the wings and tail are elongated and pointed; the tarsi moderately robust and covered with feathers; the toes rather stout, the three in front more or less united, the hinder rudimentary or wanting. Two genera are recognized by authorities—(1) *Pterocles*, with about fifteen species, and (2) *Syrnophanes*, with two. In color these birds are dull yellowish above, with darker markings, harmonizing well with the surface of the country they inhabit. They are found in Southern Europe, as well as in Africa and Asia, in dry sandy places or deserts, rocky plains, and wooded grounds. They feed chiefly upon hard seeds, bulbs, and insects. The females lay from two to four eggs on the bare ground. *Pterocles arenarius* and *P. alchata* are found in Southern Europe. *Syrnophanes paradoxus*, although strictly an Asiatic species, sometimes makes incursions into Europe as far westward as the British islands. One of these visitations was made in 1859, another in 1863, in which year it made its appearance at 148 European localities, as recorded by Prof. Alfred Newton—"from Galicia to Donegal, and from Gascony to the Farø islands." Another irruption occurred in 1888. The reason for these curious and irregular migrations is unknown, but the primary cause may be failure of food-supply in some portion of their habitats.

Revised by F. A. LUCAS.

Pterodactyl [Gr. *πτερόν*, wing + *δάκτυλος*, finger]: any one of a group of extinct flying animals, confined to the Mesozoic or Reptilian age, and usually regarded as an order of reptiles. The anterior limbs were adapted for flight by the elongation of the fore arm and fifth or outer digit, corresponding to the little finger of the human hand. By this means an expanse of membrane was supported as in the bats, which these animals in some respects resembled. The head was large, the jaws long, and in most forms armed with teeth. In many points the skull approached that of birds. Nearly all the bones were pneumatic, with very thin walls, as in most birds. The skin seems to have been destitute of scales or feathers, as no traces of either have been discovered. The earliest pterodactyl yet known is *Dimor-*



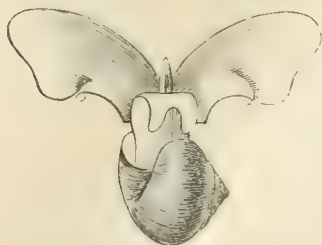
Pterodactyl

phodon macronyx from the Lower Lias of England. Many species occur in the Oolitic lithographic slates in Bavaria. A few fragments only are known from the Wealden, and the English Greensand has furnished many large species. Others from the Upper Cretaceous were the latest forms of this group known from the Old World, and were perhaps contemporaneous with the gigantic species from the Upper Cretaceous shales of Kansas. These were all destitute of teeth. The largest of them (*Pteranodon ingens*, Marsh) probably measured between the tips of the fully expanded wings nearly 25 feet. Several smaller species occur in the same formation, but all were large in comparison with the common European forms.

O. C. MARSH.

Pteroglossus: See RHAMPHASTIDÆ and ARACARI.

Pterop'oda [Mod. Lat.; Gr. πτερόν, wing + πούς, ποδός, foot]: a group of molluscs formerly regarded as a class but



Pteropod, *Limacina antarctica* (enlarged).

now known to be merely a subdivision of the tectibranch division of the opisthobranchiates. (See GASTEROPODA.) They are fitted for a free-swimming life upon the high seas by the development of the lateral lobes (parapodia) of the foot into fins or wing-like swimming organs. Two divisions are recognized, the *Thecosomata*, with a shell (either external or internal), which feed on protozoa or algae, and the shell-less *Gymnosomata*, which are rapacious, feeding largely upon the members of the other group. The pteropods frequently occur (especially in the Arctic seas) in immense schools, and some species form the food of the right whales, the "brit" of the whalers. None of the pteropods are large, and the numbers required to make the fields of brit, sometimes miles in extent, can hardly be imagined. J. S. K.

Pterylog'raphy [from Mod. Lat. *pteryla*, feather tract (from Gr. πτερόν, feather + ἔλκ, forest) + γραφία, from γράφειν, write]: that branch of ornithology which treats of the arrangement of the feathers of birds. The science originated with Nitzsch, who first showed that not only are few birds evenly clad with feathers, but that the feathers are disposed in definite tracts, or pterylae, between which are bare spaces, apteria, and that the arrangement of these tracts and apteria differs in and is characteristic of various groups of birds. F. A. LUCAS.

Ptolemaic System: the name generally applied to the ancient system of astronomy, because the only systematic description of it extant is found in the *Almagest* of Ptolemy. (See PTOLEMY, the author.) There is no reason to believe that any important part of it was the work of Ptolemy himself; its development was probably the work of many generations of observers and thinkers before his time. The writings of these men are nearly all lost, and thus it happens that the name of Ptolemy is associated with the system. The fundamental doctrines of the system are these: (1) The earth is a globe. The proofs given by Ptolemy that we do not live upon an extended plain, but on the surface of a globe, are those familiar to every schoolboy. They were better known and appreciated in ancient times than is commonly supposed. (2) The celestial sphere, with all the heavenly bodies, performs a revolution around the earth every day, on an axis called the axis of the world. We now know that this apparent motion is caused by the revolution of the earth on its own axis, but the ancients referred the motion to the heavens. (3) The earth is in the center of the celestial sphere. The apparent proofs of this given by Ptolemy must have seemed to him very strong, but they are a simple result of the revolution of the earth on its own axis. (4) The celestial sphere is so much larger than the earth that the latter is a mere point in comparison. (5) The earth has no motion of translation, but remains at rest in the center of the sphere. (6) The seven planets are arranged in the following order from the earth: the Moon, Mercury, Venus, the Sun, Mars, Jupiter, Saturn. (7) The moon and sun revolve around the earth in eccentric circles—that is to say, in circles whose center does not coincide accurately with the center of the earth. Mercury, Venus, Mars, Jupiter, and Saturn do not move uniformly around the sphere, but move around the circumference of an epicycle, whose center does move uniformly. The epicycle was intended to account for the alternate, direct, and retrograde motions of these planets, which we now know to be due to the revolution of the earth around the sun.

Notwithstanding the falsity of this system it had two merits—that of being founded on careful and exact observations and reasonings, and that of accounting for the salient phenomena of the celestial motions. S. NEWCOMB.

Ptolemais: See ACRE.

Ptolemy [from Lat. *Ptolemæus* = Gr. Πτολεμαῖος]: the name of thirteen kings of Egypt, forming the thirty-third dynasty, who ruled for nearly three centuries, from the death of Alexander of Macedon till the Roman occupation

(323–30 B. C.). The period, in its earlier portion, till the death of Ptolemy III. (221 B. C.), was one of considerable splendor, rivaling that of previous dynasties. The policy of employing Greek mercenaries was continued, and they grew to be the ruling class. The dominant spirit was Greek, not Egyptian. The royal residence was at Alexandria, whose population was mainly foreign, and that city became the center of Greek culture and science. For political reasons toleration was shown to the religious ideas and preferences of the Egyptians, who were regarded simply as servile subjects, and their land as the principal possession of the Ptolemies. Temples were repaired or built anew, as at Karnak, Edfu, and Philæ, and the most important of the native deities found entrance into the Greek pantheon. Twice during the period the native spirit broke forth into insurrection. The first revolt was at the death of Ptolemy IV. (204 B. C.). It emanated from Thebes and spread through the Delta region. With the aid of Rome it was crushed in the Delta in 198 B. C., and the reign of Ptolemy V. established firmly, but Thebes did not succumb till 186 B. C. The other insurrection occurred at Thebes in 88 B. C. during the reign of Ptolemy VIII. In 85 B. C. it was subdued, and Thebes was given over to final destruction. Roman power had been increasing in Egypt during a large part of the period after Ptolemy III., and it was actually dominant long before the final occupation after the defeat of Antony and Cleopatra by Augustus (30 B. C.).

The founder of the dynasty was PTOLEMY I. (SOTER), the reputed son of Lagus; hence the name *Lagides*, given to the dynasty. He had been one of Alexander's most trusted generals, and at the partition of the empire received the governorship of Egypt (323 B. C.). He remained as a nominal tributary to the Macedonian power till 306 B. C., when he became the actual king, assuming the titles of the Pharaohs and reigning till 284 B. C. By reason of the victory of the allies over Antigonus at Ipsus in 301 B. C., Palestine, Phœnicia, Syria, and Cyprus were added to his kingdom. Ptolemy I. strengthened his land and naval forces, and established the administration and commerce of Egypt. He also laid the foundation of the greatness of Alexandria by inaugurating its library and school. His name *Soter* was given by the Rhodians, whom he aided against Demetrius (305–304 B. C.).—PTOLEMY II. (PHILADELPHUS) (284–246 B. C.) enjoyed a peaceful reign and continued the work of his father, extending trade, building roads, canals, and cities for this end. He erected the lighthouse on the island of Pharos. He also stimulated scholarship by adding to the schools and library of Alexandria. It was during his reign that Manetho compiled his history of Egypt, and that the Greek version of the Old Testament, known as the Septuagint, is supposed to have been made, in part at least.—PTOLEMY III. (Euergetes) (246–221 B. C.) extended the limits of his kingdom to the N. E., it is said, even to the Indus, and he also made conquests in Arabia, while at home he showed himself an intelligent patron of learning. He received the name *Euergetes* because he restored to Egypt the gods which Cambyses had carried away.—With PTOLEMY IV. (PHILOPATOR) (222–204 B. C.) the period of decadence began. His possessions in Asia were wrested from him in part by Antiochus III., and his course in sending grain to Rome at the time of the second Punic war was the occasion of the growth of the Roman power in Egypt. He founded the temple at Edfu.—His successor was PTOLEMY V. (EPIPHANES) (204–181 B. C.), who began his reign in his fifth year. In 201 B. C. he became the ward of the Roman senate, and in 195 B. C. the Rosetta Stone, with its trilingual inscription, was erected in his honor, and in 192 B. C. he married Cleopatra I., the daughter of Antiochus.—The later succession was as follows: PTOLEMY VI. (PHILOMETOR) (181–146) reigned from 181 till 170 alone, and conjointly with Ptolemy VII. (Euergetes II.), surnamed *Physcon*, from 170 till 165. During the period 165–146 he was under Roman tutelage.—PTOLEMY VII. succeeded him and ruled from 146 till 117 B. C., with the exception of an interval about 130 B. C., when he was in temporary exile in Cyprus.—PTOLEMY VIII. (SOTER II.), surnamed *Lathyrus*, reigned from 117 till 106 B. C., when he was banished. He was recalled in 87 B. C. and ruled till 81 B. C.—PTOLEMY IX. (ALEXANDER I.) was co-regent with Cleopatra III. from 106 till 89 B. C., when he was banished. He died in 87 B. C. in a naval battle.—PTOLEMY X. (ALEXANDER II.) was placed in power by the Roman senate in 81 B. C., but was soon afterward slain by an outraged people. With him the legitimate line became extinct, and the succession fell upon PTOLEMY XI. (NEUS DIONYSUS).

surnamed *Auletes*, an illegitimate son of Ptolemy VIII. He ascended the throne in 81 and died in 52 B. C. His successors were PTOLEMY XII. (DIONYSUS II.) 51-48 B. C. and PTOLEMY XIII. 47-44 B. C., who were successively regents with Cleopatra VII., the daughter of Ptolemy XI. She continued to be queen till 30 B. C., when with her the line and dynasty both became extinct, and Egypt became a Roman province.

CHARLES R. GILLIE.

Ptolemy (*Claudius Ptolemaeus*): author: b. at Ptolemais in Egypt; flourished at Alexandria in the middle of the second century after Christ. Of his personal life nothing more is known. Of his works, the *Syntaxis Mathematica* and the *Geographia* are extant. The former is a representation of the science of astronomy at the time of the author, based partly on his own researches, partly on those of Hipparchus and others. As it is the only authority for the views of astronomy entertained by the ancients, and as it formed the foundation of all astronomical science down to the time of Copernicus, the book is of the greatest interest. Having disappeared during the Dark Ages, it again became known to the Europeans through the Arabs. About 827 it was translated into Arabic, and of this Arabic translation—the *Almagest*—a Latin translation was published in 1230 under the auspices of the Emperor Frederick II. The best edition of the Greek text, accompanied by a French translation and notes, is by Halma (4 vols., Paris, 1813-28). (For the fundamental ideas of this system see the article PTOLEMAIC SYSTEM.) Of the *Geographia* a Latin translation with maps was frequently reprinted at Rome in the latter part of the fifteenth century, and it was almost the only source of geographical knowledge until the voyages of discovery by the Portuguese made its information antiquated. Editions by Wilberg and Grashof (Essen, 1838-44), and Müller (Paris, 1883).

Ptomaines, *tō mā-inz* [Gr. *πτῶμα*, a corpse]: certain substances found in the process of putrefaction. Some of these are extremely poisonous, while others are harmless or nearly so. Nencki, in 1882, first isolated a definite substance from the products of putrefaction, starting with gelatin. Later, probably the same substance was obtained from putrid fish. Other basic products were subsequently obtained from putrid meat and fibrin. Brieger has prepared a number of the ptomaines, and, by his careful studies, contributed largely to our knowledge of this important class of compounds. (See Brieger, *Die Ptomaine*, Berlin, 1885 and 1886; *Sitz. K. preuss. Acad. d. Wissenschaften zu Berlin*, 1889.) Among the ptomaines described by Brieger the following may be mentioned: Cadaverine, putrescine, peptotoxine, muscarine, and mydaleine. It has been shown that the ptomaines are the products of the vitality of micro-organisms, and this discovery is plainly of the highest importance to the science of medicine. It was formerly held that many diseases are due directly to the presence of micro-organisms in the body, but now it appears that, in some cases at least, these organisms act indirectly by secreting poisons, which are the immediate cause of the disturbance of the normal functions. If the poisons secreted by the various organisms that cause disease were thoroughly understood, the foundation would be laid for the use of remedies acting chemically as antidotes.

IRA REMSEN.

Ptosis [Mod. Lat., from Gr. *πτῶσις*, a falling, deriv. of *πίπτειν*, perf. *πέπτωκα*, fall]: a drooping of one or rarely both upper eyelids; an inability to open the eye. It may come from a degenerate or undeveloped condition of the muscle-tissue, or from palsy of the third nerve which controls the muscle of the upper lid. It has been successfully treated by tacking the orbicular muscle to the occipito-frontal. It often passes away without surgical treatment, and there are cases which are not benefited by any treatment whatever.

Revised by W. PETER.

Puberty [from Lat. *puber-tas*, deriv. of *puber*, mature, adult]: the period of life at which the exercise of the reproductive function becomes possible. In males of the human race it usually takes place between the ages of thirteen and sixteen, and in females somewhat earlier; and it appears that in very warm and very cold climates puberty is reached somewhat earlier than elsewhere. There are also cases of precocious development in this respect. The period of puberty is attended in males by a more complete development of the larynx, a deepening of the voice, the first appearance of the beard, etc. In the female the contour becomes rounded and more graceful, the catamenia appear, and the mammary glands are developed. There is no doubt

that to those who are inclined toward constitutional disease this is a period of some danger, especially to the female. At this time, too, the mind and tastes are often rapidly developed.

Publicans [from Lat. *publicanus*, pertaining to the public revenues, hence (masc. adj.) one who farms the public revenues, deriv. of *publicus*, public, deriv. of *populus*, people]: in ancient Rome, tax-gatherers, farmers of the revenue, who, on the payment of a stipulated sum, obtained the privilege of levying taxes within certain districts of the Roman dominions. The extortion to which their avarice or the high price paid for the privilege often gave rise made these tax-gatherers a detested class, especially in the conquered provinces, as in Judæa, where the contempt felt for them by the Jews appears from many passages in the New Testament. The right to farm the revenues was sold at public auction for a period of five years. As the purchase became too expensive for a single person, societies of the nature of stock companies were formed, whose members contributed to the payment and received a proportional share of the revenues. After the middle of the second century B. C. the publicans belonged to the order of Equites.

F. M. COLBY.

Public Debt: See DEBT, PUBLIC.

Public Health: See HYGIENE.

Public Lands: See UNITED STATES.

Publilius Syrus: a Syrian slave, probably from Antioch, who attracted great attention in Rome in Caesar's time as a writer of mimes. St. Jerome mentions a collection of moral sentences extracted from the writings of Publius Syrus which was used in his time as a school-book in Rome. There exists a compilation of this description, *Publii Syri mimi Sententie* (about 700 verses in all), edited by Wölfflin (Leipzig, 1869), A. Spengel (Berlin, 1874), W. Meyer (Leipzig, 1880), and O. Friedrich (Berlin, 1880). See W. Meyer, *Die Sentenzen der Spruchheere des Publii* (Leipzig, 1877). Of the mimes themselves we have only two titles.

Revised by M. WARREN.

Puccoon, or **Indian Dye**: a general name applied in the U. S. to several dissimilar plants which yield a yellow or reddish juice, often utilized for dyestuffs. The best-known representatives are species of *Lithospermum* (*L. hirtum*, *L. canescens*, etc.), of the borage family. In many places the blood-root (*Sanguinaria canadensis*) of the POPPY FAMILY (*p. v.*) bears this name. *Hydrastis canadensis* (of the family *Ranunculaceæ*) is the yellow puccoon.

Pückler-Muskau, pükler-moos'kow, HERMANN LUDWIG HEINRICH, Prince of: author and landscape-gardener; b. on the family estate of Muskau, in Silesia, Oct. 30, 1785; studied law at Leipzig; served in the army during the wars against Napoleon; traveled much, and became widely known both for his enthusiasm for landscape-gardening and through his spirited traveling sketches. D. at Branitz, Feb. 4, 1871. Under his direction gardens were laid out at Muskau and at his usual residence, Branitz, in the Prussian province of Brandenburg; he also wrote *Andeutungen über Landschaftsgärtnerei* (1834). Of his traveling sketches several have been translated into English—*The Travels of a German Prince in England*, by Mrs. Sarah Austin (3 vols., 1832); *Tutti Frutti*, by Edmund Spencer (5 vols., 1834); *Mehemet Ali and Egypt* (3 vols., 1848).

Puddling: See IRON MANUFACTURES and FURNACE.

Pudicitia: the Roman personification of female purity, the virtue *par excellence* of womanhood, as bravery was that of manhood. From early times there was a temple to this goddess in the Forum Boarium, to which, however, only women of patrician families were admitted, though somewhat later a shrine to *Pudicitia plebeia* was established for women of plebeian origin. The cult seems to have fallen into neglect by the middle of the second century B. C.

G. L. H.

Puebla: an interior state of Mexico; between Tlascala, Hidalgo, Vera Cruz, Oajaca, Guerrero, Morelos, and Mexico. Area, 12,739 sq. miles. It is entirely included in the region of the plateau, most of the surface consisting of plains or rolling lands, with an average elevation of about 6,500 feet, but these are varied by groups of hills or mountains and, toward the S., by deep valleys. It is partly surrounded by the highest mountains in Mexico. The climate is temperate and healthful; the soil is generally fertile, and agriculture is the principal occupation, the most important crops be-

ing maize, agave (supplying pulque for the markets of Mexico city), and, in the valleys, sugar-cane and cotton; cattle and sheep raising are important industries in some districts. Deposits of silver, copper, and other metals, and coal are known, but are worked only on a small scale. The beautiful "Mexican onyx," a variety of alabaster, comes principally from this state, and many varieties of marble are quarried. The manufactures, especially of cotton and woolen goods and of pottery, are considerable. The state has many interesting antiquities. Pop. (1893) estimated, 845,240, of whom a large proportion are civilized Indians.

HERBERT H. SMITH.

Puebla (in full, *Puebla de Zaragoza*; formerly *Puebla de los Angeles*): capital of the state of Puebla; on the plateau, near the confines of Tlascala and the Malinche Mountain; 7,200 feet above the sea (see map of Mexico, ref. 7-H). It is clean and healthful, but, aside from the fine cathedral and churches, there are few pretentious buildings. Two parks and a large number of public squares add to the beauty of the place. It is noted for its manufactures of cotton and woolen cloths, etc., and for the onyx and marble quarries of the vicinity. It is connected by rail with Mexico, Vera Cruz, and Oaxaca, and has a thriving trade. The Indian element is largely represented in the population. Puebla was founded as a mission village by the celebrated Toribio in 1532. The U. S. troops under Scott had their headquarters here June-Aug., 1847. Later it was a noted center of the clerical party, and was twice besieged and taken by Comonfort 1856-57. The French, on their first advance, were repulsed from Puebla May 5, 1862, in a battle which is annually celebrated under the name *Cinco de Mayo*; they captured it in May, 1863. Pop. (1892) estimated, 110,000.

HERBERT H. SMITH.

Pueblo: city; county-seat of Pueblo co., Col.; on both sides of the Arkansas river, at the confluence of the Fontaine qui Bouille, and on the Atch., Top. and S. Fé., the Chi., Rock Is. and Pac., the Denver and Rio Grande, the M. Pac., and the Union Pac., Denver and Gulf railways; 120 miles S. of Denver, 170 miles S. E. of Leadville; elevation 4,660 feet above sea-level (for location, see map of Colorado, ref. 5-E). It is in an agricultural, mineral, and stock-raising region; has the largest iron and steel works between the Missouri river and the Pacific coast, capitalized at \$10,000,000; and is noted for its extensive smelting works. It is easy of access from Leadville and other mining centers and from the great coal-deposits of Trinidad, Cañon City, and nearer fields. There are 3 large smelters, 2 great blast furnaces, numerous machine-shops, rolling, blooming, planing, and nail mills, iron and brass foundries, fire-brick works, lead-pipe works, brewery, large slaughtering-plant, oil-refinery, canning factory, artificial-ice factory, pipe-works, and many minor manufactories. Artesian wells in the city supply a wonderful mineral water. Within a radius of a few miles are thirty oil-wells. The Union Stock-yards occupy an extensive tract of land. The city has gas-works, Holly water-works, electric lights, electric street-railways, 39 churches, 16 public-school buildings, public-school property valued at over \$400,000, a collegiate institute of the Methodist Episcopal Church South, 2 Roman Catholic schools, 8 hotels, public library, board of trade building, the Colorado Mineral Palace, a permanent structure for the exhibition of the mineral resources of the State, grounds and buildings of the State Agricultural Society, and the State Asylum for the Insane, together with 7 other hospitals and asylums. In 1894 there were 6 national banks with combined capital of \$1,000,000, and 2 savings-banks with capital of \$100,000, and a monthly, 3 daily, and 6 weekly periodicals. The assessed valuations of 1894 aggregated \$9,877,134. Pop. (1880) 3,217; (1890) 24,558; (1894) 30,000.

C. H. SMALL.

Pueblo (pweb'lō) **Indians, or Pueblos**: certain families of North American Indians. The term *pueblo*, meaning a town or village, as distinguished from a mere encampment or temporary settlement, was applied by the early Spanish explorers to the great terraced communal house-structures of the sedentary agricultural Indians of Mexico, New Mexico, and Arizona. Later it was adopted as the name of the inhabitants themselves rather than of their villages; hence the use here of the term to designate principally the sedentary town-building Indians of the arid region—or Aridians—of whatsoever stock or period.

Stocks or Families.—The Pueblos proper, who still maintain more or less perfectly their original modes of life, are all included in four linguistic families or stocks, represent-

ing twenty-eight tribal groups occupying as many villages in New Mexico, Arizona, Texas, and Chihuahua, in Mexico, detailed in the articles on the KERESAN, TAÑOAN, SHOSHONEAN (*Tusayan*), and ZUÑIAN INDIANS. As the special characteristics of each of these families are treated under the titles given, only those traits more or less common to all of them and to other extinct representatives of the Aridian phase of culture, such as the Mansos, who were probably Tañoan, will be described. See TAÑOAN INDIANS.

Physical Appearance.—Setting aside the changes which have been wrought on the Pueblos by various admixtures with other peoples during the last three centuries, they were, although representing distinct linguistic families, curiously similar to one another. All were originally a comparatively diminutive people, the men averaging not much more than 5 feet in height; the women were even shorter. As a rule, the men were dark or tawny, the women comparatively fair or olive. The men were spare, and rather sharp-featured, but mild of expression and intellectual in appearance. It is significant that while the Pueblos were strictly Indian in type, though more diminutive and refined, there was far greater individual variation among them than among the less advanced Indians. This variation was more pronounced among the Zuñian Indians and least so among the Tañoans, who led a less restricted life.

Dress.—Their wearing material was mostly woven of bark, yucca fiber, cotton or cottonwood down, fur, and feathers. The men wore cat-skin or rabbit-skin robes or pelisses of feather work, or else elaborately striped and embroidered mantles of cotton, gayly embroidered coats of the poncho variety, kilt-skirts tasseled and embroidered, held in place by long, broad cotton girdles, buckskin tights reaching above the knee, or else leggings of long strips of the same material wound round and round the leg, and fastened at the knee with beautifully woven garters or interbraided strands of colored cotton yarn; or, again, long crocheted stockings reaching high up the thighs. The feet were protected by sandals of plaited yucca, or more rarely by buskins or moccasins of buckskin with rawhide soles. The hair was banged to the eyebrows; two long side-locks depended from the temples, and the back hair was tied in a bunch with a plaited ribbon into which a bunch of brilliant feathers (preferably of the macaw) was stuck; a fillet of fiber, or plaited husks, dyed of the color symbolizing the quarter to which the wearer belonged, was bound about the crown. The costumes of priest-chiefs were far more elaborate, being symbolically varied. The warriors wore cone-shaped helmets of thick hide, or headgear made from the headskin of the puma, bear, horned antelope, or bison. They also wore cuirasses of skin, or of padded cotton and yucca, and carried round shields of basketry, of heavily and closely netted cotton, or of thick rawhide, symbolically painted. They carried short lances, javelins, and throwing-slats, long-bows, war-clubs, very broad flint or obsidian knives sheathed in pouches suspended from the belt in front, wood-hafted stone axes stuck through the left fold of the girdle, or else wooden swords edged with close-set blades of obsidian or other flinty material, and slings of skillfully braided yucca.

The costume of the women differed little. They wore a long *camisa* or sleeveless gown of cotton which reached below the knee. An embroidered mantle of cotton, a light head-shawl, leggings and sandals, or moccasins like those of the men, but uncolored, or, for house wear, thickly knitted stockings, completed the dress. The hair of the women was banged slightly in front, parted lengthwise over the middle of the head, and done up in two square knots back of the ears for matrons; in two round coils, "like pitcher handles" (as the early explorers describe them), over the ears for the unmarried women. They wore numerous ornaments, certain of them as amulets of maternity, and others, like those of the men—bracelets, finger-rings, and ear pendants.

Habitations.—Among the Eastern tribes the parallelogrammic form of house-clustering seems to have prevailed, while among the interior and Western tribes the polygonal or rounded village was more usual; but in all, the outer walls were usually built highest, the terraced stories of the town descending from them and looking inward on open courts and alleys. There were no doorways in the lower stories, but access was gained by means of very long-poled ladders, arranged like well-sweeps, so that they could be easily swung up at night for protection. The houses, particularly of the lower stories, were entered through scuttles in the roofs by means of step-logs or ladders. The windows below were mere portholes, while above they were larger and

sometimes well glazed with plates of selenite or mica. In the upper stories were both doors and windows. The cellular houses of these villages were divided, but slightly, into wards or septs corresponding to the number of tribal divisions, and again subdivided into sets of quarters, according to the number of clans in each division. These quarters were permanently occupied only by the women (to whom they belonged) and the children. The men of the tribe, both married and single, had as permanent quarters the large semi-subterranean kivas, of which there was one for every division of the tribe. Here all councils of the clan-clusters were held and ceremonies of the secret cult-societies belonging to them performed. Here also, especially in winter, the men assembled to labor at their looms, at weapon-making, and at minor arts. Here also they sought amusement, and here the "elders" taught the adult youth the lore and regulative usages of the particular division to which they belonged. Lawsuits or disputes between the clans were settled here, while the affairs of the tribal divisions were administered from the principal kiva of the town, usually that of the leading division. In this kiva also, all tribal affairs were conducted, and strangers from other tribes were entertained. Each household in the clan-quarters occupied three or more rooms, according to numbers—for the rooms were very small—and was presided over by the eldest matron. There were always a kitchen, a storeroom, and an eating and living room, in the latter of which the husbands came to meals with their families or visited their wives.

Occupations and Methods of Life.—The women cared for the families, prepared all food, made the pottery and basketry, and fashioned the stone-mills and other household utensils. The men were the principal weavers and spinners. They tilled the fields, raising their crops mainly by means of irrigation. The women had little truck-gardens close to the towns, where leeks, chile, or red peppers, and a few fragrant herbs were raised by hand-watering. The main meat-supply was gained by hunting, which was usually communal, and whole divisions joined in great round-ups of game, for which purpose enormous corrals were constructed. However, turkeys and other small animals were domesticated by some of the Pueblos. Land-tiling, the construction of irrigating-dams, ditches, and embankments, and all other operations conducted at a distance from the towns, were, like the hunts, communal undertakings, since the villagers, with their rich stores of food, were ever liable to predatory attacks from the neighboring nomadic tribes. This state of affairs reacted powerfully on their sociologic organization, forms of town-building, and methods of life. It also affected their intercourse with the outside world. Journeys of all descriptions were communal. This again had the effect of making the Pueblos of the interior essentially home-dwelling and extraordinarily conservative and exclusive.

Culture Characteristics.—All the Pueblo tribes were composed of clans, and descent was in the female line. These clans were families of kindred named after some animal, plant, mineral, or element. Some of the smaller tribes grouped these clans in two divisions—those of the North and South or of Summer and Winter; others had four clan-groups (those of North, West, South, and East, or of the Four Seasons), while the highly developed Pueblos had rarely fewer than six, usually (as with the Zuñians) seven groups—namely, those of the North, West, South, East, Upper, Lower, and Middle regions. The clans were grouped or related, according to the supposed analogies of their totems or namesakes (the animals, etc., from which they were named), to the various phenomena of the different regions. Thus the Puma, being fierce and loud-roaring, belonged in the north, whence came the fiercest winds and raging storms of winter; and as the Live-oak never withered in these storms, it too pertained to the north and winter; hence the clans of the Puma and the Live-oak, and others like them, belonged obviously to Winter and the North, and therefore belonged together. The Sun and the Eagle, dwellers in the skies, the Turquoise, a bit of the sky itself, were no less surely of the upper world than were the Rattlesnake and the Frog of the lower world.

Over each group of clans was a priest-chief, or "elder," the worshiper-in-chief, keeper of the medicines or powers and mysteries of the great animal-spirits and gods of the region or world-precinct which his division represented.

This priest-chief was also the oracle in all religious and secular matters in his "household." There were generally seven of these divisional priests or leaders of clan-groups, and rarely fewer than four. Among them were the "Peace-

ful Leader" and "Wrathful Leader," who were popularly known as Governor or Alcalde, and Captain of War. These have their assistants, or *tenientes*, whose offices, like those of their superiors, are of Spanish adoption, and who are annually elected with the sanction of the supreme council of priest-chiefs or *caciques*.

The people were controlled not so much by the Peace and War Chiefs (to whom they were nevertheless obedient generally) as by the oracular and magical fathers behind them. These deserved the reverence and respect in which they were held as the "fathers and mothers" of the tribe, for they were the *penitentes* of their people, and had to labor at the sacred rites from season to season, to watch, fast, and repeat rituals, etc., days at a time on stated occasions. Therefore, under the auspices of the divisional societies, nearly all the great "customs" (such as the games, races, communal hunts, tillings, harvestings, and journeyings for wood) were annually performed for their benefit.

There were in every considerable tribe of Pueblo Indians from four to thirteen secret or tabu societies or priestly fraternities of the so-called "medicine-men" of popular tradition. These societies were systematically adjusted to the tribal sociologic organization. They pertained separately, according to their special functions, to the various regional clan-groups or divisions. Their members, with the divisional priest-caciques, were the keepers and teachers of the mythic lore and rituals, religious regulations, magic mysteries, and medicines or "potencies" of the divisions to which they belonged. Thus the name of *cult-societies*, as given them by Powell, is most appropriate. The societies of the North were wind and cold makers, and took precedence in winter; those of the South—fire-makers or masters of fire—had control in summer. Above all, the members of these cult-societies were doctors, or priest-doctors, each according to the region, season, element, and associated function of his particular society. Their practice of medicine and the application of remedies was, in theory, irrational, though strictly regulated and often both simple and surprisingly successful. The belief in the universality of disease and its spiritual or ghostly origin vastly enlarged the field of supposed usefulness and the power of these fraternal priest-doctors. Not only did they treat disease, but their more regular labors were directed toward its (spiritual) prevention.

Religion.—The religion of the Pueblos was a Nature-religion. Their gods (equally of both sexes) were animal gods, phenomenal gods, ancestral gods, and celestial gods. Supreme among the immortals was the God of the Sun-shield, the Creator of the All-makers, Water or Generation, personified in the Ocean-mother, the Sky-man, and the Earth-woman, whence all mortal things were born. Under the Sun-god were the God of Fate and his twin younger brother, the God of War; the God of Time or the Seasons, and his younger brother, the God of Dawn, etc. Apart from all was the Master of Life—son of the Sun-god and of Life, or the Great Waters. He was the Messiah of the Pueblos, who was supreme over the animal and phenomenal gods and the mediator between these mortal-like beings and the celestial or attribute gods, and was a personification of the reflection or image of the sun in the water, as the Goddess of Love, or of the Ocean, was the reflection of the Moon (Goddess of Menstruation or Maternity).

All of these gods were supposed to be related to one another as are men, creatures, and things in this world; their organization was like the sociologic organization of men. The heavenly or spiritual world was over, yet interpenetrated the visible world. As this world had a center or middle in the center of the Pueblo country, so the spiritual world had a center or middle over the Lagune of Shipapu (the hot springs of Colorado in the north of the Pueblo country), which was the place of umbilical connection between the parent spiritual world and the offspring mortal world. Thither, therefore, the rituals and offerings to the Master of Life, or Nether-sun God, were always addressed by the priests of the cult-societies.

Just as the Pueblo theory of medical practice was spiritual, so their theory of spiritual worship was largely medical. The ills of life and times were diseases to be remedied by charms and formulas and by rules of spiritual hygiene (observances and right behavior), or to be prevented by work, the business or industry of worship. In all this it was necessary to aid and be aided by the gods, and to this end, in token of sincerity, the priests abstained from meat and all other carnal things four days each month, and from eight to ten days at the summer and winter solstices, or for

longer or shorter periods whenever evil times demanded. At such times they labored day and night, making symbolic, plumed prayer-wands, as testimonials of constancy to be set up in shrines abroad as "prayers from season to season." These labors were accompanied by the repetition of traditional rituals and incantations of great length, and dramaturgic performances (the so-called *cachinas* or dances) before altars set up to symbolize one or another of the sacramental regions. Offerings of sacred prayer-meal were also made on various occasions; shell, coral, or turquois beads or other treasures were sacrificed as spirit-medicines or as payments or gifts of good will.

The people at large joined for a day in each month and four days semi-annually in these exercises of worship. In autumn the dead were remembered by all with offerings of the substance of food and other articles consumed or set free by fire, and at New Year or the "mid-time" (in November) the solemn festivals and dramaturgic celebrations of creation and of the "middle of the world" were held. The dancers of the *cachinas* were masked as animals or as demons (see ZUNI INDIANS), joining the priests in these representations of the re-creation of the world and the seasons.

Customs as to Marriage, Burial, etc.—The men of a clan could not marry the women of the same clan, and marriage was, therefore, almost as much an affair of the clans as of individuals, alliances taking place as much as possible outside of the clan-group as well as the clan (in order that diverse seasons and elements might be "wedded"). Until after betrothal, lovers wooed very indirectly; that is, a young man, in courting, would strive to attract the attention of his choice by general, not pointed, displays and actions. After betrothal the young man was accepted by the maternal relatives as a perpetual rather than temporary guest of their clan and of his wife. Thus divorce, of course, was chiefly in the hands of the women.

A midwife (usually a cult-priestess), the maternal grandmother or matron, and, if a priestess, the paternal grandmother, or in her place grandfather (called on the occasion "grandmother"), presided at birth. Immediately afterward birth-offerings were made by the paternal female relatives, and the child was laid, with many ceremonial observances, on a sand-heap, and an ear of "male corn" for a boy, or of "female corn" for a girl, was placed by the infant's right side. After nine days the child was presented to the Sun by the paternal elders, and formally adopted from them, and clan-named by the clanspeople of the mother, to whom thenceforward it belonged.

After death these observances were reversed. A jar of water was broken by the dead, who was thus renounced by the clanspeople of the mother to the clanspeople of the father. Presents of food and personal property were given, and the body was then washed and wrapped in blankets with sacred offerings and plumes. If the dead had been a clan or cult priest, he was buried under the ladders outside or inside of the house, the presents or offerings of the kin being burned; if not priestly, then the body of the dead (in order that the soul be facilitated in its escape from the flesh and from sorcerers) was burned with the offerings, thus being given back to the sun and earth.

Pristine History.—Originally, the Pueblos included representatives of several more stocks. In the south the Mansos, already mentioned, the Sumas, Janos, and Piman tribes belonged to them; in the west two or more Yuman tribes; others, the stocks of which are unknown, have been exterminated or absorbed principally by the Apache, Navajo, and Comanche within the last four centuries. But, howsoever diverse the stocks of the original Pueblo Indians may have been, they everywhere followed practically the same line of development, and proceeded so far toward becoming a distinctive people that the term Aridian has been adopted as best characterizing them. Evidence is complete that these Pueblo peoples were derived from numerous (probably small) tribes bordering the great arid region in an irregular semi-circle from Central Utah and Colorado on the N. and Central Texas on the E. These tribes were driven southward into the deserts by stronger tribes from time to time, and were forced to live in limited areas near scant water-supplies, in widely sundered bands. As these bands increased, cultivation by means of a crude system of irrigation was necessitated. Thus the bands became fixed, and built more substantially earth-covered wooden huts; then, from scarcity of timber, larger and better houses of stone and mud were constructed, separate, yet in straggling groups around their

watering-places and scattered fields. Then came their time of trial, which only the hardiest survived; tilling the soil and remaining fixed in habitation, they acquired food-stores and possessions which drew their enemies once more upon them, and forced them to flee to the cañon walls, where they became cliff and cave dwellers. The necessity of building on limited sheltered shelves of the rocks and of living in such crowded villages as the CLIFF-DWELLINGS (*q. v.*) developed at once the characteristic terraced and cellular type of architecture, and the divisions of quarters (for example, of the men from those of the women), etc., so peculiar to their pueblos of later times. Here they abode until they became too numerous for their footholds in the cliffs, and sought safety in numbers, climbing to the heights of their valley or cañon fields, and there building their many villages in one. Yet for a long time they still used their cliff-towns as farming villages, and often fled to them and built others like them when pressed by enemies. This was substantially the history of the development of the Pueblo Indian village life as found in the sixteenth century by the Spaniards.

The Zunians were probably the first Pueblo peoples who, still living in the sixteenth century, had become fixed in the habit of *plain-dwelling* in segregated and definitely interrelated but not wholly autonomous communal villages. Nearly all of the Pueblos of other stocks were rapidly following their example at the time of the Conquest, as the Keresans had long done, and the Tusayan villagers had, although building the latest-made pueblos, most perfectly done.

Ruins.—Throughout the whole vast arid Southwest, from Central Nevada, Utah, Colorado, and Texas southward to and far beyond the boundary of Mexico, occur everywhere, except in the highest mountains, ruins which mark the presence and wanderings of the Pueblo peoples, and record vividly the stages of their slow development as communal villagers. Many hundreds of these ruins are buried under sand and drift, while others remain to be revealed only by accident. Of the conspicuous ruins, there are doubtless more than 3,000 in New Mexico, Arizona, and a small part of Utah and Colorado alone, and of smaller remains fourfold that number.

These ruins may be roughly classified, for convenience of reference, as lava-pueblos, small or single house pueblos, cliff-pueblos, communal pueblos, group-pueblos, and aggregate or city pueblos (towns), such as the Casas Grandes of Southern Arizona and Northern Mexico. An example of group-pueblos is furnished by the Seven Cities of Cibola, now in ruins, which were the original towns occupied by the Zuñis, the name being given by their Spanish discoverers in 1539-40. Some of these types are practically universal, and there are sections in which all are present; but the group-pueblos and city-pueblos occur only in comparatively limited areas. This variation in type and relative distribution represents the successive phases in development of a single or of similar peoples.

Population.—At the time of the Spanish conquest the Pueblo Indians numbered, all told, more than 30,000. That their numbers were not less is evidenced by the ruins of Pueblos which were recorded as occupied in the sixteenth century. The number of Pueblo towns in the U. S. now inhabited is only twenty-seven, an additional village (Senecú del Sur) being in Chihuahua. The total population of the modern towns is about 10,000. The Pueblo Indians, as a whole, are not materially diminishing in numbers.

Authorities.—See the works cited under ZUNI INDIANS; also Holmes and Jackson in Bulletin of the U. S. Geol. and Geog. Survey of the Territories, vol. ii. (1876); Wheeler Survey Report, vol. vii., *Archæology* (1879); Morgan, *Houses and House-life of the American Aborigines* (Cont. N. A. Ethnology, vol. iv.); and the annual reports of the Bureau of Ethnology. See also CLIFF-DWELLINGS, INDIANS OF NORTH AMERICA, KERESAN INDIANS, SHOSHONEAN INDIANS (*Tusayan*), TANOAN INDIANS, and ZUNI INDIANS.

FRANK HAMILTON CUSHING.

Pueblo Largo: See TANOAN INDIANS.

Puerperal Fever [*puerperal* is from Lat. *puer'pera*, a lying-in woman; *puer*, child + *pa'rere*, give birth]: a continued fever, formerly supposed to be specific, appearing in puerperal women between the second and sixth days after delivery. The condition is initiated by a chill, followed by fever, uneasiness, nausea, abdominal tenderness or pain, diarrhoea, arrest of the lochial discharge, great prostration, and sometimes by delirium. Pneumonia, pleurisy, pericarditis, acute Bright's disease, and suppurative inflammation of the

joints may occur as complications. The disease runs a rapid course, usually terminating fatally within a week, the patient dying from exhaustion.

Puerperal fever is a septic disease that is always due either to infection from some micro-organism already existing in the woman's genital tract (auto-infection) that finds an ingress into the system through the tissues that are lacerated and bruised during labor, or (as is generally the case) to infection by the midwife or attendant, or to contact with infected bedding, clothing, or instruments (hetero-infection). In 1843 Dr. Oliver Wendell Holmes promulgated this latter theory in America, and in 1847 Semmelweis proclaimed the doctrine in Europe. It was not until bacteriologists had conclusively demonstrated to what septic infection was due that the foregoing idea was generally adopted. Now there is no obstetrician of any scientific attainments who would question the fact. There should be no deaths from puerperal fever in properly attended obstetrical cases, in which absolute cleanliness of the midwife's hands and of all things coming in contact with the patient are secured.

On the first symptoms the genital tract should be irrigated, at intervals of three to four hours, with from 3 to 4 quarts of a 1-per-cent. solution of table-salt in boiled water, to which may be added 2½ per cent. of creolin or carbolic acid, that is allowed to cool to a temperature of from 100°-105° F. If this dose does not reduce the fever in a short time, the physician may be certain that a portion of the after-birth is left within the uterus and is decomposing, and he should place the patient on an operating-table, and by means of a speculum expose the uterus and scrape its interior with a long wire scoop (curetting), following this by irrigation with a hot-salt and creolin solution. This, with a hot-water coil or hot-turpentine stupe to the abdomen, and iron, quinine, and brandy internally, comprises the necessary treatment.

S. T. ARMSTRONG.

Puerperal Insanity: perversion of the mind in women immediately after childbirth, although it may also occur before delivery, or weeks or months after labor, when excessive nursing has undermined the strength. It may therefore be considered as a derangement of the mind due to the influences of the childbirth upon the nervous system and emotional nature of the mother. Puerperal insanity may be characterized by mental agitation or excitability, or, reversely, the patient may sink into a state of mental apathy, moodiness, reticence, or despondency. There will be restlessness, inability to sleep, headache, impaired appetite, coated tongue—in some cases an increase of temperature. The bowels are usually constipated and the urine diminished in quantity. The secretion of milk is often lessened or suspended, and a sudden maniacal condition may follow immediately upon a cessation of the flow of milk. Although the delirium in some cases is violent, no evidence of inflammation or other organic disease of the brain or its membranes has been detected, on post-mortem examination, as the lesions to which the symptoms might be due. In the delirious form and in the melancholic form there is equally an aversion to the father or the child. Suicide and murder of the child are occasional occurrences. Puerperal insanity may be expected to occur in women of nervous temperament or those predisposed to insanity; in such also as are greatly reduced by previous ill health, by hæmorrhage during or following delivery, or whose blood has been impoverished. The maniacal form is apt to occur immediately after childbirth and in the young and more vigorous, whereas the melancholic type more often begins late during lactation, or in the old and debilitated, immediately after labor. The prognosis is favorable; the mind in most cases is, in time, restored to a normal condition. The patient may wholly escape it at subsequent childbirths if the system be fortified in advance by iron to correct anemia, and care be taken to prevent unusual loss of blood during parturition. Where insanity or emotional excitability are family traits mania may recur with successive labors despite all precautionary efforts. The infant, in most cases, should be removed. Firm but gentle control of the patient is essential, and often removal from husband, family, and familiar friends is essential. Rest and sleep must be insured by cerebral sedatives and soporifics, and even the hypodermic injection of morphine may be required in obstinate insomnia and delirium. The strength must be sustained and the blood enriched by cod-liver oil, quinine, and iron.

Revised by W. PEPPER.

Puerto Caballos: See PUERTO CORTEZ.

Puerto Cabello. pwâr tō kâbêllo; principal port of the state of Carabobo, Venezuela; on a small peninsula, which, with a chain of small islands and reefs, forms a very secure and commodious harbor admitting the largest vessels (see map of South America, ref. 1-C). A railway runs inland to the copper region of La Luz. The trade of Carabobo, Lara, Zamora, and Los Andes centers here, and the port is the most important in Venezuela after La Guayra; the principal exports are coffee, cacao, dye-woods, hides, and copper ores. The port was strongly fortified in the eighteenth century, and repulsed the attack of a British fleet. During the war for independence it changed hands several times, and was the last stronghold taken from the Spaniards in 1823. Pop. (1891) 10,145. H. H. S.

Puerto Cortez', or Puerto Caballos: a town and port of Honduras; on a bay of the Caribbean coast; 125 miles N. N. W. of Tegucigalpa (see map of Central America, ref. 3-G). The bay forms an excellent harbor, where the principal railway of Honduras terminates. The town, although small, is the principal northern port of Honduras. Hernando Cortés founded here (1525) the town of Natividad, subsequently abandoned for Omoa. H. H. S.

Puerto de Santa Maria. pwâr tō-dâ-san-tâ-mâ-ri-â, or simply **El Puerto:** town; in the province of Cadiz, Spain; at the mouth of the Guadalete in the Bay of Cadiz; 22 miles by rail N. E. of Cadiz (see map of Spain, ref. 20-D). It is a handsome and well-built town, surrounded with fine promenades, and in communication with the great commercial centers, as it is the principal place for the exportation of sherry wine. Leather, soap, hats, brandy, and liqueurs are manufactured, and in May of each year an important bull-fight takes place here. Pop. (1887) 20,590.

Puerto Lamar: See COBIJA.

Puer'to Prin'cipe: a town near the center of the island of Cuba; 45 miles by rail W. S. W. from its port of Nuevitas, on the northern coast (see map of West Indies, ref. 4-D). It is the third city of the island in size, is the center of a rich agricultural and grazing district, and exports sugar, hides, cattle, etc. It was originally founded in 1514 on the site of an Indian village near the coast, but was subsequently moved inland. Pop. with the district (1892), 46,641; of the city proper, about 28,000. H. H. S.

Puerto Rico. pwâr tō ree kō, or **Porto Rico.** pōr tō ree kō: an island of the West Indies, belonging to Spain; separated from Santo Domingo on the W. by the Mona Passage, and having the Virgin islands on the E.; area, 3,530 sq. miles, and its dependencies, the small islands of Mona, Culebra, etc., aggregate 184 miles more. A low range of mountains, the Sierra Cayey, traverses it from E. to W., and numerous branches separate fertile and well-watered valleys; near the coasts there are equally fertile plains of considerable extent. The highest peak, Mt. Yunque, near the northeast end, is 3,688 feet above the sea. There are no volcanoes, and few severe earthquakes have been felt. The climate compares favorably with that of any other of the West Indies; foreigners easily become acclimated; the heat, even in the summer months, is seldom severe, and almost the only drawbacks are the hurricanes which sometimes blow between July and October. Nearly the whole surface is under cultivation, forest being restricted to a few mountain sides. The principal products are sugar, coffee, and tobacco for exportation, and maize, mainly for home consumption; the grazing industry is considerable, and hides are exported. There are no minerals of importance. The exports in 1887 were valued at \$10,181,291, the U. S. taking more than any other country; imports, \$10,198,006, mainly from Great Britain, Spain, the U. S., France, and Germany. A railway system to girdle the island is projected and partly completed, and there is a good telegraph service. Puerto Rico is one of the most thickly populated regions of the New World. In 1887 it had 807,708 inhabitants, or about 216 to the square mile: the proportion of Negroes and mulattoes is less than in most of the other islands. With its dependencies it has formed a province of Spain since 1870. The official chief is a governor chosen by the crown. Spanish is the common language, and nearly all the inhabitants are Roman Catholics; education is somewhat backward. The island was discovered by Columbus in 1493, and was conquered by the Spaniards under Ponce de Leon 1509-18; during this period nearly the whole native population was exterminated. It has since been held by Spain. Slavery was abolished in 1873. H. H. S.

Pueyrredon, pwā-ē-rā-dōn', JUAN MARTIN: general and politician; b. at Buenos Ayres about 1780. He early supported the patriot cause, and, after the first period of confusion, was chosen supreme director of the united provinces of La Plata July 9, 1816. Under him the republicans of the south first acquired cohesion, and his efficient support of San Martin resulted in the independence of Chili. Pueyrredon resigned in June, 1819, and thereafter took little part in politics. D. near Buenos Ayres about 1845.

H. H. S.

Pufendorf, SAMUEL, Baron von: jurist and historian; b. near Chemnitz, Saxony, Jan. 8, 1632; son of a Lutheran clergyman; studied theology at Leipzig, public law at Jena, and in 1658, after a short residence and imprisonment in Denmark, published anonymously at Geneva *Elementa Jurisprudentiæ Universalis*; in 1661 became Professor of the Law of Nature and of Nations at Heidelberg; in 1667 published *De Statu Imperii Germanici*, denouncing the house of Austria and exposing the inherent weakness of the holy empire; in 1670 accepted the professorship of law at Lund, and in 1673 published *De Jure Naturæ et Gentium* (Of the Law of Nature and of Nations). Although in this work there is much that is commonplace, it marks an epoch in legal literature, being the first to give a systematic treatment to the subject-matter contained in it. He followed largely, but not servilely, the doctrines of Grotius, and supplemented them with his own ideas and with theories derived from the works of Hobbes, with whom he differed on many points. In 1677 he went to Stockholm as royal historiographer and remained there till 1688, when he entered the service of Frederick William, Elector of Brandenburg. He wrote a number of historical works on Swedish and Prussian affairs which in general are reliable, but are very tedious reading. D. in Berlin, Oct. 26, 1694.

F. STURGES ALLEN.

Puff-adder: a deadly serpent (*Clotho arietans*) of South Africa, deriving its popular name from its habit of puffing up the neck when irritated. It is very large and thick, and is ordinarily slow, but can move very quickly when angered. There is no known remedy for its bite.

Puff-balls: saphrophytic plants of the family *Lycoperdaceæ* and order *Gasteromycetæ*, in which the dust-like spores escape in a cloud when the ripe spore-fruit is suddenly compressed. They grow on the ground or on decaying stumps, logs, etc., and are abundant in all temperate and warm climates.

The proper plant of a puff-ball consists of a mass of white branching threads (often called the mycelium) which creep through the soil or decaying matter, gathering food and moisture for its nourishment. After a time there appear upon the plant at various points small rounded bodies, the young spore-fruits, consisting of compacted threads. These bodies grow rapidly, and eventually emerge from the ground. When young there is little differentiation in the tissues of the spore-fruits, but as they grow the outer layers become modified as a boundary tissue (*peridium*), more or less separable into an outer and an inner stratum, while the interior differentiates into (1) a sterile and (2) a spore-bearing portion (*gleba*), the former constituting the base or supporting part of the spore-fruit, while the latter fills the upper, usually enlarged part.

The spore-bearing tissue is penetrated by numerous narrow, tortuous passages lined with perpendicularly placed cells (the *basidia*), each of which produces several spores. The young basidia are smooth, but protrusions appear upon them later, grow out, become elongated, and finally form spores by enlargement at the distal end. Thus it follows that the tortuous passages above mentioned contain myriads of spores. When ripe these are set free by the deliquescence of most of the spore-bearing tissue and the evaporation of the surplus moisture. Certain thick-walled threads do not deliquesce, and are known collectively as the "capillitium." The peridium now breaks irregularly, or in some species more or less regularly, allowing the spores to escape and be carried away by the wind.

The more common puff-balls of North America may be arranged under several genera as follows:

1. *Geaster*, the earth-stars, in which the outer peridium splits stellately, becoming reflexed away from the thin persistent inner one. Of the sixty-eight known species, many have a wide distribution, while others appear to be restricted to particular regions. Thus *G. saccatus* (Fig. 1) occurs in North and South America, the East Indies, and

Australia. *G. fimbriatus* is found throughout Europe, North and South America, the West Indies, South Africa, and

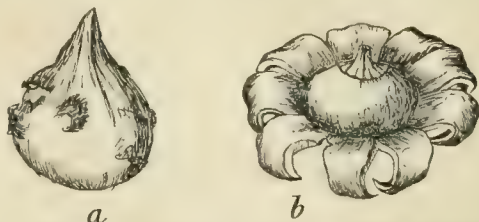


FIG. 1.—*Geaster saccatus*. a, before, and b, after the rupture of the outer peridium. Slightly reduced.

Australia. *G. hygrometricus* (Fig. 2) appears to be found in all parts of the world. The segments of its outer peridium



FIG. 2.—*Geaster hygrometricus*. a, when moist; b, when dry. Slightly reduced.

are strongly hygrometric, opening when moist, and becoming inflexed when dry. On account of some structural peculiarities, it is regarded by Morgan as the type of a separate genus, *Astræus*.

2. *Tylostoma*, the stalked puff-balls, in which at the maturity of the spore-fruit its sterile base rapidly elongates into a stalk. About twenty-five species of these curious plants are known. They occur in all parts of the world, especially in dry and sandy regions. One of the most widely distributed species is *T. mammosum* (Fig. 3, a), which occurs in Siberia, Europe, North America, and Australia. *T. fimbriatum*, another common species, occurs in Europe and Australia also. *T. campestre* (Fig. 3, b) and *T. meyenianum* (Fig. 3, c) are known only from the Rocky

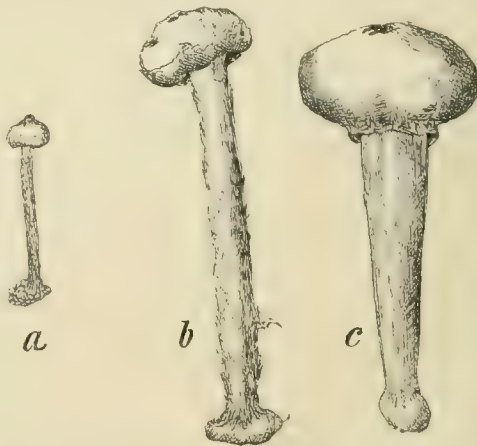


FIG. 3—a, *Tylostoma mammosum*; b, *T. campestre*; c, *T. meyenianum*. All two-thirds natural size.

Mountains and adjacent regions, the latter ranging southward to Peru.

3. *Calvatia*, the big puff-balls, in which the spores escape by the irregular rupture of the peridium of the large spore-fruit, the gleba soon breaking up entirely. When young and perfectly fresh they are edible and nutritious.

One of the most common of the big puff-balls is *C. maxima*, which is globular or nearly so, white, and from 6 inches to a foot in diameter. Occasionally it attains an enormous size; one found in Ohio was 20 inches in diameter and weighed 17½ lb. It is found in grassy fields in Europe, Asia, and North America. Another common species is *C. craniiformis* (Fig. 4), which is much like the preceding, but smaller, and with a more distinct sterile base.

4. *Lycoperdon*, the common puff-balls, in which the spores escape from the small spore-fruit by a regular mouth at the top.

More than 100 species are known in all parts of the world. Morgan describes thirty-one species found in North

America, some of which are very pretty—e. g. *L. ichnatum* (Fig. 5)—when young. *L. piriforme* is found in clusters on old logs and stumps, and is of a rich brown.

5. *Bovista*, the little puff-balls, in which the sterile base of the small spore-fruit is very small or wanting and the inner peridium thin and papery.

Among species indigenous to the U. S. are *B. nigrescens* and *B.*



FIG. 4.—*Calvatia craniformis*, reduced.

plumbea, common in pastures and meadows across the continent. *B. minor* (Fig. 6), from Ohio and Nebraska, is a good representative of the genus. Morgan has separated several species of *Bovista* and placed them in the new genus *Catastoma* because of the remarkable fact that the mouth by which the spores escape is below, as shown in Fig. 7. The outer peridium splits transversely, the lower part



FIG. 5. *Lycoperdon echinatum*, slightly reduced.

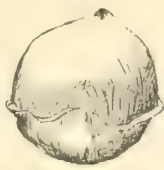


FIG. 6.—*Bovista minor*, about natural size.

adhering to the earth, while the remainder, with the attached inner peridium and its contents, blows away, thus scattering the spores.

6. *Mycenastrum*, the hard puff-balls, are similar to *Bovista*, but are of larger size and have a thick and hard inner peridium. *M. spinulosum* is 2 to 4 inches in diameter, and grows on sandy soil upon the prairies and Great Plains.

The puff-balls are closely allied to three other families of fungi, and with them constitute the order *Gasteromycetes*, known in a general way as the Puff-ball order. The four families may be briefly characterized as follows:

Hymenogasteraceae, the subterranean higher family.—

Spore-fruit subterranean; gleba fleshy, persistent; peridium single, not separating. In many ways these fungi remind one of the subterranean sac-fungi (*Tuberoides*).

Lycoperdaceae, the puff-balls.—Spore-fruit emerging from the ground; gleba spongy, deliquescent, and then powdery;

peridium mostly double, separating regularly or irregularly.

Nidulariaceae, the bird's-nest fungi.—Spore-fruit external cup-shaped; gleba spongy, deliquescent, and leaving egg-like "peridiola." These small fungi are common on decaying wood.

Phalloideae, the stink-horn fungi.—Spore-fruit at the surface of the ground; gleba fleshy, deliquescent into a fetid jelly, then emerging from the peridium by the elongation of the sterile base.

LITERATURE.—P. A. Saccardo, *Sylloge Fungorum*, vol. vii. (1888); A. P. Morgan, *North American Fungi*, in *Journal of the Cincinnati Society of Natural History*, 1890-1893; A. de Bary, *Comparative Morphology of the Fungi*, *Mycetozoa and Bacteria* (1887).

CHARLES E. BERRY.

Puff-bird: any member of the *Bucconidae*, a family of small birds having large heads and stout bills, peculiar to the tropical or warmer regions of America. They are mostly of dull plumage and equally dull disposition, sitting motionless for a long time with their feathers erected, looking as if they were puffed up, whence the popular name. F. A. L.

Puffer (in auctioning): See BY-BIDDING.

Puffin: any bird of the auk family (*Alcidae*, see Auk), belonging to the genera *Fratercula* and *Lunda*, which are characterized by high, compressed, highly colored bills. The best-known species is the common puffin, couleterneb, or sea-parrot (*Fratercula arctica*), found abundantly on both sides of the Atlantic. This bird is about a foot long, black above, white below, with a gray face and black collar about the neck. The bill is red with yellow and bluish markings, and is in great part shed and renewed annually, together with a little excrescence on either upper eyelid. In all, nine pieces are shed, leaving the bill of the adult in winter looking like that of a young bird. The Arctic puffin breeds



The puffin

in burrows and lays a single white egg with a few faint gray markings at the large end. The nestlings are clad in thick down. A closely related species (*Fratercula corniculata*), known as the horned puffin, from the rather long outgrowth on the upper eyelids, occurs in the North Pacific, as does also the tufted puffin (*Lunda cirrhata*), a rather larger bird with a long tuft of yellowish feathers curving backward from above either eye. Puffins swim and dive well and fly rapidly though heavily. They feed on fish and go long distances to catch food for their young. The flesh of the various species is much used for food, and tastes much better than might be supposed from their fishy diet. F. A. Lucas.

Pug: a small, short-haired, short-muzzled breed of dogs, represented by at least three varieties, probably derived from the bulldog. The head should be massive, forehead wrinkled, eyes large and prominent, body short and wide, tail tightly curled. Color fawn with black muzzle and a dark spot on forehead, and dark line down the back. The pug is a stupid but good-natured dog. F. A. L.

Pugatcheff, YEMELIAN: adventurer; b. in 1720 at Simo-weisk, a village on the Don, in the territory of the Cossacks; grew up as a member of a band of robbers; served in the Seven Years' war, first in the Russian, then in the Prussian, and at last in the Austrian army, and was imprisoned for

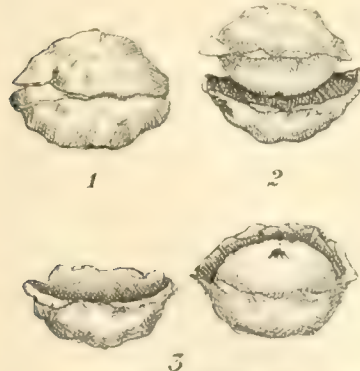


FIG. 7.—*Catastoma circumscissum*, slightly reduced

some time after his return to Russia for attempts at sedition. In 1770 he went to Poland, and there joined the Raskolniks (q. v.). He resembled the murdered Emperor Peter III., and in 1773, after a rumor had been spread that Peter was not dead, Pugatcheff presented himself as the monarch, and was joined by a few other adventurers. The Raskolniks acknowledged him, and the peasantry rose in his favor; he occupied several forts on the Ural and Don; some Tartar and Finnish tribes joined him, and he was on his march to Moscow with a considerable army when he was sold by his comrades for 100,000 rubles to Suwarow. He was executed at Moscow Jan. 10, 1775.

Puget, pū'zhā', PIERRE: painter, sculptor, and architect; b. at Château-Follet, near Marseilles, France, Oct. 31, 1622. At the age of fourteen he became the pupil of a wood-carver and builder of galleys named Romano. In 1639 he found his way to Florence, where he worked as a carver in wood, and then went to Rome, where he studied painting. In 1653 he returned to Marseilles, where he built a rich galley for the Queen of France, and then devoted himself to painting. In 1656 he finished the doorway and balcony of the hôtel de ville of Toulon, and later designed the new hôtel de ville at Marseilles. He was employed by Fouquet, the superintendent of the Treasury, and went to Genoa on Fouquet's business, where he remained after his patron's fall and designed palaces and produced important works in sculpture and painting. Colbert invited him to return to France and gave him employment at Toulon in the artistic decoration of Government ships, then an important branch of fine and decorative art. About 1670 he resigned this post, settled in Marseilles, and occupied himself in architectural and other art works there, and in Toulon and other cities. D. at Marseilles 1694. In the Louvre Museum one hall is named after Puget and contains his sculptures *Hercules Reposing*, *Persens and Andromeda*, *Milo of Crotona*, and *Alexander and Diogenes*. In Marseilles is the important bas-relief, the *Plague at Milan*. W. J. STILLMAN.

Puget, pyu'jet, **Sound**: an arm of the Pacific Ocean; extending S. from the Straits of Juan de Fuca, in the State of Washington, and between the Coast Range of mountains on the E. and the Olympic Mountains on the W. It is perhaps the most beautiful sheet of water in the world; is about 100 miles long, has a coast-line of 1,600 miles, and an area of 2,000 sq. miles; has very many bays, coves, islands, channels, and inlets; is very deep even abreast of the shores, and forms of itself a magnificent harbor, though lacking in good anchorages on account of its depth. The tide varies from 9 feet at the N. to 15 in the narrow inlets at the extreme S. It formerly extended much farther S. (to the Willamette valley), and its regression has left a large area of low-lying, fertile land between it and the Columbia river. It has also a large area of tidal lands which can be reclaimed at small expense. Along its shores lie Seattle, Tacoma, and Olympia, with many other rapidly growing places. The shores were originally covered with forests of pines, firs, and cedars—the finest in the U. S. These have since been extensively felled, and lumber has formed the principal interest, but the timber resources are still very large. The neighboring country has fine agricultural resources and large supplies of coal and other minerals exist in the mountains. Settlement and development have proceeded with great rapidity. The entrance to the sound is dominated by the British naval establishment of Esquimaux. The Olympic peninsula is but little explored. M. W. HARRINGTON.

Pugin, pū'zhān', Augustus: architectural draughtsman; b. in Normandy in 1762; is known by works illustrating mediæval architecture—*Architectural Antiquities of Normandy*, *Specimens of Gothic Architecture in England*, *Architectural Illustrations of the Buildings of London*, *Gothic Ornaments from Buildings in England and France*. These appeared during the years 1821–40, and were among the important aids to the new study of mediæval archæology. D. in England, Dec. 19, 1832.

Revised by RUSSELL STURGIS.

Pu'gin, AUGUSTUS NORTHMORE WELBY: architect and architectural designer and draughtsman; b. in London, England, Mar. 1, 1812; son of Augustus Pugin, whose love for mediæval art he inherited. Having been converted to Roman Catholicism, he devoted himself with zeal to the revival of ecclesiastical architecture in England. His influence was great in fostering a taste for Gothic forms in architecture and ornament. He was a skillful etcher, and produced several works which he illustrated in this way. His

principal works are *Contrasts, or a Parallel between the Architecture of the Fifteenth and Nineteenth Centuries*, *Examples of Gothic Architecture*, *Principles of Pointed or Christian Architecture*, *An Apology for the Revival of Gothic Architecture*, and *Glossary of Ecclesiastical Ornament*. D. at Ramsgate, Sept. 14, 1852.

Pugin, EDWARD WELBY: architect; son of Augustus N. W. Pugin; b. in England, Mar. 11, 1834; at the age of seventeen undertook the completion of his father's designs and contracts; a devoted Roman Catholic, designed the cathedral at Queenstown; built more than 100 churches, besides orphanages, colleges, priories, etc.; restored the archiepiscopal palace at Mayfield; finished a superb Gothic structure begun by his father at Scarisbrook Hall. D. June 5, 1875.

Pugwash: a seaport in Cumberland co., Nova Scotia, on Northumberland Strait, 50 miles W. of Pictou (see map of Quebec, ref. 2–B). It has quarries of gypsum, limestone, and sandstone. Deals are largely shipped to Great Britain.

Pujet, PIERRE: See PUGET.

Pujunan Indians [*Pujunan* is from *Pusuna*, the name of a small band formerly near the mouth of American river, Sacramento co., Cal.]: a linguistic stock of Indians comprising the Maidu and Nishinam divisions, with their numerous sub-tribes, who occupied the eastern bank of the Sacramento in California, beginning some 80 or 100 miles from its mouth and extending northward to within a short distance of Pit river. Upon the E. they reached nearly to the border of the State.

Maidu (signifying man, Indian) is a collective name given to a large number of tribes or villages formerly occupying the territory between Deer creek, Lassen butte, and Honey Lake on the N., Cosumnes river on the S., the Sacramento, and in places points W. of the Sacramento, on the W., and the summit line of the Sierra Nevada on the E. The Maidu correspond to the usual type of the California Indian, being naturally peaceable, inoffensive, and indolent. They are described as extremely nomadic within a very limited area. The Maidu dialect is homogeneous.

The customs of the Nishinam, who live S. of the Maidu, differ considerably from those of the Maidu tribes, as also does their language. The tribal organization of the Maidu appears to be of an extremely loose character even for Indians. The tribal-village organization of the Nishinam answered to the tribal system of more advanced Indians, as is shown by the strictness obtaining with regard to the ownership of land. Their boundaries were defined with great precision by physical features, such as springs, hills, and valleys. They did not ordinarily destroy a member of another tribe for trespassing on their territory, but if he caught fish or game or gathered acorns on it they demanded reparation in kind.

Few representatives of the tribes survive, and these are scattered. See Stephen Powers, *Tribes of California* (Cont. N. A. Ethnology, iii., pp. 282–345, Washington, 1877); H. H. Bancroft, *History of California* (vols. i.–vii., San Francisco, 1884–90). See also INDIANS OF NORTH AMERICA.

F. W. HODGE.

Pukhtu: See AFGHAN LANGUAGE AND LITERATURE.

Pulaski: town; capital of Giles co., Tenn.; on the Louisv. and Nashv. Railroad; 33 miles S. of Columbia, 81 miles S. by W. of Nashville (for location, see map of Tennessee, ref. 7–F). It is in an agricultural and stock-raising region, has flour and planing mills, and contains 2 national banks with combined capital of \$120,000, a State bank with capital of \$38,600, Martin Female College, and 2 weekly newspapers. Pop. (1880) 2,089; (1890) 2,274.

Pulaski, CASIMIR, Count (called in Polish KAZIMIERZ PULAWSKI): soldier; b. in Lithuania, Mar. 4, 1748; son of Count Joseph Pulaski, who in 1768 formed the Confederation of Bar for the preservation of the liberties of Poland; was educated for the law; saw some military service under Charles, Duke of Courland, and in 1769 joined his father and two brothers in the national struggle against the despotism of King Stanislaus Augustus. His father and brothers having perished in the war, Casimir was for some time commander of the insurgents, and made a bold attempt to seize the king in Warsaw. Being outlawed on the failure of this attempt, he escaped to Turkey 1772; participated in a war against Russia; proceeded to France in 1775, where he made the acquaintance of Franklin, and offered his services to the cause of American independence. Arriving at Philadelphia in the summer of 1777, he joined

the army as a volunteer; distinguished himself at the battle of Brandywine, and four days later (Sept. 15) was appointed by Congress brigadier-general, and given command of the cavalry. He took part in the battle of Germantown, and in Mar., 1778, having resigned his command, he formed at Valley Forge an independent corps of lighthorse and infantry called Pulaski's Legion, officered chiefly by foreigners. By a surprise at Little Egg Harbor, N. J., a large part of his infantry were bayoneted, but the legion was again recruited to 350 men. In Feb., 1779, he set out for the South; reached Charleston May 8; made a vigorous but unsuccessful attack upon the British advance guard May 11; accompanied Count d'Estaing to the siege of Savannah, where he was given the command of the French and American cavalry; was mortally wounded in the assault of Oct. 9; was carried on board the U. S. brig Wasp in Savannah, where he died Oct. 11, 1779. He was buried at sea. A monument to his memory was erected by the citizens of Savannah, and the corner-stone laid by La Fayette in 1825. See his *Life* in Sparks's *American Biography*, 2d series, vol. iv.

Pulci, pŏl'chē, LUIGI: poet; b. in Florence, Italy, Aug. 15, 1432; d. Oct., 1484, probably at Padua. His was a poetic family, his two brothers, Luca and Bernardo, and the latter's wife, Antonia, having all made some name in letters. His relations with the Medici family were close, Cosimo and Piero showing him much favor, while his *Lettere a Lorenzo il Magnifico* (edited by S. Bongi, Lucca, 1886) imply considerable intimacy between the two men. His fame rests upon his *Il Morgante* (1st ed., 23 cantos, 1482), or, as it came to be called after the second and larger edition had appeared, *Il Morgante Maggiore* (28 cantos, Florence, 1483. See ITALIAN LITERATURE.) There is a translation of the poem by Byron. Besides this, Pulci left several lesser works, the most important, a so-called *Confessione*, satiric in character. See J. Hübscher, *Orlando, Die Vorlage zu Pulci's Morgante* (Marburg, 1886). LUCY A. PATON.

Pulkowa: village near St. Petersburg, Russia. Ten miles N. is the famous Nicholas Central Observatory (lat. 59° 46' 18" N., lon. 30° 19' 40" E.), founded by the Czar Nicholas (1838-39). The staff consists of a director and four astronomers besides assistants, etc. The *Pulkowa Observations* are published by the Academy of St. Petersburg. One of the largest telescopes in the world, a 30-inch refractor, was erected here in 1882.

Pullman, JAMES MINTON, D. D.: clergyman; b. Aug. 21, 1836, at Portland, Chautauqua co., N. Y.; graduated at St. Lawrence Divinity School in 1860; pastor of First Universalist parish of Troy, N. Y., same year; ordained in 1862; pastor of the Church of Our Saviour, New York city, from 1867 until early in 1885, when he became pastor of First Universalist Society of Lynn, Mass. He organized the Young Men's Universalist Association of the City of New York in 1869; was secretary of the General Convention of Universalists 1868-77; was chairman of the publication board of the New York State convention of Universalists, having in charge *The Christian Leader* 1869-73; received the degree of Doctor of Divinity from the St. Lawrence University in 1878; founded the Children's Country Week charity in 1882.

Pulmonaria: See LUNGWORT.

Pulmona'ta, or **Pulmonifera** [*Pulmonifera* is from Lat. *pulmo*, lung + *ferre*, to bear]: an order of Gasteropod Mollusca in which gills are absent, the animal breathing air by means of a "lung" formed by the ramifications of the blood-vessels upon the surface of the mantle-cavity. It embraces the common snails and slugs, and all its members live either on the earth or in fresh water. Two sub-orders are recognized—the *Stylommatophora*, in which the eyes are placed upon the tips of the tentacles, and these last are capable of being retracted by an inversion like the pushing in of the finger of a glove; and the *Basommatophora*, in which the eyes are at the base of the non-retractile tentacles. Most prominent of the first group is the family *Helicidae*, embracing the common snails, of which about 5,000 species have been described. Recent authors have divided the principal genus *Helix* into a large number of so-called genera, most of them being based upon totally inadequate characters. The snails are largely vegetarians, and where abundant may cause extensive ravages in gardens, vineyards, etc. The family *Limacidae* embraces the slugs, in which the visceral hump has undergone degeneration, and the shell has been reduced to a small internal plate. Most of the freshwater snails of the U. S. belong to the *Limnæidæ* of the sub-

order *Basommatophora*. The *Onchidiidæ* embraces some amphibious forms living on the shores of tropical seas. In one species Semper has described numerous eyes scattered over the back, these eyes being formed like those of the Vertebrates. J. S. KINGSLEY.

Pulo-Kalamantin: See BORNEO.

Pulque, pool'kâ [the Aztec name]: the fermented juice of various species of *Agave*, but principally the maguey (*A. americana*), which grows wild and is also extensively cultivated on the table-lands of Mexico. (See AGAVE.) Mexicans consume such quantities that special pulque trains are run on the railways to supply the city markets. Some physicians recommend it for chlorosis and other diseases; others condemn it as unwholesome. Pulque was first made and used by the Aztecs. H. H. S.

Pulsatilla: See ANEMONE.

Pulse [M. Eng. *puls*, from Lat. *puls*, *pultis*, pottage of meal pulse, etc.]: a general name for such seeds of leguminous plants as are used for human food. All kinds of pulse abound in vegetable caseine, and all are highly nutritious; but as a rule they are not easy of digestion, and are best suited for hard-working men. Beans, peas, and lentils are the most important kinds of pulse.

Pulse [(with -l- restored from Lat.) < M. Eng. *pous*, viâ O. Fr. from Lat. *pulsus*, pulse, liter., beating, deriv. of *pellere*, *pulsum*, strike, beat]: the result of the blood-wave sent through the arteries of the body by the ventricles of the heart. Each contraction of these ventricles sends into the arteries 2 to 4 oz. of blood, which entering vessels, already full but contracted, expands, elongates, and uplifts them, and produces a sudden lifting and impulse on the finger applied to them. This impulse is equal in all the arteries of equal size throughout the body, but the physician usually examines it on the thumb-side of the wrist (in the radial artery), because there the vessel is near the surface, resting on bone, and its varying movements can be best appreciated. The frequency of the pulse in a healthy adult, at rest, is 72 to 75 beats in a minute—in women a little more frequent than in men; more frequent while standing than while sitting, least frequent in the recumbent position. But a slow pulse is sometimes found in healthy, strong persons; 40 or 45 is not a very uncommon rate; Heberden and Fordyce have found it as low as 30 and 26, the latter in one instance no more than 20. At birth the normal frequency is 140; in youth, 90; and in old age, 70. Muscular exertion increases the number of heart-beats in a given time in proportion to its amount and duration. Certain mental states, as surprise, anger, or a sudden sense of danger, will produce great increase in its frequency. See SPHYGMOGRAPH.

The pulse in disease sometimes becomes very frequent, and sometimes very slow. In inflammation of the membranes of the brain in children it has been often found, toward the termination, beating at the rate of 180 per minute for a day or more; it has sometimes reached 200. The condition known as tachycardia (see HEART DISEASE) not rarely occasions pulsations of 250 or 300 per minute. The latter number can not be easily counted at the wrist; 160 is often with difficulty made out; but the heart-beats can be appreciated by the ear at almost any rate of possible frequency, except in the mere flutter of some conditions of heart disease. In some states of disease of the brain, liver, and of the heart the pulsations are no more than 40, or even 30, in the minute. In the most marked cases of slowing the rate may be but 10 per minute.

The pulse may be small or full, rapid or slow, hard or soft, quick or prolonged; or it may be irregular in various ways, giving a varying number of beats in the different fractions of a minute, the beats tumultuous, frequent, and slow alternately, or sometimes double (*dicrotic*). It is often intermittent; that is, a single beat is lost. This occurs both with and without disease of the heart; it is often caused by the use of tobacco. In some states of imperfect innervation of the heart its pulsations cease entirely, to be resumed after the lapse of a considerable fraction of a minute. An instrument has been invented by which many conditions of the pulse can be inscribed on paper attached to a revolving cylinder. It is called a "sphygmograph." The study of the pulse by the finger or by the sphygmograph reveals to the physician, much more than the mere rapidity of the circulation, the existence of fever, and the like. Above all, he appreciates the condition of the arterial wall itself and the general state of the patient, as well as the probable condition of the heart.

Venous Pulse.—The arterial pulsation reaches the very

small arteries, but is lost in the capillaries, so that the blood returns to the heart in a continuous, steady stream; but when the tricuspid valve is insufficient, a wave of venous blood may be sent back into the venous trunks producing a visible pulsation, mostly in the veins of the neck. Such pulsations will correspond, as those in the arteries do, with the contractions of the ventricles (systole). Hypertrophy of the right auricle of the heart may also produce venous pulsations. So may aneurism of the aorta when it obstructs the current of blood descending through the vena cava, the enlarged artery communicating its pulsation to the blood in the vein. In some instances of difficult breathing the veins of the neck are seen to become distended in a sort of wave, apparently from below, but really from above, because the outlet is obstructed at the heart. This filling occurs in expiration, and the veins are emptied in inspiration. Though this action has been called pulse or pulsation, it is very different from the movement to which the term is commonly applied.

The Pulse in Animals.—Nysten (*Dictionnaire*, etc.) states that the arterial pulsations in the horse are from 32 to 38 in the minute; in the ass, from 45 to 48; in oxen and cows, 35 to 42; in sheep, 70 to 77; in the dog, 90 to 100. These countings were made when the animals were at rest.

Revised by W. PEPPER.

Pulsometer: See PUMP.

Pulteney, pŭlt'ni, WILLIAM, Earl of Bath: statesman; b. in England in 1682; educated at Westminster School and at Christ Church, Oxford; entered Parliament as a Whig 1705; took part in the prosecution of Dr. Sacheverell; defended Walpole in the prosecution made in 1712; became, on the accession of George I., privy counselor and secretary of war 1714-17; refused a peerage but accepted an unimportant post under Walpole in 1723; went over to the opposition 1725, becoming the bitterest political enemy of his former friend, against whom he wrote several pamphlets; fought a duel with Lord Hervey, in which both combatants were wounded, 1731; became extremely popular as the leader of the general crusade against Walpole; associated with Pope and the wits of the day, who paid him extravagant compliments for his literary ability; was the real framer of the cabinet of 1742 on the downfall of Walpole, though the Earl of Wilmington was the ostensible head; was created at this time Earl of Bath; lost much political influence by his transference to the Upper House of Parliament, and was premier for two days in Feb., 1746, on the resignation of the Pelham ministry, but was unable to form a cabinet. D. in London, July 8, 1764. He was the author of many political pamphlets, and chief assistant of Bolingbroke in writing the journal *The Craftsman*.

Pu'tu, or **Vegetable Silk**: a richly beautiful fiber produced by tree-ferns of the genus *Cibotium*, growing in the Malay and other Pacific islands. The attempt to manufacture it has not proved successful. It is a very useful styptic, and is considerably used as such by Dutch surgeons.

Puma [= Peruv.]: the common name for *Felis concolor*, a large member of the cat family (*Felidae*) inhabiting America; also known as panther, mountain lion, lion, tiger, and—in books at least—as cougar and catamount. It is of a general reddish gray, or tawny, above, whitish beneath, end of tail dusky, outside of ears and a spot on either side of the muzzle black. The young, two to five in number, are spotted. Next to the jaguar the puma is the largest cat of the New World, attaining a length of 8 feet and a weight of 200 lb., although individuals of this size are very rare. Few terrestrial mammals have a more extended north and south range. It is found from Patagonia to 60° N. lat., from Maine to California and throughout South America up to a height of 9,000 feet on the Andes. Naturally with such a range there are great variations in size, color, coat, and ferocity. The puma is ordinarily a cowardly animal, but when wounded or brought to bay it is dangerous. It is usually silent and the tales of its "blood-curdling scream" are mostly apocryphal. The creature feeds largely on deer, but smaller animals are eaten, even the Canada porcupine. In South America the aguti, capybara, and rhea are extensively preyed upon, and, when accessible, calves, sheep, and pigs. For a full account of the puma, with numerous references to literature on the subject, see *The Puma, or American Lion*, by F. W. True, Report U. S. Nat. Museum (1889), pp. 591.

F. A. LUCAS.

Pumacag'na, or **Pumacahua**, MATEO GARCIA: Indian general; b. near Cuzco, Peru, 1758. He was the chief of a

powerful mountain tribe under the Spanish viceroys, and received the military rank of brigadier for taking part in the suppression of the revolt of Tupac Amaru, 1781. In 1814 he headed at Cuzco the first serious rebellion against Spanish rule in Peru. For a time he was very successful; nearly all the southern districts supported him; he occupied Arequipa and had an army of 40,000, but his men were poorly disciplined and badly armed. He was eventually defeated by the Spanish general Ramirez at Umachiri, Mar. 10, 1815; Pumacagua escaped, but was captured soon after and hanged at Sicuani.

HERBERT H. SMITH.

Pumelo, or **Pomelo**: See SHADDOCK.

Pumice [Lat. *pumex*]: See OBSIDIAN.

Pumice Foot: See FARRIERY.

Pump [a word appearing in various Europ. languages: Fr. *pompe*, Dutch, *pomp*, Germ. *pumpe*, but of uncertain source and history]: an hydraulic or pneumatic machine for elevating water or other liquids, or for forcing fluids through a pipe or passage. The height to which water is raised by a pump is called the "lift." Pumps sometimes act not by raising water, but by forcing it into a vessel against a pressure, as in the case of the feed-pumps of steam-boilers. Such pressure may, however, be always represented by a head of water. Pumps for operating on air (see PNEUMATICS) are known as air-pumps, air-compressors, blowers, etc. Pumps for raising viscous matters, as tar, paper-stock, the slip of potteries, etc., are very strongly built, have large valves and valve-chambers, and move slowly. The necessities of industry and science and the rivalry of inventors and manufacturers have given rise to innumerable varieties of this machine. The accompanying figures are examples of the types in most common use.

Fig. 1 shows the simplest form of pump. It is used for lifts of but a few feet, for draining shallow pits and bailing flat-bottomed boats. As it can be made by a carpenter in a few hours, it is frequently applied where there is but temporary need of a pump. It consists of a square wooden barrel, a foot-valve, *a*, and a piston, *b*. The foot-valve is a leather flap on a wooden seat; the flap has a leaden back to give it due stiffness and weight. The piston *b* is a leather cup attached to a wooden rod. On its downward stroke the water folds it together, and allows it to pass freely. In its upward movement the water distends or bags it out, caus-

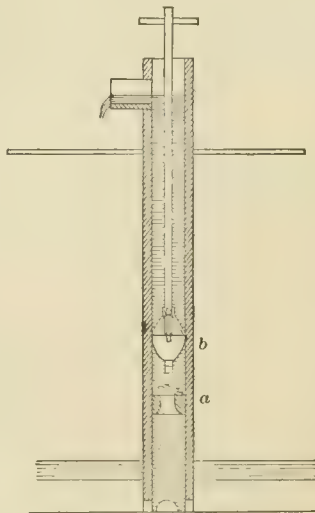


FIG. 1.

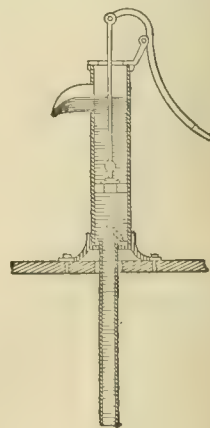


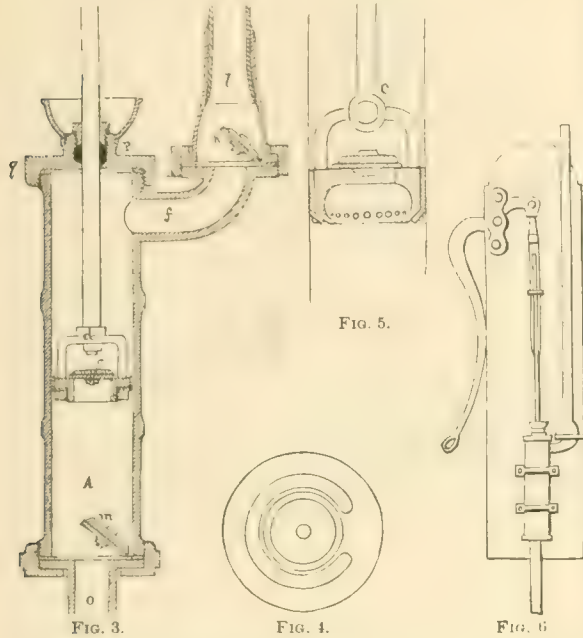
FIG. 2.

ing it to press against the interior of the barrel, and making it tight. The water above the piston is simply lifted, while the water follows the piston and flows through the valve *a* in virtue of the atmospheric pressure.

Fig. 2 shows an ordinary well or cistern pump. It is not different in principle from Fig. 1, but is arranged for more convenient working and adapted to a higher lift.

Fig. 3 represents a section of a force-pump much used for domestic purposes—as for filling a tank in the upper part of the house. Fig. 6 represents a general view of the same. The valves, the most important organs of the pump, are fully shown here and in Figs. 4 and 5. Fig. 4

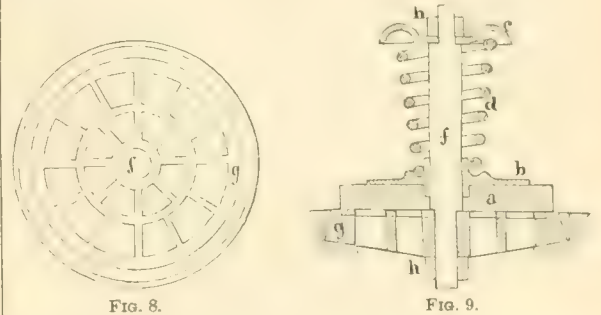
represents the valve *m* or *k*, the outer ring of which serves as the joint-packing. The inner circle is the valve or flap. The neck between the two is the hinge. A backing of lead gives weight and stiffness to the flap. The piston-rod passes through a stuffing-box *P* in the cover *g*, and is moved by a handle, as shown in Fig. 6. The action of



the pump is readily understood. During the downward movement of the piston the valves *m* and *k* close, preventing the backward movement of the water. The pressure of the water raises the valve *c* in the piston, and allows the water to pass through the piston as it descends. During the up-

ward movement of the piston the valve *c* is closed. The water above the piston is forced through the branch *f*, raising the valve *k* and passing into the ascending pipe *h*. The atmospheric pressure forces the water through the supply-pipe *o* into the pump-barrel *A*, raising the valve *m*. This pump differs from the ordinary domestic pump only in delivering the water above the pump. If the cover *g* and the branch *f* were removed, it would be the ordinary suction-pump discharging at *f*. The valve *k* is inserted to relieve the stuffing-box and prevent leakage. It is manifest that the pump would work perfectly well if this valve were removed. The piston of the ordinary suction-pump is more commonly made as shown in Fig. 5. It has a joint at *c*, as the piston-rod does not move in a straight line. The leather packing is also differently applied from that shown at *d*, Fig. 3.

It will be noticed that the pumps shown in Figs. 1 and 3 are *single-acting*. They furnish a stream only during the ascent of the piston. Fig. 7 represents a *double-acting* pump driven by a powerful steam-engine. The plunger *a* moves horizontally through water-tight packing. It is supposed, in the drawing, to be moving as indicated by the arrow. In so doing it diminishes the water-space in the chamber *b*, forcing the water through the valves *l l l* into the chamber *c* communicating with the force-main *f*. At the same time it tends to create a vacuum in the chamber *c*, which tendency causes the water to rise from the pump-well through the pipe *g* and chamber *d*, lifting the valves *o o o* and entering the chamber *c*. During the return stroke the water enters the chamber *b* through the valves *n n n*, and passes from *c* to *e* through the valves *m m m*, the valves *l l l*, *o o o* remaining closed. This is called a *double-acting* pump, because it discharges an intermittent stream. *h* is an air-chamber communicating with the force-main. This is an appendage usually applied to powerful pumps, especially those which force the water through a considerable length of pipe. Its object is to diminish the shocks due to the sudden starting of a long column of water. Figs. 8 and 9 show the valves of this pump:



g is the valve-seat, of iron with a brass face. It is leaded into a recess in the plate; *a* is the valve, of rubber; *f*, a spindle on which the valve slides in rising and falling; *b*, a plate forming a socket for the valve and a bearing for the spring; *d*, a spiral spring of brass wire; *c*, cap; *h h*, nuts. Each pump has twenty-four valves, there being two rows, only one of which appears in the drawing. This pump is designed to be operated by a "direct-acting" steam-engine, the piston of the engine and plunger of the pump being attached to opposite ends of the same rod. This arrangement of valves is used in the Worthington steam-pump.

Atmospheric pressure plays an important part in the action of pumps. The normal pressure of the atmosphere is 14.7 lb. per square inch, which is equivalent to that of a column of water 34 feet high. The pipe *o*, Fig. 2, being supposed to descend into the water of a well, if the fixed valve is 34 feet or more above the surface of the water, the water can not be raised. Practically the limit of suction is materially less than this. Thirty-four feet implies a perfect vacuum over the column of water, which can not be secured with ordinary pump-valves. Moreover, when the air is entirely removed from the suction-pipe the latter is filled with vapor of water which can not be exhausted, being produced as fast as the pump can withdraw it. The pressure of this vapor is very slight in cold water and increases with the temperature.

The limit of suction at 32° F. is 33.80 feet.

"	"	60	"	33.42	"
"	"	90	"	32.39	"
"	"	120	"	30.10	"
"	"	150	"	25.41	"
"	"	180	"	16.78	"
"	"	212	"	0	"

ward movement of the piston the valve *c* is closed. The water above the piston is forced through the branch *f*, raising the valve *k* and passing into the ascending pipe *h*. The

That is to say, water at 212° can not be raised at all by suction, the suction-pipe being constantly filled with vapor of the same tension as the atmosphere.

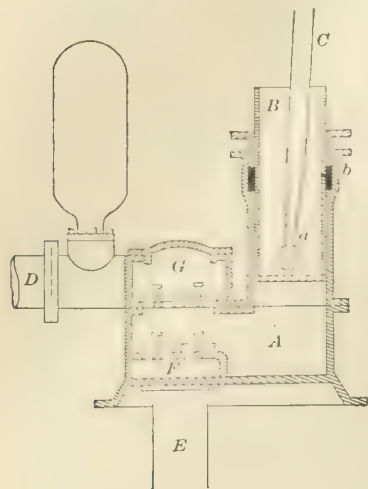


FIG. 10.

This pump, it will be perceived, is single-acting. The raising of the barrel B causes the lower valves to open, and draws water through the supply-pipe E. The down stroke raises the upper valves, and forces water through the discharge-pipe D. Such pumps are more commonly arranged in groups of three, all driven from the same shaft, the cranks making an angle of 120° with each other. In this case the chambers F and G are common to all the barrels, but each barrel must have a separate chamber A with its set of valves. Arranged in this manner it is a continuous-acting pump, giving a constant stream through the pipes E and D.

This pump, with a single barrel, is well suited to be worked by a windmill, especially when it can be so placed that the suction is one-half the lift, so that the crank exerts the same pressure on the up stroke as on the down stroke. Where the suction is but a small part of the lift the inequality is too great, causing shocks which are injurious. In that case it is better to use two barrels, uniting them by a beam so that one rises as the other falls.

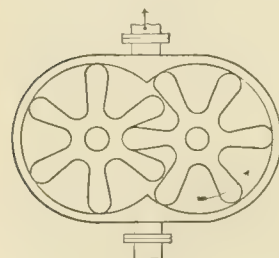


FIG. 11.

the spaces between the teeth. The close meshing of the teeth prevents its return between the gears, and it is forced through the discharge-pipe, entering the case through the supply-pipe under the action of atmospheric pressure. No valves are necessary with this pump, though a valve in the suction-pipe is convenient to prevent the pump from running down.

An engine specially designed for driving a pump, the engine and pump being inseparable, is called a pumping-engine or steam-pump. In the simplest form of pumping-engine the piston or plunger of the pump and the piston of the engine are on opposite ends of the same rod. This is the form contemplated in Fig. 7, in which the rod of the plunger *a* passes through a stuffing-box in the water-cylinder and enters the steam-cylinder through another stuffing-box. This is a cheap and serviceable form of pumping-engine, but it does not use steam in the most economical manner, being ill adapted for expansive working. With two cylinders, one drawing direct from the boiler and exhausting into the other at a lower pressure, it can make some use of the expansive action of the steam. An engine driving a pump through the intervention of a heavy fly-wheel can make full use of the expansive power of steam, and works most economically. Fly-wheel engines are used for pumping where economy of working is more important than economy of first

cost. The Cornish pumping-engine, used mainly for draining deep mines, differs from both the above types. The steam acts only to raise the piston with its attachment of heavy rods reaching down into the mine. These descend by their own weight.

Besides the ARCHIMEDES'S SCREW and the HYDRAULIC RAM (*qq. v.*) there are many devices in use for raising water which can not be classed as pumps, or are more properly described under other headings, as:

The *Noria*.—A water-wheel carrying a series of vessels at its periphery, which fill at its lowest position and discharge at its highest.

The *Chain Pump*.—A series of disks linked together, which being drawn rapidly through a close-fitting pipe draw the water with them.

The *pulsometer*, in which the pressure of steam acts directly on the surface of water in a closed chamber, forcing the water through a pipe to a higher level; then the steam condenses and refills the chamber by suction.

The *jet pump and injector*, in which a jet of water or steam discharged through the center of a pipe draws the surrounding water with it. If an open vertical pipe be two-thirds or three-fourths immersed in water, and air be injected at its lower end, the water will rise and flow from the top in a continuous stream, as long as the supply of air is kept up.

The *centrifugal pump*, in which the centrifugal force developed in a revolving mass of water raises it to a higher level.

This machine is much used in hydraulic constructions requiring the temporary removal of large volumes of water. The water is caused to revolve with great velocity in a cir-

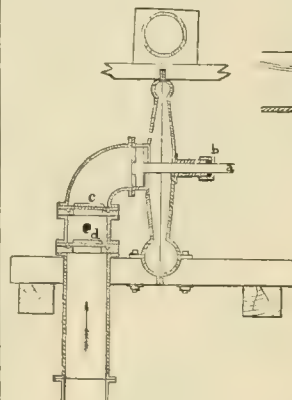


FIG. 12.

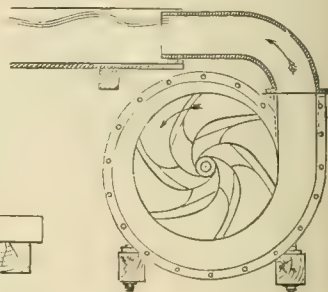


FIG. 13.

cular chamber. The tendency which water, in common with all heavy bodies, has to move in a straight line causes a pressure upon the circumference of the chamber sufficient to make the water rise to a greater or less height, depending on the velocity. The simplest, most efficient, and most reliable form of the centrifugal pump is the one indicated by Fig. 15. It is placed at the lowest point of the pit to be drained, and being once put in position, can not be readily changed. The water receives a rotary movement from arms attached to a vertical shaft within the case. It enters the pump at the center and rises through a pipe at the circumference. The shaft is driven by a steam-engine by means of a belt and pulley at the top. This form of pump requires no valves and is not readily deranged. The height to which the water will rise is theoretically the height from which a body must fall in a vacuum to attain the same velocity as that with which the periphery revolves.

It is not always convenient, however, to place the pump at the lowest point of the pit. Some excavations require pumping before reaching the lowest point. Some also require frequent changes of the position of the pump. For such cases a pump has been devised which can be placed at the top of the lift, raising the water by suction. Figs. 12, 13, and 14 show such a pump in detail. The cylindrical shell is made in two halves. Fig. 13 shows one half with the arms. Fig. 12 is a vertical section showing the valves. *a* is the driving-shaft passing through a stuffing-box, *b*, and carrying the arms, which are not shown in the section. The shaft carries a pulley through which it receives motion from a portable steam-engine; *c* *d* are the valves. They are made

of thick rubber, cut out as shown at Fig. 4, serving as joint packing as well as valves. Fig. 14 is an auxiliary hand pump attached outside the suction-pipe between the valves, for the purpose of filling the latter and the pump before

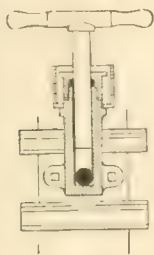


FIG. 14.

starting. It is a single-acting plunger-pump. When the plunger rises, the valve *d* (Fig. 12) is lifted, admitting air or water into the space between the valves. When the plunger falls, *c* rises, etc. This small pump is called the primer. While the pump is in operation the water flows continuously through the valves. These are not essential to the action of the pump

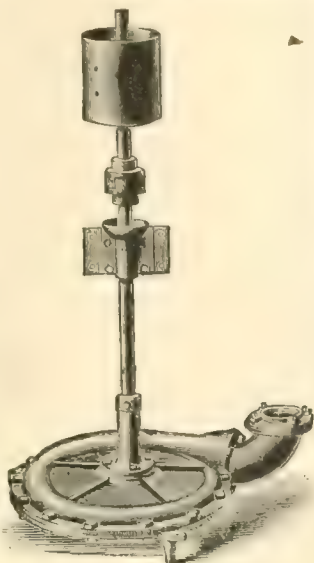


FIG. 15. Centrifugal pump.

while running, but only necessary in filling it and preventing it from emptying when it stops. The length of the suction-pipe is increased as the excavation progresses. This pump is of course subject to the same restriction as all suction-pumps. Its lift can not exceed the height due to the pressure of the atmosphere. In fact it can not work efficiently with more than three-fourths of that lift. The most powerful existing pumping plant is the system of centrifugal pumps built by J. & H. Gwynne, of Hammersmith, England, for draining the Ferrara marshes in Italy. It is said to be capable of raising to a height of 12 feet 2,000 tons of water per minute, being equivalent to a river 100 feet wide and 4 feet deep flowing with a velocity of about 13 miles per hour. The Appold centrifugal pumps have found many applications of this kind, and are much used for emptying dry-docks and for raising the level of water in the great commercial docks of European harbors. For air-pumps, see PNEUMATICS.

J. P. FRIZELL.

Pumpelly, RAPHAEL, M. N. A. S.: geologist; b. at Owego, Tioga co., N. Y., Sept. 8, 1837; educated at Paris, Hanover, and Freiberg, Saxony, 1854-60; was engaged in mining operations in Arizona 1860-61; was employed by the Government of Japan to explore the island of Yezo 1861-63; by the Government of China to report upon the coal-supply of that empire 1863-64; returned to the U. S. overland through Mongolia, Siberia, and Russia; became Professor of Mining Engineering at Harvard 1866; made a survey of the copper region of the upper peninsula of Michigan 1870-71; was State geologist of Missouri 1871-73; geologist in charge of the Archæan division of the U. S. Geological Survey 1879-92; and vice-president of the international congress of geologists, Washington, 1891. He is the author of numerous articles in scientific journals; of *Geological Researches in China, Mongolia, and Japan* (Washington, 1867); *Across America and Asia* (New York, 1870); of volumes of the *Geological Survey of Michigan* (1873) and of Missouri (1873), each accompanied by an atlas; and vol. xv. of the census reports on *The Mining Industries of the United States* (Washington, 1886).

Pumpkin [dimin. of earlier *pompion*, pumpkin, from O. Fr. *pompion*, for earlier *papion* - Lat. *pe-pō* - Gr. *πέπων*, a kind of melon]: any plant of the genus *Cucurbita*, of the family *Cucurbitaceæ*. There are three species of this genus in common cultivation: *Cucurbita pepo*, with lobed leaves and rough, almost prickly stems and leaf-stalks, a strongly angled fruit-stem, and widely flaring flower with erect and pointed lobes; *C. moschata*, with leaves usually less lobed, grayish pubescent stems and leaf-stalks, fruit-stalks ridged, enlarged next the fruit, and flower much like that of the last, but the lobes broader and the calyx often leafy;

C. maxima, with rounded large leaves, stems and leaf-stalks not rough and only minutely, if at all, pubescent, the fruit-stalk cylindrical and spongy, and the flower-tubes nearly cylindrical or gibbous, the lobes obtuse and drooping. These species are probably native to the New World. The first one (*C. pepo*) is the pumpkin of North America—the one which is grown in corn-fields and which produces the great reddish fruits commonly used for making pies and also as food for stock. This species is immensely variable. In some forms it is scarcely running. The summer or warty crookneck squashes and the bush scallop and patty-pan squashes are of this species, and here belong, also, the common inedible, ornamental gourds, as this term is understood in the U. S. The second species (*C. moschata*) is the parent of the large, striped winter or Canada crookneck squashes, and the Cushaw pumpkins or squashes. To the third species (*C. maxima*) belong the turban and the true winter squashes, like the Hubbard, Marblehead, Essex, Boston Marrow, etc. The larger type of fruits of this species are known as pumpkins in Europe, while they are called squashes in the U. S. In Great Britain the word gourd is used generically for all three species. It is a common notion that the different species will cross-fertilize when planted near together in the field; but it is now known that the varieties belonging to different species do not cross, with very rare exceptions. There are no crosses or hybrids of *C. pepo* and *C. maxima*, nor of *C. maxima* and *C. moschata*, but *C. pepo* and *C. moschata* can probably be induced to cross, although it is doubtful if spontaneous mixing often occurs.

L. H. BAILEY.

Pun [perhaps from the local English *pun*, pound, and the Anglo-Saxon *punian*, bruise]: a kind of play upon words, in which a word is capable of being understood in two or more quite different senses, the combination of which, or the mental change from one to the other, presents an odd idea, generally a ludicrous one. Punning is usually considered the lowest species of wit, being in general purely mechanical in character, and not, like the higher forms of wit, justifying itself by presenting an idea in some new and unexpected form. Not unfrequently the point of a pun lies in the juxtaposition of two or more words similar or identical in sound, but different in spelling and signification, like the Latin *amantes sunt amentes*. The wit in a pun is not unfrequently polyglot—that is, a phrase of one language is used which in sound or spelling closely resembles a phrase in another language, but which has a wholly different meaning. The figure of speech called *paronomasia* by writers on rhetoric, and defined by them as “the use of words in the same connection which are similar in sound, but dissimilar in sense,” is simply punning. This was a favorite form of expression among the Hebrews, and the books of the Old Testament, in the original, abound in examples of it, although it is of course usually lost in translating, and thus the precise point of many passages is necessarily missed in our version, unless the paronomasia is pointed out in a note.

Revised by A. R. MARSH.

Pu'na or Despobla'do: in Peru and Bolivia any very high, arid, and uninhabitable table-land; synonymous with *paramo*, used in Colombia. In a special sense, a high plain between two subchains of the Cordillera, extending from about lat. 13° S. southward into Bolivia. It consists of flat or rolling, generally stony or sandy lands, from 14,000 to 16,000 feet above sea-level, narrow northward but widening southward to 150 miles or more.

H. H. S.

Puna: a city of India; same as Poona (*q. v.*).

Punch, Punch and Judy, or Punchinello [Ital. *pulcinella* or *polcenella*; Fr. *pole-henelle*]: a kind of puppet-show frequently exhibited in the streets of European cities, especially of Italy. Its origin has been obscurely traced to the Atellan farces of ancient Rome, but in its present popular form the drama is ascribed to Silvio Fiorillo, an Italian playwright who flourished about 1600. The actors in the performance are wooden puppets, of whom the principal are Punchinello (in English Mr. Punch), his wife (called in English Mrs. Judy), and their dog Toby. The puppets are moved by the exhibitor, who puts his hands under the dress, making the second finger and thumb serve for the arms, while the forefinger works the head; he also supplies a comic dialogue, varying his voice to suit the different characters. As usually represented, Mr. Punch is a stout personage with protruding paunch, thin legs, hooked nose, and a chin which turns up so as almost to meet the point of the nose; Mrs. Judy is a thin, shrewish dame, grotesquely attired; and

the dog Toby, who is the embodiment of cunning, and usually wears a hat, plays an important part in the action. The play is a domestic tragi-comedy, in which Mr. Punch is greatly berated by his wife, and finally comes to grief. The French sometimes employ a cat instead of the dog Toby. Various explanations have been given of the origin of the name. The most probable supposition is that it is a diminutive of the Italian *puleino*, a chicken, applied to a little child, and hence a puppet; but some suppose that it comes from the Latin *pollex*, *pollicis*, the thumb, a common appellation of dwarfs, as in "Tom Thumb"; while others conjecture that the name comes from Puccio d'Aniello, a famous buffoon of Acerra, near Naples, whose humorous eccentricities were in the seventeenth century transferred to the Neapolitan stage. In some of its aspects the show of Punchinello reminds one of the so-called "moralities" of the Middle Ages and of the clown of the later comic drama; and the grotesque faces of the performers have their prototypes in the masks worn by the actors in the ancient Greek and Latin comedies. Puppet-shows of an essentially similar character, but often much more elaborate, are common in China and Japan. A typical version of the modern play by Payne Collier, with colored illustrations by George Cruikshank, was published in 1828. Revised by R. A. ROBERTS.

Punctuation [from Mediaev. Lat. *punctuā're*, punctuate, deriv. of Lat. *punctum*, something pricked, point, punctuation mark, deriv. of *pungere*, *punctum*, prick]: the act or art of dividing literary composition into sentences and parts of sentences to show grammatical or sometimes rhetorical relations, and thus assist the reader in apprehending the writer's meaning. It is also frequently asserted that punctuation is intended to assist the reader by indicating the pauses and inflections required by the sense. This is incorrect, however, although it is evident that punctuation marks, while indicating syntactical relations, may also guide the reader to some extent as to pauses and inflections.

Our present system of punctuation is of modern invention. Ancient manuscripts were not punctuated until after 364 B. C., when it became customary to place a mark of separation after each word. The beginnings of our present system are said to date from the time of Manutius (Manuzio), the first of a famous family of Italian printers, who died in 1515. In English writings a period was first used, though without great regularity, to indicate a break of any sort in the composition. In addition to this, a period on the line or above it, sometimes an inverted semicolon, was used in poetry to mark a metrical rather than a syntactical division. Caxton, the father of English printing, used only an oblique line to indicate the divisions of discourse.

The principal marks of punctuation in modern English are the comma, semicolon, colon, period, interrogation, and exclamation points, of which the last two are mainly rhetorical. Of these the *comma* is most frequently and most variously used. Its offices may be summed up in two general heads: First, the comma marks a syntactical division of the sentence having a certain completeness of its own; next, it may indicate an ellipsis. Under the first head come parenthetical and intermediate expressions, dependent and conditional clauses, relative clauses not restrictive, words or expressions forming a series, nouns in apposition or in the vocative case. Under the second head are included ellipses of verbs, nouns, and conjunctions. The principal uses of the *semicolon* are to mark the divisions of a compound sentence, to separate clauses and expressions with a common dependence, sentences connected in idea but without syntactical dependence, and final clauses of explanation or inference. The *colon* is used to mark the larger divisions in complex sentences, the beginning of long quotations, and a series of particulars introduced by *thus*, *as follows*, *namely*, and similar expressions. The *period* marks the end of a sentence, while it is also used after titles and abbreviations. The marks of interrogation and exclamation indicate respectively a direct question and an exclamation.

Among the more important minor marks of punctuation are the dash, parenthesis, bracket, apostrophe, and quotation marks. The dash is used for a sudden break in the sentence and for parenthetical expressions. For the latter the parenthesis is also used, and for explanatory words not syntactically a part of the sentence the brackets are employed. The apostrophe marks the possessive case and the omission of a letter or letters in words. Quotation marks inclose direct quotations. The apostrophe, as not denoting a syntactical division, is not strictly a mark of punctuation, and

there are numerous others of like use sometimes considered under this head, as the hyphen, section and paragraph marks, and marks of reference.

Punctuation is to some extent a matter of taste and judgment, rather than of rigid rule. Certain writers seem to aim at using the largest possible number of points; others try to use the fewest points possible. As might be expected, the best punctuation lies between these two extremes. There is also some room for individual preference in pointing. Whether a parenthetical expression should be set off by commas, by the dash, or by marks of parenthesis, is often to be decided by individual taste. The same may be said of the use of the semicolon, some writers using the comma or the period, according as the separation requires the more or less distinctive mark. In any case punctuation is more largely a grammatical, rather than a rhetorical device. It should aid the reader in gaining the sense, but it should never be depended upon for clearness or precision.

OLIVER FARRAR EMERSON.

Pu'nic Wars: the three great wars between the Carthaginians (*Punici*) and the Romans. The First Punic war lasted twenty-three years (264-241 B. C.). It was a contest for the possession of Sicily, which was finally won by the Romans. The Second war lasted sixteen years (218-202 B. C.). It was initiated by the capture of Saguntum by HANNIBAL (q. v.), who thereupon made his great invasion of Italy. The war was closed by the Roman victory at Zama. The Third war was undertaken by the Romans with the express intention of finally destroying Carthage, her long humiliated and now scarcely dangerous rival. The war lasted three years (149-146 B. C.). Carthage made a most heroic and persistent defense, but was at last utterly destroyed. Polybius, wherever his account is preserved, is our most trustworthy ancient source. The variations from his narrative presented by Livy and Appian are regarded with suspicion. See the histories of Rome by Arnold and Mommsen; C. Neumann, *Geschichte Roms im Zeitalter der punischen Kriege* (Breslau, 1883); T. A. Dodge, *Hannibal* (Boston, 1890).

Revised by G. L. HENDRICKSON.

Punishment: in criminal law, the suffering or deprivation of the enjoyment of rights which is visited by law upon those who violate the penal law.

The object and the methods of administering punishment for crime among the early or more crudely civilized peoples are based chiefly upon the idea of retribution, or the vindication of the law upon the offender, and the expiation of his crime by reparation to the injured person. Crimes among such peoples are looked upon more as offenses against the individual than against the state, the idea of which is not strongly developed; and the infliction of punishment for crime is frequently or usually intrusted to the person wronged, or to his kin, clan, or tribe. Hence under such a system the distinction between crimes and torts is not well defined; the punishments inflicted are usually characterized by cruelty; the severity of punishment is frequently graded according to the nearness of the time of the infliction of the punishment to that of the commission of the crime; indignities are frequently inflicted upon the body after death; and for the expiation of many or all crimes a pecuniary value is set, by the payment of which to the injured person, or to his family, the offender is made free from liability to further punishment. In many cases a way of escaping punishment is provided by the establishment of cities of refuge, sanctuaries, etc.

With the development of the idea of the state and of the duties of the citizen to the state, crime comes to be looked upon more as a wrong against the community, and the right to inflict punishment is taken from the individual and vested in the state alone; the injured party is left to obtain reparation for the wrong by resorting to his civil remedy; and the primary idea of punishment becomes the protection of society from criminal acts, coupled with the design of reforming the criminal, not merely as a means of preventing crimes, but as an end in itself. Traces of the early theory of punishment, however, survive in the modern code. Thus the husband, among Christian nations, is still permitted to kill an adulterer caught by him *flagrante delicto*, and vindictive features are seen in some of the severities which are still imposed in some modern methods of punishing.

Punishments inflicted for the protection of society may be divided into those which disable or remove wholly or partially the ability of the criminal; those which are intended

to deter him from committing it again; and those which are intended to act as a deterrent to others.

The punishments of the first class include such forms as capital punishment, deportation, mutilation, branding, perpetual imprisonment, etc.

Punishments of the second class include those which may deter the criminal from the repetition of his crime, either by the reformation of the criminal or by inflicting suffering or some other form of punishment dreaded by the criminal, such as public indignity or great cruelty.

Punishments of the third class consist almost wholly in the infliction of cruelty or public disgrace.

It is now generally believed that the deterrent effect of all cruel punishments and of those likely to bring the criminal into public disgrace are more than counterbalanced by the brutalizing and hardening effect upon the criminal and upon the public itself; and consequently public executions, public whipping-posts, branding, mutilation, etc., have either been entirely abolished or are rapidly disappearing from the different codes of criminal law.

The principal forms of criminal punishment now in use among civilized nations are as follows: Death, perpetual imprisonment with or without hard labor, imprisonment for determinate periods, enforced labor in mines, galleys, etc., banishment to penal settlements, pecuniary fines, and in certain cases the infliction of the lash.

The criminal is also often deprived of political or civil rights belonging to citizenship, such as the electoral franchise, capacity to testify in courts of justice, or to hold office, etc.

For various forms of punishment now discarded among civilized nations or used only among semi-civilized peoples, see PILLORY, TORTURE, etc.

The whole history of criminal punishment is a history of cruelties and horrors, but inflicted for the ends of justice. The reformation of the criminal law in England is due chiefly to John Howard and Sir Samuel Romilly. Howard introduced the changes which made capital punishment less frequent, and Romilly, seconded by Sir James MacIntosh, introduced laws which gradually did away with the barbarous character of the criminal laws and the use of the penalties.

The law of England, however, is still more severe than that of the U. S., but it is on the whole just and tolerant. The existing criminal law of both countries now consists principally of a great number of statutes meant to provide for the punishment of acts which formerly for some reason or other were not provided for by the law or are now supposed not to have been punished with sufficient severity by the former laws, such as stealing wills, malicious mischief, statutory burglary, etc. Of the different forms of punishments above mentioned, capital punishment is gradually being abolished among Christian nations. For a fuller treatment of the specific forms of punishment, see CAPITAL PUNISHMENT, IMPRISONMENT, PRISON, GALLEY, TRANSPORTATION, WHIPPING-POST, etc.

LITERATURE.—See Beccaria's *Treatise on Crimes and Punishments*; Maine's *Ancient Law* (ch. ii.); Bentham's *Theory of Penalties and Rewards*, *Treatise on Civil and Penal Legislation*; Proal, *Le Crime et la Peine* (Paris, 1892); Garofalo's *Studio sul delitto, sulle sue cause, e sui mezzi di repressione* (Turin, 1890); Ryland's *Crime, its Causes and Remedy* (London, 1889); Bentley's *Principals of Penal Law* (Philadelphia, 1889); Lombroso's *L'uomo delinquente* (Turin, 1889); Cherry's *Lectures on the Growth of Criminal Law in Ancient Communities* (London, 1891); and Stephen's *History of the Criminal Law of England*.

F. STURGES ALLEN.

Punjaub' [from Hind. *Punjab*; *pānch*, five + Sanskr. *pañca*] + *āb*, water (< Sanskr. *āpas*). So called from its five rivers]: a territory of Northwestern Hindustan, bounded N. and N. E. by Cashmere, S. E. and S. by the Sutlej, and W. by the Suliman Mountains, and since 1849 belonging to British India. Area, 110,667 sq. miles. The northern part of the country is mountainous, covered with spurs of the Himalayas, from 17,000 to 20,000 feet high, and inclosing deep valleys. The southern and western part is a great plain around the Indus and its five powerful affluents, hot, dry, and treeless, consisting of a hard clay or loam which in many places becomes sandy and arid. The heat of summer rises to 112°; the winter is cool, with frequent frosts. Rain is rare, but the large and numerous streams can easily be used for irrigation, and there is a large network of canals for its purpose. Wherever the soil is well cultivated its productive-

ness is very great. Sugar, rice, cotton, wheat, and indigo are raised in large crops and of superior quality. The manufacturing industry of the country is highly developed in the large cities of Amritsar, Lahore, Multan, etc. In 1845 occurred the first Sikh war, which ended with Great Britain appropriating the territory on the left bank of the Sutlej; in 1848 followed the second Sikh war, which ended with the conquest by the British of the whole country. Pop. (1891) 20,866,847, consisting of Afghans, Tibetans, and different Hindu races, such as Jats, Sikhs, etc.; about one-half are Mohammedans.

Revised by C. C. ADAMS.

Pu'no: the southeasternmost department of Peru; between Bolivia on the E. and Moquegua, Arequipa, and Cuzco on the W.; area vaguely estimated at 20,000 sq. miles. It embraces the Peruvian portion of the Collado or high basin of Lake Titicaca, part of the lake, the Andes to the E. of the basin, and their eastern forest-covered slopes (Montaña), where the river Madre de Dios takes its rise. Nearly all the inhabitants are gathered in the Collado, and most of them are Aymara Indians. The Montaña is rich in cinchona, etc., and its gold washings were formerly very productive; but the region is nearly abandoned, owing to the difficulty of communication; the department is now one of the poorest in Peru and has hardly any exports. Pop. about 275,000.—PUNO, the capital and largest town, is in a valley near the western extremity of Lake Titicaca, 12,550 feet above the sea (see map of South America, ref. 5-C). It is a bishop's see and has a fine cathedral. It is connected by rail with Arequipa and Mollendo, and the trade from Bolivia to the Peruvian coast passes through it. During the colonial period rich silver mines were worked in the vicinity; they are now nearly abandoned. Pop. about 9,000.

HERBERT H. SMITH.

Punshon, WILLIAM MORLEY, LL. D.: clergyman and author; b. at Doncaster, England, May 29, 1824; became a local Wesleyan preacher in 1840; studied at the Wesleyan College, Richmond; became one of the most popular preachers in England; preached in London 1858-68; labored in Canada 1868-73; in 1873 returned to England, and was president of the British Conference 1874; wrote sermons and discourses, *Life Thoughts* (1863); *Sabbath Chimes*, in verse (1867); the *Prodigal Son* (1868). D. in London, Apr. 14, 1881. See his *Life* by Frederic W. Macdonald (New York, 1888).

Revised by A. OSBORN.

Punt, or **Pun-t**: a land on the Red Sea, from which the Egyptians made imports, at first indirectly and afterward directly, during a large portion of their history, extending from the early dynasties down to Ptolemaic times. During a part of the time regular tribute was rendered in kind to the Pharaohs. Its exact location has been disputed, some, as Brugsch, claiming that it was in Arabia, the "land of the East"; others, as Mariette, that it was on the African side of the sea on account of the nature of the objects of import; and again others, as Lieblein and Dümichen, arguing that it lay on both sides of the sea. The question is difficult of determination, but the weight of argument seems to favor the view that it lay on the west side of the Red Sea, or on the south side of the Gulf of Aden on the Somali coast, especially as Punt is often classed in the monuments with Ethiopia or Cush. It was ordinarily reached from Egypt by way of the caravan route from Koptos to Kosseir through the HAMMAT (*q. v.*) valley, and thence by ship. The mural representations at Deir el-Bahari, however, represent the vessels of HATASU (*q. v.*) as sailing from Punt and arriving at Thebes, thus giving the impression of a continuous navigable waterway. There are many references to commercial and other intercourse between Egypt and Punt, the most extensive and minute of which are those of Hatasu. These represent the inhabitants as a mixed race, the rulers being of a light color, approximating that of the Egyptians or Libyans (with whom they may originally have been closely allied), while their subjects vary from red to black. The name "Negro," applied by the Egyptians to all the inhabitants of Eastern Africa, is not distinctive enough for ethnological purposes. The predominating racial types, however, point to the Somali coast. The men look much like Egyptians, but the women are represented as abnormally and grotesquely fat. The products of the land are also mainly African; sycomore trees in tubs ready for shipment, various sorts of wood, such as ebony, also ivory, mother-of-pearl, incense, balsam, myrrh, gold, silver, and other metals, two species of ape, giraffes, greyhounds, and leopard skins. See W. Max Müller, *Journal of the Asiatic Society*, 1875, p. 1.

(Leipzig, 1893, pp. 106-120); Mariette, *Deir el-Bahari* (Leipzig, 1877); Dümichen, *Flotte einer aeg. Königin* (Leipzig, 1868); Hoskins, *Travels in Ethiopia* (London, 1835); Lieblein, *Handel und Schifffahrt auf dem rothen Meere in alten Zeiten* (Christiania, 1886); Meyer, *Gesch. des alten Ägyptens* (Berlin, 1887); Krall, *Das Land Punt* (Vienna, 1890).

CHARLES R. GILLET.

Punta Arenas, Chili: See MAGALLANES.

Puntareñas: the principal Pacific port of Costa Rica, on the eastern side of the Gulf of Nicoya (see map of Central America, ref. 8-1); a terminus of the Costa Rican railway system. The harbor is shallow. The climate is warm but generally healthful. Pop. about 4,500. It is the capital of a *comarca* of the same name, which embraces two-thirds of the Pacific coast of the republic.

H. H. S.

Pupa [from Lat. *pu/pa*, girl, doll, puppet]: one of the three stages of those insects which undergo a metamorphosis. See ENTOMOLOGY.

Puppets: See MARIONETTES.

Puracé, poo-rā-sā': the highest active volcano of the Andes of Colombia, E. S. E. of Popayan, Cauca; in the Central and near the junction of the Eastern and Western Cordilleras; altitude (Reiss and Stübel), 15,420 feet. Severe eruptions have several times occurred. It is impossible at any time to enter the crater, owing to the hot and suffocating vapors. The celebrated Pasumbio or "Vinegar river" which flows from this mountain is charged with sulphuric and chlorhydric acids.

H. H. S.

Purānas: eighteen old traditional stories, chiefly in Sanskrit verse, compiled by an ancient sage named *Vyāsa*, the supposed founder of the Vedānta philosophy. They contain the history of the gods interwoven with every variety of legendary tradition in other subjects. Six of them relate to Brāhma, six to Vishnu, and six to Siva. Each is supposed to treat of only five topics—the creation of the universe, its destruction, the genealogy of the gods and patriarchs, the reigns and periods of the Manus, and the history of the solar and the lunar kings. See SANSKRIT LITERATURE, DEVALOKA, and Monier-Williams's *Indian Wisdom*. R. L.

Purcell, HENRY: composer; the most eminent and most original of English musicians; b. at Westminster, England, in 1658; was appointed organist of Westminster Abbey in 1680; organist of the Chapel Royal in 1682. Had it not been for the overshadowing greatness of Handel (who made England his home so soon after this period) it is probable that Purcell's fame would have been still greater and more largely spread abroad. D. Nov. 21, 1695, and was buried in Westminster Abbey. In many respects he must have been looked upon with more or less doubtful eyes as an innovator, not to say "heretic." His sacred works have held their own, commanding the admiration of modern critical opinion. His dramatic and chamber music is also admittedly the work of real genius, despite the change of style, etc., which the centuries have brought about. See Grove's *Dictionary of Music and Musicians* (London, 1881). DUDLEY BUCK.

Purchas, SAMUEL: author; b. at Thaxted, Essex, in 1577; educated at St. John's College, Cambridge; took orders in the Church of England; was presented by James I. to the vicarage of Eastwood, Essex, Aug., 1604; subsequently obtained the rectory of St. Martin's, Ludgate, London, and became chaplain to Archbishop Abbot. D. in London in Sept., 1626. Compiler of *Purchas his Pilgrimage; or, Relations of the World*, etc. (folio, 1613), and *Purchas his Pilgrimages* (4 vols., folio, 1625), a celebrated collection from the works of many hundreds of travelers, and author of *Microcosmos, or the History of Man* (1619), and *The King's Tower and Triumphant Arch of London* (1623).

Purchase: See TITLE.

Purdue University: an institution at Lafayette, Ind.; founded as the Indiana Institute of Technology by act of legislature accepting the national land grant for agricultural and mechanical colleges. The location was fixed at Lafayette in 1869, when the name was changed to Purdue University in honor of John Purdue, who made the institution a gift of \$150,000. It was formally opened in Sept., 1874, with seven professors and sixty-four students.

Purdue University sustains schools in agriculture, in science, in civil, mechanical, and electrical engineering, and a school of pharmacy. The U. S. agricultural experiment station for Indiana located there in 1887. The university has a farm and campus of 189 acres, twenty good buildings,

and property, including annuities, to the value of \$1,700,000. The register of 1893-94 shows a faculty numbering fifty-five and 682 students. A new mechanical laboratory and equipment, valued at \$180,000, was destroyed by fire in Jan., 1894, but was immediately restored, with improvements. The income is derived from land-grant endowment, the Morrill fund, and annual appropriation by the State of Indiana.

J. H. SMART.

Purgatives [from Lat. *purgati/vus*, deriv. of *purga/re*, purify, purge; *pu/rus*, pure + *a/gere*, make, do]: in medicine, substances that produce more or less fluid discharges from the bowels. Very many drugs are purgative in sufficient dose, but those available in medicine as cathartics, and in common use, are castor oil, rhubarb, aloes, and calomel, forming a group of comparatively mild agents, causing only fluid feculent stools; certain salts, producing watery discharges, of which the most prominent are magnesium citrate and sulphate, sodium phosphate, acid potassium tartrate, and potassium and sodium tartrate; and, finally, a group of vegetable nature, likewise producing watery stools, but also being more or less irritant to the intestines. These are senna, jalap, podophyllum, scammony, colocynth, gamboge, croton oil, and elaterium. Setting aside senna, the others last mentioned are commonly spoken of as the *drastic* cathartics, from their highly irritant properties. Besides the foregoing, there are many substances which have a very mild effect upon the bowels, and are called *laxatives*. The more prominent of these are magnesia and magnesium carbonate and sulphur among inorganic substances, and cascara sagrada, manna, purging cassia, tamarinds, prunes, figs, and other fruits among vegetable. Purgatives operate partly by quickening the muscular contractions of the intestines, whereby the contents of the latter are hurried down to the rectum, and partly, especially with those causing watery stools, by determining an abundant pouring out of fluid into the intestinal canal. They are used for the primary object of emptying the bowels, and also to relieve congestion of distant organs and to induce the absorption of dropsical collections of fluid. Revised by H. A. HARE.

Purgatory [from Lat. *purga/re*, purify. See PURGATIVES]: according to the Roman Catholic and Oriental Churches, a place in which the souls of those who died in the state of grace suffer for a time, either on account of venial sin or on account of the temporal punishment due to mortal sin already forgiven. Purgatory is not a place of probation, but of expiation. The Roman Catholic Church has committed herself to only two statements about purgatory: (1) that there is a purgatory, and (2) that the souls detained there are helped by the prayers of the faithful, and especially by the sacrifice of the Mass. See Council of Florence, *Decree of Union*, and Trent, *De Purgatorio*, *Sess. XXV*. Further the Roman Catholic Church does not go, but the theologians discuss many other points, as the character of the sufferings, the situation of purgatory, the number of its inmates, etc.

JOHN J. KEANE.

Purging-flax: the *Linum catharticum*, an annual plant resembling the common flax on a small scale. It is a native of Europe. It has been considerably used in medicine as a gentle hydragogue cathartic.

Purim [Heb. *pūr*, plur. *pūrim*, a lot. So called from Haman's casting lots for the destruction of the Jews (Esth. iii. 7)]: a Jewish feast, lasting two days, which falls on the 14th and 15th of the month Adar (February and March), in commemoration of the deliverance described in the book of Esther. The festival was in former times, as still in many places, celebrated in a noisy and tumultuous manner, with loud expressions of hatred at the reading of Haman's name in the synagogue.

Purinton, DANIEL BOARDMAN, A. B., A. M., LL. D.: educator and author; b. in Preston co., Va., Feb. 15, 1850; educated at George's Creek Academy, Pennsylvania, and at the West Virginia State University, where he graduated in 1873. He has held the following positions: Instructor George's Creek Academy, professor and vice-president West Virginia State University; since Dec., 1889, has been president of Denison University, Granville, O. For seven years he was president of the West Virginia Baptist General Association. He has published *Christian Theism* (1889) and *The Contest of the Frogs*, a poem (1888). Besides these he has written hymns and music, both sacred and secular, and about forty of his pieces have been published.

W. H. WHITSITT.

Puritans [irreg. from Lat. *puritas*, purity, deriv. of *purus*, pure]: in general, persons who are scrupulous and strict in their religious life; in particular, a body of Christians which arose in England in the sixteenth century. The Reformation in England under Henry VIII. was unsatisfactory to many, because, in their view, it accomplished only a partial elimination of the corruptions and abuses of the Church of Rome. Through the ecclesiastical alternations of the reigns of Edward VI. and Queen Mary these recusants grew in numbers and influence. Many of them fled to Geneva, and there came under Calvin's influence. They returned on Mary's death with new notions upon theology and polity. They gave Queen Elizabeth no little trouble, and were in turn greatly harassed by the efforts made, through the high commission court, to force them to conformity. It was during her reign that they came to be called in derision *Puritans*, because they were ever calling for a simpler, purer form of worship and insisting on a stricter, purer life. They, however, supported her most heartily when, after the destruction of the Spanish Armada (1588), she threw herself decidedly upon the Protestant side. They stood forth as a distinct party, leading the opposition to the despotic claims for the royal prerogative asserted by the first two Stuarts, and their influence culminated in a triumph when royalty was overthrown and the Commonwealth was established. The genuine Puritans were mostly of the commoners of England, men of strong minds, good judgment, and sterling character. They adopted the Calvinistic creed, and rigidly conformed their lives to its principles. This gave an aspect of precision to their manners and stern severity to their lives, but it made them strong in their integrity and persistent in the struggle for liberty and right. Much as they have been ridiculed and maligned, England owes to the Puritans some of the best features of her free constitution; and never before had her power in Europe been felt as it was under the Commonwealth, when, through Cromwell, they controlled the Government. The influence of the Dutch upon the Puritans, in toning them up and suggesting the reforms they advocated and, when able, instituted in Church and state, is now generally recognized. During the struggle with the Stuarts many Puritans emigrated to New England.

The term Puritans is applied loosely to embrace all who objected to the ceremonies of the Established Church, and advocated holy living, and resisted the royal prerogative. But, especially with reference to the early history of the U. S., a distinction of two classes should be recognized. The Puritans proper adhered to the Church, striving to mould it to their own views. The Independents, originally called Separatists and Brownists, despairing of accomplishing the needed reform in that way, insisted on an absolute separation from the Church for a new organization. The Pilgrims who established the first colony in New England at Plymouth were Independents. Those who subsequently established themselves on Massachusetts Bay were Puritans. Neal, *History of the Puritans*, ed. Choules (2 vols., New York, 1844); L. Bacon, *The Genesis of the New England Churches* (1874); G. E. Ellis, *The Puritan Age in Massachusetts* (Boston, 1888); D. Campbell, *The Puritan in Holland, England, and America* (New York, 2 vols., 1892). Also see ENGLAND, CHURCH OF, and INDEPENDENTS.

Revised by S. M. JACKSON.

Purlin: a beam or girder which connects two roof trusses, and upon which rafters are placed to support the covering of the roof. See ROOF.

Purneah: town; in the presidency of Bengal, British India, on both sides of the river Kosi, in lat. 25° 45' N. and lon. 88° 23' E. (see map of N. India, ref. 6-H). It occupies an area of 9 sq. miles, mostly single houses surrounded with gardens, orchards, and indigo plantations. Pop. about 20,000.

Purple of Cassius: a substance which is formed by adding a tin solution to a dilute solution of gold chloride. The tin solution must contain both stannous and stannic chloride. Analyses of this substance made by different chemists have not given the same results. From recent work it appears highly probable that the substance contains gold in the metallic state. The purple can be made by treating a solution of gold chloride with tin filings. When dry and powdered, the purple of Cassius has a metallic luster. It is used in manufacturing artificial gems, and for imparting a red, rose, or pink color to porcelain or enamel. I. R.

Purple, Tyrian: See TYRIAN PURPLE.

Purple Wood: a beautiful plum-colored wood from Guiana, of great strength and capable of a very smooth finish. It is the product of the leguminous trees *Copaifera bracteata* and *C. pubiflora*. It is adapted to a wide range of uses. L. H. B.

Purpura [Mod. Lat., from Lat. *pur'pura*, purple-fish]: a genus of marine gasteropods. This genus furnished a part of the Tyrian purple dye of antiquity, whence the name. There are numerous living and extinct species.

Purpura [from Lat. *purpura*, the purple-fish, purple dye or color, from Gr. *πορφύρα*, purple-fish, the dye obtained from the purple-fish]: a condition in which spots of deep purple color appear in the skin, produced by the escape of blood from the vessels. Purpura is not a disease, but merely a symptom, like cough, which may occur in many diseases. The immediate cause of the hæmorrhage in the skin is generally either a disorganized condition of the blood or a disease of the blood-vessel. Among the blood diseases producing purpura are leukæmia, progressive pernicious anæmia, scurvy, and the like. Among the causes which influence the blood-vessels are to be counted certain poisons, but in these the blood itself is also altered. A number of causes appear to affect both the blood and the vessel walls. Among these are the infectious fevers, like typhus and smallpox, poisoning by phosphorus, snake bite, etc. The treatment of purpura requires, first of all, a consideration of its cause. After this symptomatic treatment is useful. Iron, arsenic, quinine, or other tonics are useful, and styptics may be necessary to control hæmorrhage. WILLIAM PEPPER.

Purpurin: a substance whose formula is $C_{14}H_6O_8 = C_{14}H_5(OH)(O_2)^+$. It exists in madder in the form of a glucoside, distinct from ruberythric acid, which is the alizarin glucoside. It is extracted from madder by the same processes as alizarin, and is usually separated from it by its greater solubility in a solution of alum. F. de Lalande converts alizarin into purpurin by treating it with sulphuric acid and arsenic acid or manganese dioxide; pours into water, and purifies the precipitate by alum, etc.

Purpurin appears as a red powder, in red feathery crystals (by sublimation), and in orange-red needles (from boiling alcohol). It is slightly soluble in boiling water, giving a rose-colored solution. It dissolves in alcohol, ether, benzene, glycerin, concentrated sulphuric acid, and acetic acid. Its solution in sulphuric acid may be heated to 400° F. without decomposition, the purpurin being thrown down unchanged on pouring the solution into water. It dissolves in a boiling alum solution to a pink fluorescent liquid, and does not separate on cooling, even from concentrated solutions. It dissolves in alkaline hydrates and carbonates, forming cherry-red or poppy-red solutions, from which acids reprecipitate it in orange-yellow flocks. The solutions in alkaline hydrates lose color on standing in the air, the purpurin being oxidized and destroyed. Boiling nitric acid converts purpurin into phthalic and oxalic acids. With bases it forms compounds; those with the alkalis are soluble in water. The basic, calcic, and aluminic lakes are soluble in boiling solutions of sodium carbonate.

Application to Dyeing and Calico-printing.—With alumina mordants purpurin produces bright reds; with iron, grayish violet. These tints resist cleaning with soap and nitro-hydrochloride of tin tolerably well, but are not so permanent as those produced by alizarin, nor do they resist light as well. There is a difference of opinion as to the part played by purpurin when madder, garancin, etc., are used in dyeing calico. Some think the purpurin of little importance; others consider it essential to certain pinks and reds. On account of its high price, this dyestuff is but little used. Revised by IRA REMSEN.

Pur'ree, or Indian Yellow [*purree* is from Hind. *peori*, yellow]: a yellow coloring-matter brought from India and China in lumps weighing 3 or 4 oz., brown on the outside and deep orange-yellow within. It is made almost exclusively at Monghyr, in Bengal, from the urine of cows fed on mango leaves. When the urine is heated the coloring-matter separates. One cow produces on the average 2 oz. of purree a day. It is used for the preparation of Indian yellow, a fine, rich, durable yellow color, much used by artists, and often adulterated with chrome yellow. It consists mainly of the magnesium and calcium salts of euxanthic acid. Revised by IRA REMSEN.

Purslane Family: the *Portulacaceæ*, a family of succulent dicotyledonous herbs and shrubs, all harmless and

many of them with gay flowers. The purslanes (*Portulaca*), the calandrinias, and the claytonias, include a few ornamental species. Common purslane (*Portulaca oleracea*) is a well-known annual weed of fields and gardens in the U. S. (where it is colloquially called *pusley*). It was introduced thither from Southern Europe, where it is freely eaten as a pot-herb. C. E. B.

Pursuivant of Arms: the lowest order of officers in heraldry. See HERALDRY and HERALDS' COLLEGE.

Purús, poo-roos': one of the most important tributaries of the Amazon, on its southern side; rises within the confines of Peru near lat. 11° S., thence passes through a small part of Bolivia, flowing N. E. through Brazil, and joining the Amazon (after receiving some of its water through several channels, near lon. 61° 30' W.). It is entirely a river of the forest-covered plains, and extremely crooked. Though the distance in a direct line between its source and mouth is only 900 miles, the channel is nearly 1,900 miles long. It was first explored in 1864-65 by the English traveler Chandless. He ascended it in a canoe until he found it reduced to a mere brook, and up to that point it was unobstructed by rapids. The Purús has many affluents. It is much frequented by rubber-gatherers, and steamers ascend regularly during the rubber season; but the few small settlements on the banks are near the mouth. See Chandless, *Ascent of the River Purús* (in *Journal of the Royal Geographical Society*, 1866). HERBERT H. SMITH.

Pūrva-mīmāṃsā: See HINDU PHILOSOPHY and MIMĀṂSĀ.

Purves, GEORGE TYBOUT, D. D.: Presbyterian minister and professor; b. in Philadelphia, Pa., Sept. 27, 1852; graduated at the University of Pennsylvania 1872, and at Princeton Theological Seminary 1876; pastor at Wayne, Pa., 1877; at Baltimore, 1880; at Pittsburg, 1886; and Professor of New Testament Literature and Exegesis in Princeton Theological Seminary 1892. He was Stone lecturer at Princeton 1888. Besides articles in theological reviews, he has published *The Testimony of Justin Martyr to Early Christianity* (the Stone Lectures, New York, 1889). C. K. HORT.

Pus: See SUPPURATION.

Pusey, EDWARD BOUVIERE, D. D., D. C. L.: theologian; b. at Pusey, Berkshire, England, in 1800; a nephew of the first Earl of Radnor; was educated at Eton and Christ Church, Oxford; graduated with high honors 1822; became a fellow of Oriel College 1823; studied in Germany, and in 1828 became Regius Professor of Hebrew at Oxford and one of the canons of Christ Church. His contributions to the *Tracts for the Times* (1835, seq.), of which series he wrote Nos. 18, 66, 67, and 69, gave to the Tractarian movement the name of "Puseyism." Newman's celebrated tract, No. 90, was in 1841 defended by Dr. Pusey in a published letter which excited much controversy. (See TRACTARIANISM.) He was suspended from preaching in the university for three years (1843-46) in consequence of the supposed utterance of heretical doctrine in a sermon on the real presence. Among the most important of his works are: *On the Benefits of Cathedral Institutions* (1833); *On the Royal Supremacy* (1850); *On the Real Presence* (1855, 1857); *History of the Councils of the Church* (1857); *Commentary on the Minor Prophets* (1860, seq.); *Daniel, the Prophet* (1864); *Eirenicon*, etc. D. at Oxford, Sept. 16, 1882.

Dr. Pusey's first publication (1828) was *An Historical Enquiry into the probable causes of the Rationalistic Character lately Predominant in the Theology of Germany*, in answer to Hugh James Rose's *Discourses on the State of Protestantism in Germany*. Both writers agreed that German theology was in a bad state, but differed as to its causes, Rose approaching the subject from the polemical, Pusey from the historical side. Each replied to the other, Pusey having the final word (1830), here first showing his hand as a religious controversialist. Later on, however, the book did not satisfy Pusey, and he withdrew it from circulation. He had taken in it a position more rationalistic than he was afterward willing to maintain. His next publication appeared in 1833, and was occasioned by Lord Henley's plan for the abolition of cathedral institutions. Pusey stood forth strongly in their defense, and looked at both their prospective and their past benefits in the promotion of sound religious knowledge. In this book the author's standpoint fully reveals itself. He had long been accustomed to hear the confessions of men and women who went to him for spiritual advice, and insisted that the Church of England allowed both confessions to its people and absolu-

tion through its priesthood. The disputes over the confessional led to his famous letter to W. Upton Richards, in 1850, entitled *The Church of England leaves her Children free to whom to open their Griefs*, which made a great impression at the time. He was also mainly instrumental in fostering the growth of conventual institutions in the Church, and in establishing voluntary penitentiaries for women. Canon Thomas Thelluson Carter's work at Clewer and Rev. Dr. John Mason Neale's work at East Grinstead were the outgrowth of his teachings. In 1865 came a new departure. Cardinal Manning, in a *Letter to an Anglican Friend*, challenged him to show that the Church of England was the Catholic Church, or any part of it, or in any divine or true sense of the word a Church at all. This was the occasion of Dr. Pusey's famous letter to John Keble entitled *The Truth and Office of the English Church*, in which he set forth the terms of an eirenicon between the Anglican and Roman Churches. This volume drew forth a friendly response from Rev. Dr. Newman, to which he replied in two successive pamphlets as large as the original work, the last of which appeared in 1870.

Personally, Dr. Pusey was an humble and holy man. His piety was of the ascetic or monastic type. His theology was essentially Catholic, consequently he was opposed to Romanism in many important questions—such as mariolatry, the infallibility of the pope, etc. It has truly been said of him that he was the moral, as Newman was the intellectual, and Keble the poetic, leader of the Anglo-Catholic movement. The acknowledged revival of the English Church dates from the Oxford movement, and is largely due to the loyal devotion to Anglicanism and the scholarly defense of its Catholicity which have made the name of Pusey famous. His *Life* was undertaken by Canon Henry Parry Liddon, who left it unfinished at his own death in 1890. It was then completed and published by Rev. John Octavius Johnston and Rev. Robert James Wilson (4 vols., London and New York, 1893-95). Revised by W. S. PERRY.

Pushkin, or **Pouchekin,** ALEXANDER SERGEEVITCH: poet; b. in Moscow, Russia, May 26, 1799; studied at Tzarskoe Selo; entered in 1817 as clerk in the Government office of foreign affairs, but was discharged in 1820 for an *Ode to Liberty*, and banished to his estates; was recalled in 1825 by the Emperor Nicholas, who restored him to his office, charged him with writing the history of Peter the Great, and gave his widow a pension of 10,000 rubles when he was killed in a duel at St. Petersburg, Jan. 29, 1837. By his countrymen he is considered the greatest poet Russia ever produced, and those of his works which have been translated into German, French, or English have attracted great attention. He wrote romantic epics—*Ruslan and Liudmila* (1820), *Kawkázskij Plehnik* (1822), etc.; one drama—*Boris Godunow*; several novels, under the pseudonym of *Belkin*, of which some were translated into English in 1875 by Mrs. J. Buchan Telfer in *Russian Romance*. His collected works in twelve volumes were published in St. Petersburg in 1839; a translation of his *Poems* in New York (1889).

Pushtu Language: See AFGHAN LANGUAGE and LITERATURE.

Pusley: See PURSLANE FAMILY.

Pustule, Malignant: See ANTHRAX.

Putamen: See DRUPE.

Puteoli: See POZZUOLI.

Putnam: town; Windham co., Conn.; on the Quinnebaug river and the N. Y. and New England Railroad; 26 miles S. by W. of Worcester, Mass., 33 miles N. by E. of Norwich (for location, see map of Connecticut, ref. 7-L). It is noted for its manufactures, which include silk, cotton, and woolen goods, boots, shoes, and slippers, steam-heaters, cutlery, and carriages. There are several lumber-yards and wood-working plants, 2 national banks with combined capital of \$225,000, 2 savings-banks with deposits of over \$2,000,000, and 2 weekly newspapers. The assessed valuation in 1893 was \$3,036,631. Pop. (1880) 5,827; (1890) 6,512.

Putnam, FREDERICK WARD: anthropologist; b. at Salem, Mass., Apr. 16, 1839; was educated by his father until 1856, when he entered the Lawrence Scientific School under Prof. Agassiz, with whom he remained until 1864, when he returned to Salem; took an active part in the Essex Institute as superintendent of its museum. On the foundation of the Peabody Academy of Science in 1867 he was elected director of the museum, which position he held until Oct., 1875, when he succeeded Prof. Wyman as curator of the

Peabody Museum of Archaeology and Ethnology at Cambridge. He was one of the founders of *The American Naturalist*; was elected permanent secretary of the American Association for the Advancement of Science; was appointed in Dec., 1875, civilian assistant on the U. S. surveys W. of the 100th meridian (in charge of Lieut. Wheeler), being intrusted with the special duty of reporting on the archaeological and ethnological material that had been collected; and in 1876-78 had charge of the Agassiz collection of fishes at the Museum of Comparative Zoology; in 1886 was appointed Professor of American Archaeology and Ethnology at Harvard; was chief of the department of ethnology, etc., at the World's Columbian Exposition 1893.

Revised by J. S. KINGSLEY.

Putnam, GEORGE PALMER: publisher; b. at Brunswick, Me., Feb. 21, 1814; became a bookseller's clerk in Boston 1826, and in New York 1828; prepared in early youth *Chronology, or an Introduction and Index to Universal History, Biography, and Useful Knowledge* (New York, 1833), republished in 1850 and in later editions as *The World's Progress, a Dictionary of Dates*; visited Europe in the employ of John Wiley 1836-38, with whom he became a partner 1840; resided in London 1840-47; wrote *The Tourist in Europe* (1838) and *American Facts* (1845); and prepared a *Pocket Memorandum-book in France, Italy, and Germany* (1848). Returning to New York in 1847, he began business on his own account in 1848, and founded *Putnam's Magazine*, which ran from 1853 to 1856, was re-established in 1868, and merged with *Scribner's Monthly* in 1870. He held the position of collector of internal revenue in New York 1863-66; became one of the founders and honorary superintendent of the Metropolitan Museum of Art, and was chairman of the committee on art in connection with the universal exposition at Vienna. D. in New York, Dec. 10, 1872.

Revised by H. A. BEERS.

Putnam, ISRAEL: soldier; b. at Salem (that part now the town of Danvers), Mass., Jan. 7, 1718. With only a very rude education, his natural, vigorous mental endowments enabled him to exercise a wide influence upon the exciting events of his time, while his strong physical powers and daring disposition were displayed in the many romantic adventures related of him. In 1739 he married and removed to Pomfret, Conn., where he became a successful farmer and a large wool-grower. By various daring adventures he established a reputation for courage—a reputation he subsequently maintained in the French war, in which he commanded a company of Connecticut troops with distinction at Crown Point and Ticonderoga. In Aug., 1756, while in command of a party, he was captured by the enemy and bound to a tree, where during the continuance of the action he was frequently exposed to the fire of both friend and foe, but escaped unhurt. He was, however, borne away by the enemy in their retreat, and at night the fire had been lighted to burn him alive when he was saved by the intervention of a French officer, Molang. Taken to Ticonderoga, and subsequently to Montreal, he was, by the influence of Col. Schuyler, himself a prisoner at the latter place on Putnam's arrival, exchanged in 1759 and promoted to be lieutenant-colonel. He returned to his farm on the restoration of peace. The news of the battle of Lexington reached him while plowing, and leaving his plow he mounted his horse and rode rapidly to Cambridge. After a brief consultation he returned to Connecticut, when he was made brigadier-general by the Legislature, of which he was a member, and a week later was on his way back to Cambridge at the head of a regiment which he had raised. Spurning the offers of rank and money made to him by the British, he entered with zeal upon the struggle for independence, and soon conducted several successful expeditions. At the battle of Bunker Hill he displayed his usual energy and bravery throughout the day, as well as in the subsequent endeavor to rally the overpowered and retreating troops. Washington, upon his arrival to assume command (July 2), bestowed upon Putnam one of the four major-generals' commissions he bore from Congress, but the other three were not then delivered. Upon the evacuation of Boston, Putnam was ordered to take command at New York, and after the battle of Long Island and evacuation of New York was sent to Philadelphia to complete the fortification of that city; subsequently stationed at Crosswicks and Princeton, N. J., he was in May, 1777, assigned to command the army in the Highlands of New York. Owing to the dissatisfaction created by the surprise and loss of Forts

Montgomery and Clinton in the summer of 1777, Putnam was removed from his command, although a subsequent court of inquiry acquitted him from blame for their capture, and he was restored to command. His success as a general, however, was not equal to his reputation for enterprise and daring. While on a visit to his home in Connecticut in 1779 he was stricken with paralysis, from which he only partially recovered. D. at Brooklyn, Conn., May 19, 1790.

Revised by C. K. ADAMS.

Putnam, MARY TRAILL SPENCE (Lowell): b. at West of James Russell Lowell; b. in Boston, Mass., Dec. 3, 1810; was early distinguished as a linguist; was married in 1832 to Samuel R. Putnam, a merchant of Boston (d. 1861); resided in Europe 1851-57; published a *History of the Constitution of Hungary and its Relations with Austria* (1850); *Records of an Obscure Man* (1861); *The Tragedy of Errors*, and *The Tragedy of Success* (1862), the latter two a dramatic poem in two parts, illustrative of slavery; a memoir of her son, William Lowell Putnam (killed at the battle of Ball's Bluff, 1861); *Fifteen Days* (1866); memoir of Charles Lowell (1885); contributed largely to *The North American Review* and *The Christian Examiner*, and translated from the Swedish Frederica Bremer's novel *The Neighbors*.

Revised by H. A. BEERS.

Putnam, RUFUS: soldier; b. in Sutton, Mass., April 9, 1738; a millwright by trade, he abandoned his occupation to serve as a private in the French war of 1757-60; resuming his business on the return of peace, by study during spare time he attained proficiency in mathematics and surveying; in 1773 visited Florida, and was appointed deputy surveyor of that province. In the war of the Revolution, as lieutenant-colonel of a regiment, he superintended the defenses of Roxbury, Mass.; was appointed chief engineer with rank of colonel, and charged with the defense of New York for fortifications; constructed the fortifications at West Point in connection with his cousin, Israel Putnam; commanded a regiment in Wayne's brigade until the close of the war; in Jan., 1783, was appointed a brigadier-general; was frequently a member of the Massachusetts Legislature; was aide to Gov. Lincoln during Shays's rebellion 1787; formed a land company, which purchased large tracts of land in what is now Ohio and founded Marietta, the first permanent settlement in the Northwest; was judge of the Supreme Court of the Northwest Territory 1789; appointed brigadier-general 1792, he accompanied Gen. Wayne's army to Detroit against the Indians, and subsequently as U. S. commissioner negotiated an important treaty with numerous tribes; from 1793 to 1803 U. S. surveyor-general. D. at Marietta, O., May 1, 1824.

Putrefaction: See FERMENTATION.

Putty [from O. Fr. *potee*, calcined brass, tin, etc., putty, deriv. of *pot*, pot, the substance formerly called putty resembling putty-powder and being often made from the metal of old pots]; a cement used by glaziers for fastening window-glass in place, and by painters for filling holes in wood over nail-heads, etc. It is composed of whiting (calcium carbonate) and linseed oil, often colored with pigment.

Putty-powder: oxide of tin, or a mixture of this oxide with oxide of lead, used for polishing glass, etc. It is prepared by calcining tin or a mixture of tin and lead. For the optician's use it is prepared by precipitating a solution of tin in aqua regia with ammonia, washing, drying, and igniting the product.

Putumayo: See ICA.

Puvis de Chavannes, pū vēs de-chāvā vān', PIERRE; historical painter; b. in Lyons, France, Dec. 14, 1824; pupil of Henry Scheffer and of Couture; awarded medal of honor 1882; commander of the Legion of Honor 1889. He is one of the greatest artists of the French school, and his mural paintings in the Panthéon, the New Sorbonne, and the hôtel de ville in Paris, the museum at Amiens, and other public buildings in France, have placed him at the head of modern decorative painters. His works are especially remarkable for their grand style, dignity of composition, and delicate schemes of coloration. Studio in Paris.

WILLIAM A. COFFIN.

Puy-de-Dôme, pwee' de-dôm': a central department of France; area, 3,070 sq. miles. The surface is high and on the W. covered with branches of the Cevennes and the Auvergne mountains, whose conical peaks and their extinct craters (*puy*s), together with the large masses of lava and basalt, show the volcanic character of the country. The

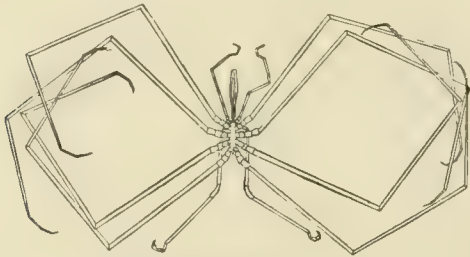
highest of these mountains is Puy-de-Sarcy (6,188 feet); on the E. are the Forez Mountains, reaching 5,380 feet. The chief rivers are the Allier and the Dordogne. The soil is generally fertile, but agriculture is not in an advanced state. Wheat and wine are produced; on the fine pastures of the mountain plateaus cattle and sheep are reared. Iron, lead, and silver are found in small quantities; marble, granite, and millstones are quarried. The manufacturing industry is not much developed. Pop. (1891) 564,266.

Puy, Le, or Le Puy-en-Velay, *le-pwee'-aah'-ve-lā'*: capital of the department of Haute-Loire, France; 70 miles S. W. of Lyons (see map of France, ref. 7-G). It is picturesquely built in terraces near the left bank of the Loire, on the slopes of Mt. Anis, on the summit of which is a basaltic mass called Mt. Corneille, crowned by a figure (53 feet high) of the Virgin, made of Russian cannon brought from Sebastopol. It has celebrated bell-foundries and manufactures of yarn, laces, linen, and woolen fabrics and cloth. Pop. (1891) 20,038.

Puzzolana: same as POZZOLANA (*q. v.*).

Pyæ'mia: See BLOOD-POISONING.

Pycnogon'ida [Mod. Lat., from Gr. *πυκνός*, close + *γόνυ*, knee]: a group of marine arthropods of uncertain position. The common name sea-spiders alludes to their resemblances to the true *Arachnida*. They have a small jointed body terminated by a proboscis in front and a short abdomen behind, and upon this are borne, typically, six pairs of appendages, four of which are used by the animal in its slow motions over seaweeds and hydroids. In the male a seventh pair is present, and upon this the eggs are carried until they hatch. In other forms the number of legs may be reduced until only four pairs of appendages are present. The nerv-



A deep-sea pycnogonid (*Colossendeis*) after Wilson. One-quarter natural size.

ous system is on the regular arthropod plan; the four eyes (ocelli) on the first body-segment are peculiar in structure; circulatory organs are present, but those of respiration are lacking. The alimentary canal sends pouches into the legs. After hatching, the young of some species form galls upon hydroids, recalling the galls upon plants. By the older naturalists the *Pycnogonida* were regarded as *Crustacea*; more lately the tendency is to place them among the *Arachnida*. See Wilson, *New England Species*, Report U. S. Fish Commission for 1878; Morgan, *Development and Position*, Studies Biol. Lab. Johns Hopkins, v. (1891).

J. S. KINGSLEY.

Pygmalion (in Gr. *Πυγμαλίων*): a king of Cyprus, who fell in love with an ivory statue of a maiden which he himself had made. He prayed to Aphrodite to endue the statue with life; his prayer was granted, and the animated statue became his wife and bore to him Paphos. J. R. S. S.

Pygmy, or Dwarf, Tribes [*pygmy* is from Lat. *pygmæ'us* = Gr. *πυγμαίος*, about a foot long, a *πυγμή* in length, deriv. of *πυγμή*, fist, the length of the forearm with the fist closed]: peoples much under average stature, found in small numbers in Southern India and Madagascar, constituting a large part of the inhabitants of the Andamans, and spread widely over the southern half of Africa. Their origin is unknown, but all seem to pertain to the Negro or Negrito families. They have been chiefly studied in Africa. Their existence has been known since the dawn of history, but when the world repudiated many statements of the earliest geographers it rejected also the pygmy tribes of whom Homer, Herodotus, Hekateus, and other ancients wrote, and they were not rediscovered until the second half of the nineteenth century. The pygmy tribes of Africa have been distributed into four great groups: (1) The dwarfs of West Africa; (2) those of the central regions; (3) the East African dwarfs; and (4) the tribes that live S. of the Congo basin.

The first group (Obongo, Akoa, Babongo) live chiefly among the forests between the Gabun, Ogowe, and Congo rivers, where they are scattered among various Bantu tribes. The height of the adult male Obongo is 4'3 to 4'7 feet, while that of the women is less.

The second group (Akka, Wambutti, Batua) are the most important tribes of pygmies. They inhabit the vast forest-region S. of the upper part of the Mobangi-Makua tributary of the Congo, and are found also far S. along the Lomami, Chuapa, Bussera, and other southern tributaries of that river. They range in height from 4'3 to 4'8 feet, the Akkas being the smallest known people. The pygmies in groups one and two greatly resemble one another in appearance and mode of living. They are skillful, nomadic hunters, building rude temporary huts wherever game is plentiful, killing even the largest game with spears and poisoned arrows, or by means of pitfalls and traps, and supplying the Bantu tribes with flesh and skins in exchange for vegetable food, spears, knives, and other articles. They never engage in agriculture. They are usually lighter in color than the Bantus and many have slight beards. They often intermarry with other peoples and speak the languages of surrounding tribes. They have rarely been induced to speak their own languages in the presence of strangers.

The third group are the Dokos and other tribes living E. of the Nile and S. of Kaffa, and the river Omo. No explorer (1894) has visited them, but there is abundant evidence as to their existence. They are similar in size, appearance, and habits to the pygmies of the Upper Nile and Congo regions.

The Bushmen and their relatives, comprising the fourth group, are from 4 to 4'5 feet in height and subsist by the chase and on the roots and fruits of the Kalahari desert.

These groups, though separated by wide territories inhabited by many tribes of different origin, have so many similarities that their relationship is regarded as proven. Very little is yet known of their languages, but some words collected in the various groups are identical. The assumption that these tribes are remnants of the original population of Africa is plausible on several grounds. The Andaman islanders are from 4'6 to 4'9 feet high, are more pleasing to look upon than the African dwarfs, and differ from them in other respects. Very little is known of the Kimo of Madagascar except that they exist. See *The Pygmy Tribes of Africa*, by Dr. Henry Schlichter, *Scottish Geographical Magazine* (June and July, 1892); *Ueber Zwergvölker in Afrika und Süd-Asien*, by H. Panckow, *Zeitschrift der Gesellschaft für Erdkunde zu Berlin* (No. 2, 1892); *Les Pygmées*, by M. Quatrefages (1887); articles by Prof. Flower on the Akkas and the pygmy races of men in *Journal of the Anthropological Institute of Great Britain* (1889); and the works of Schweinfurth, Stanley, Junker, Lenz, Wissmann, Du Chailu, Casati, and François. C. C. ADAMS.

Pygop'odes [Mod. Lat., from Gr. *πυγή*, rump + *πούς*, *πόδός*, foot; in allusion to the position of the feet]: a name given to an order of birds containing the loons (*Urinatoriæ*), the grebes (*Podicipitæ*, or *Colymbidæ*), and the auks (*Alcidæ*), all of which have the legs placed far back and only to a small extent free from the body. These birds are all expert divers, but, although they are often placed together, the order thus made is not a natural one and rests chiefly on similarity of habits. F. A. LUCAS.

Py'lus (in Gr. *Πύλος*): town of Messenia, on the promontory of Coryphasium; one of the last towns taken by the Spartans in the Second Messenian war. In 424 B. C. the Athenians built a fort on the site of the town, which became very famous in the Peloponnesian war. The present name, *Navarino*, is a corruption of *Avarino*, the Avars having settled here in the sixth century. J. R. S. S.

Pym, JOHN: b. at Brymore, Somersetshire, England, in 1584; spent some years at Pembroke College, Oxford, 1599-1602, but did not graduate; studied law at one of the inns of court; was elected to the Parliament of 1621, in which he became one of the leaders of the opposition to the royal encroachments on parliamentary rights, and suffered imprisonment for three months on the dissolution of the Parliament. In the first Parliament of Charles I. he was actively engaged in the impeachment of the Duke of Buckingham, 1626. He was the recognized leader of the "Short Parliament" of 1640 and of the "Long Parliament," which assembled in 1641; managed the impeachment of Strafford and the trial of Laud; presented the "grand remonstrance," which set forth all the evils endured from the beginning of

the reign of Charles I.; was the chief of the "five members" whose attempted seizure by the king, Jan. 1642, made reconciliation with Parliament impossible; was the real heart of the provisional executive established at London after the king's flight; issued a manifesto in 1643 defending him; in moderate language from the king's accusation of treasonable dealings with the Scots; was appointed lieutenant of the ordnance in November. D. suddenly at Derby House, London, Dec. 8, 1643. He was buried with pomp in Westminster Abbey, and having impoverished himself in the cause of his country, £10,000 was voted by the House of Commons to pay his debts. By the royalists he was nicknamed "King Pym," and Clarendon testifies that at the opening of the Long Parliament he was "the most popular man in that or any other age." He was possessed of a peculiar eloquence, terse and vigorous, and was a perfect master of parliamentary law. See Foster's *Arrest of the Five Members* (1860), *The Debates on the Grand Remonstrance* (1860), and *Statesmen of the Commonwealth* (1864); Goldwin Smith's *Three English Statesmen* (1867); J. R. Green's *Short History of the English People* (1875); and Gardiner's *History of England from the Accession of James I. to the Outbreak of the Civil War* (1887). Revised by F. M. COLBY.

Pynchon, THOMAS RUGGLES, D. D., LL. D.: educator; b. at New Haven, Conn., Jan. 19, 1823; was educated at the Boston Latin School and at Trinity College, Hartford, where he was graduated in 1841, M. A. 1844; was tutor 1843-47; ordained deacon at New Haven June 14, 1848, and priest at Boston July 25, 1849; rector of Stockbridge and Lenox, Mass., 1849-55; elected Scovill Professor of Chemistry in Trinity College, Oct. 2, 1854; received the degree of D. D. from St. Stephen's College, New York, in 1865, and LL. D. from Columbia College, New York, 1877; president of Trinity College Nov. 7, 1874-83; is still (1894) a professor in that institution; author of *Introduction to Chemical Physics* (New York, 1869; 2d ed. 1874), and of various sermons, scientific papers, and pamphlets. Revised by W. S. PERRY.

Pynchon, WILLIAM: colonist; one of the original patentees of the Massachusetts Bay Company; b. at Springfield, Essex, England, about 1590; emigrated to New England in 1630 with Winthrop and other patentees, and settled at Roxbury; in 1636 removed to Connecticut river and founded Agawam, renamed Springfield, after his birthplace; published a book opposing the Calvinistic view of the atonement, entitled *The Meritorious Price of Man's Redemption* (London, 1650). In consequence of the disfavor with which this book was received, and the persecution to which it subjected him, he returned to England in Sept., 1652. D. Oct. 29, 1662. He was also author of a treatise on the Sabbath and other works.—He left one son, JOHN (1621-1703), to whom he bequeathed all his vast landed estate in the valley of the Connecticut river. The latter was an assistant under the first Massachusetts royal charter, and during 1686-1703 was several times councilor.

Pyramid [from Lat. *pyramis*, *pyramidis* = Gr. *πυραμῖς*, *pyramidos*, pyramid]: a polyhedron having any polygon for a base, the remaining faces being triangles meeting at a common point called the *vertex*. The triangular faces taken together make up the *lateral surface* of the pyramid. A spherical pyramid is a portion of a sphere bounded by any spherical polygon, called the *base*, and by corresponding sectors of great circles. The vertex is at the center of the sphere.

Pyramidal Numbers: See FIGURATE NUMBERS.

Pyramid Lake: a body of water in Western Nevada, near the Nevada-California boundary. It is 30 miles long and from 5 to 12 miles broad. It is without outlet, and varies both in depth and in extent with the seasons and with secular changes of climate. In Sept., 1882, its area was 828 sq. miles and its maximum depth 361 feet. It is fed principally by Truckee river, which rises in Lake Tahoe, and is remarkable for the purity of its waters. The inflow is counterbalanced by evaporation, and the waters have been concentrated until they contain about 3.5 parts per 1,000, of saline matter in solution. The waters are too alkaline to drink, but are inhabited by trout and other fishes in great numbers. The lake occupies one of the lower depressions in the bed of a former sea named Lake Lahontan, which flooded many of the valleys of Nevada in Pleistocene times. Immense deposits of calcium carbonate precipitated from the waters of the former lake occur in the form of castles and towers about the border of its modern representative.

ISRAEL C. RUSSELL.

Pyramid of Cestius: See CESTIUS, PYRAMID OF.

Pyramids: structures built in the form of a geometrical pyramid by several ancient nations. Of these the Egyptian are the most important. These are usually square at the base, and were erected as tombs of the Pharaohs down to the twelfth dynasty at least, their number being formerly much larger than now. Natural decay, fanatical zeal, and building activity in Cairo have reduced their number and mass. Like the *MASTABA* (q. v.), their purpose was that of a permanent tomb for the mummy of the royal builder. Their location, uniformly surrounded by tombs and cemeteries, their contents, whether funeral remains or magical and ritual texts, their close resemblance to the plans of the tombs of contemporary nobles—all point to the one reasonable explanation of their purpose. Theories which find in them occult mysteries of a mathematical or astronomical sort are entirely fanciful. Their orientation (which was connected with the native religious beliefs of the builders), upon which so much stress has been laid, while showing considerable knowledge of astronomy, is not always exact.

The number of those in the region near Memphis, now existing in greater or less degree of dilapidation, amounts to seventy-five, and they are arranged in several groups. The area which they cover is about 25 miles long, extending southward on the west side of the Nile from Abu Roâsh, opposite Cairo, to Dahshûr. They were oriented with more or less care, though some of them are considerably out of a correct alignment. Investigation shows that the ratio of height to base is approximately 7 to 22. They were built on the same general plan, though not without some variations of detail, and, like the mastaba, had certain essential features: the chamber for the reception of the mummy, or several chambers when more than the mummy of the king was to be deposited inside; the passageways more or less complicated, and the chamber of offerings, which was an integral part of the plan though actually located outside of the pyramid itself. The entrance was almost invariably on the north



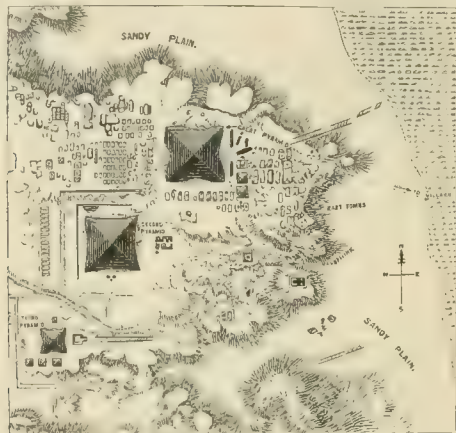
Section of the Great Pyramid: 1. Entrance; 2. descending passage leading to H; a rough, subterranean chamber; 3. passage leading upward through grand gallery; 4. anteroom; 5. to king's chamber; 6. containing 7 sarcophagi; 7. queen's chamber; 8. subterranean grotto with small passages leading to galleries above and below; 9. ventilating shafts; N. S. debris. Dimensions are given in inches.

side, and opened into a descending passageway ending in a subterranean chamber. Another gallery midway of the first branched off upward and led to the sepulchral chamber near the center of the mass. In the Great Pyramid of Cheops at Gizeh there were two sepulchral chambers, one below, presumably for the queen, and a second for the king on a higher level. A peculiarity of structure is seen in this case, in that hollow spaces, the top one triangular in cross-section and the others rectangular, were left above the king's chamber to reduce the weight of the superincumbent mass.

No theory of the method of construction is entirely satisfactory. Petrie's theory of the origin of the pyramidal form is that it was developed out of the mastaba by repeated additions, and has much in its favor. The older theory of Lepsius had long currency, and is still accepted by many. A rocky site was chosen and leveled to form a foundation, a portion of the rock being left in the center for a core. After the subterranean passages and chamber had been excavated the building was begun about the core and was completed so far as to make a finished whole, though perhaps of small size. It contained all the essential features, and only lacked its later gigantic size. During succeeding years more layers of stone were added, and the longer the reign of the building Pharaoh the larger his tomb. These added layers have been fitly compared to the rings which mark the growth of

a tree. When the structure was large enough to suit the ambition of the king, or after the builder's death, it was covered by triangular stones which rested on the successive steps, and was made to present a smooth outward surface. The stones for the building were brought from various quarries, principally from the opposite side of the Nile, and dragged to their places up an inclined causeway, which was raised as the work progressed. Remnants of these causeways are still visible in some places. The testimony of ancient and mediæval writers goes to show that in some cases the exterior was covered with hieroglyphic writing which was undoubtedly of a religious nature. The statement of Herodotus (ii., 125) that they recorded the amounts of provisions consumed by the workmen while the pyramid was building is very unlikely, and probably he was deceived by his guide. Destruction began with the limestone coverings, which were stripped off and burned in the kiln. Further destruction was due to the use of the inner blocks in building the city of Cairo. The earliest depredations go back to an early Pharaonic date; the Persians broke into the pyramids of Gizeh, and probably into many others, in the fifth and fourth centuries B. C., and later the Romans did the same. In the first part of the ninth century A. D. the Arabs also entered the Great Pyramid of Gizeh at least.

Taking the pyramids in their geographical order, beginning at the north, the first remains are those of *Abu Roâsh*. Only ruins survive, but these suffice to show that one of the buildings was 350 feet square at the base. An inclined passageway of 160 feet led to a subterranean chamber 43 feet long. The date of this pyramid is unknown. To the E. are the remains of a mile of causeway designed for the carriage



The pyramids of Gizeh.

and elevation of material. Six miles S. are the three immense pyramids of Gizeh, with several smaller companions. The largest is the oldest, having been constructed by Khufu or Cheops, the second king of the fourth dynasty. The name of the builder was found in red on one of the stones in the triangular chamber mentioned above. It is 755 feet square and 451 feet high, and was originally about 775 feet square at the base and 481 feet high. At the top is a flat space 30 feet square. It is estimated to contain 85,000,000 cubic feet of stone. It still contains the broken red granite sarcophagus of Cheops. The next largest pyramid was that of Khafra or Cheffren, the successor of Cheops, though it does not contain his name. It measures 700 feet square at the base and is about 450 feet high. The sepulchral chamber is $46\frac{1}{2}$ by $16\frac{1}{2}$ by $22\frac{1}{2}$ feet. It was opened and explored by Belzoni in 1816. The third pyramid of Gizeh belonged to Menkara or Mycerinus, the fourth king of the same dynasty. The statement of Manetho that it belonged to Nitocris is undoubtedly incorrect, as the sarcophagus of Mycerinus was found inside by Col. Vyse in 1837. It is conjectured that it was left unfinished and completed by a later ruler. It was built on a sloping rock, is 350 feet square, and 210 to 215 feet high. Three smaller pyramids are near by, one of which contains the name of Mycerinus on the ceiling. About 3 miles southward are the pyramids of *Zâwyet el-'Aryâm*, one of which has been almost entirely destroyed. The other must have been a large structure, as its remains are now nearly 300 feet square. At *Abusir*, about 3 miles farther S., are remains of fourteen pyramids built by Pharaohs of the fifth dynasty, only three of which were of any considerable size.

One of these was built by Sahura, second king, and measures 117 feet high and 217 feet square. Another is 165 feet high, and 324 feet square at the base; builder unknown. Next are the pyramids of *Saggarah*, of which that known as the Step Pyramid is the most noteworthy. It is supposed to have been built by Ata, the fourth king of the first dynasty, though its date can not be fixed. At all events, it is supposed to be older than the pyramids at Gizeh. It rises by six steps which vary from 38 to 294 feet in height, separated by ledges from 6 to 7 feet wide. The north and south sides are 352 feet long, and the east and west sides 396 feet; the height is 197 feet. It is not well oriented. A short distance to the S. W. is the pyramid of Unas, the last king of the fifth dynasty. It is 62 feet high and 220 feet square. When explored by Maspero in 1881 the sarcophagus and bones of Unas were found inside. In view of the uninscribed condition of the pyramids previously explored, it was a startling discovery to find the walls of two chambers and of two corridors covered with ritual prayers and religious texts. (See EGYPTIAN LANGUAGE AND LITERATURE.) Similar was the pyramid of Teta, the first king of the sixth dynasty, a little to the N. E. of the Step Pyramid. It is 59 feet high, 210 feet square, and has a platform at the top 50 feet square. It also contained texts in hieroglyphs which were painted green. Farther to the S. is the pyramid of Pepi I., the second king of the sixth dynasty, which was opened in 1880. It is 250 feet square and only 40 feet high. The sarcophagus of Pepi was found broken, surrounded by pieces of the mummy. This pyramid was also inscribed with similar texts. The name given to it was Men-nefer, pleasant dwelling, the original of the name of MEMPHIS (*q. v.*). Near by is the Mastaba Far'un (mastaba of Pharaoh), which was supposed by Mariette to have belonged to Unas of the fifth dynasty. Ruins of several other pyramids are found in the group of *Saggarah*. At *Dahshûr*, $3\frac{1}{2}$ miles farther S., there are six pyramids, four of stone and two of brick. Two of the former are of immense size, rivaling those of Gizeh, being respectively 700 and 620 feet square and 326 and 321 feet high. The latter is known as the Blunted Pyramid, on account of a break in the original angle of construction. The brick pyramids are respectively 350 and 343 feet square, and 90 and 156 feet high. Originally they were covered with a facing of stone. There are also some structures of less importance at *Lisht*, a few miles farther S. The False Pyramid of *Médûm* is so called because, unlike the rest, it rises in three sections, 69, 204, and (originally 32) now about 25 feet high. It was never completed. Recent excavations show that it was constructed by Snofru (*Gr. Sosis, q. v.*), the first king of the fourth dynasty, making it the oldest dated pyramid. Connected with it was the oldest Egyptian temple known to us, dating from the same reign. The pyramid at *Illahûn*, at the mouth of the Fayum, was the work of User-tasen II. (Sesostris of Manetho), the third king of the twelfth dynasty. Another at *Hawâra*, a little to the W., was erected by Amenemha III., the fifth king of the same dynasty. At *El-Kulâh*, near Esneh above Thebes, is a pyramid which has the appearance of steps, owing to the decay of the coating material. It is undated and is of small importance, having a base of only 55 feet square and a height of 30 feet. The pyramids of *Ethiopia* (see *MEROË*) were simply late imitations of Egyptian structures. The literature of the subject is extensive, but somewhat scattered. Following are some of the important works: Maspero, *Egyptian Archaeology*, translated by Edwards (London and New York, 1887); Per-ring, *Pyramids of Gizeh* (3 vols., London, 1839-42); Vyse, *Operations at the Pyramids of Gizeh* (2 vols., London, 1840-42); Petrie, *Pyramids and Temples of Gizeh* (London, 1887); *Season in Egypt* (London, 1888); *Hawara* (London, 1889); *Kahun* (London, 1890); *Illahun* (London, 1891). Guide-books, such as those of Baedeker, Murray, and Meyer, contain much detailed information. See MEXICAN ANTIQUITIES.

CHARLES R. GILLET.

Pyrene, or **Phenylene-Naphthalene** [*pyrene* is from *Gr. πῦρ*, fire]: a solid hydro-carbon, whose formula is $C_{16}H_{10} = C_{10}H_6(C_6H_4)$. It occurs with chrysene in the last portions of the distillate obtained in distilling coal-tar to coke. The two bodies are separated by means of carbon disulphide, which dissolves the pyrene and leaves the chrysene. The carbon disulphide is distilled off, and the residue is repeatedly extracted with warm alcohol, and the cooled solution is mixed with an alcoholic solution of picric acid as long as a crystalline precipitate of pyrene picrate is produced. The precipitate is washed with alcohol, decomposed by am-

monia, washed with water, and recrystallized from alcohol till the melting-point is constant at 142 to 144° C. Pyrene crystallizes from hot alcohol in laminae resembling those of anthracene. It is usually yellow from impurities, but may be decolorized by exposing the solution in benzene to sunlight. It is very soluble in benzene, ether, and carbon disulphide. It melts at 142° C., and distills at a temperature considerably above 360° C.

Revised by IRA REMSEN.

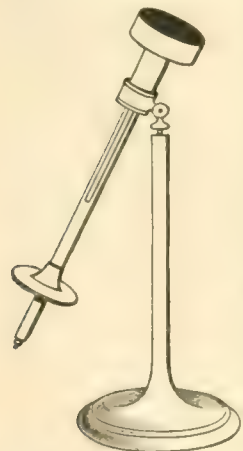
Pyrenees [from Lat. *Pyrenæi* (sc. *montes*, mountains), masc. plur. adj., Pyrenean, the Pyrenees, deriv. of *Pyre* = Gr. *Πύρη*, the Pyrenees]; a lofty mountain system, chiefly granite, overlaid by sedimentary strata, which forms the boundary between France and Spain, and stretches from the Mediterranean to the Bay of Biscay. Its entire length is 240 miles, its average breadth is about 75 miles. It is broadest and highest about midway, where the two almost parallel ranges of which the mountains consist are connected by a number of wild, towering peaks, of which the highest are Pic de Nethou, 11,168 feet; Mont Perdu, 10,997 feet; Vignemale, 10,820 feet; and Pic du Midi, 9,540 feet. In their eastern course, toward the Mediterranean, the Pyrenees fall rapidly to an average height of 2,000 feet, while the western part retains an average height of 5,000 feet, with many peaks rising 8,000 feet. Northward, toward France, the Pyrenees slope gradually, sending out forest-clad offshoots which inclose beautiful valleys; southward, toward Spain, they present steep, abrupt, and barren but bold and picturesque slopes. There are seven passes at an elevation of over 7,000 feet, making the Pyrenees notable for the great height of its passes in proportion to the height of the mountains.

Revised by C. C. ADAMS.

Pyrenomyce [Mod. Lat.; Gr. *πύρη*, stone of a fruit + *μύκης*, plur. *μύκητες*, mushroom]: an order of ascomycetous parasitic and saprophytic plants commonly known as the black fungi. Their ascospores are produced in sacs (*asci*), in usually hard-walled cavities (*perithecia*); conidia are produced singly or in clusters upon superficial threads. The common PLUM-KNOT (q. v.; *Plowrightia morbosus*) is a good example. See FUNGI.

CHARLES E. BESSEY.

Pyrheliometer [Gr. *πῦρ*, fire + *ἥλιος*, sun + *μέτρον*, measure]: an instrument invented by Pouillet for measuring the heat received at the earth's surface from the sun. The requisites for such a determination are a surface of known size, the absorption coefficient of which is also known, together with a calorimetric device for measuring the energy thus transformed. Pouillet's instrument consisted of an inverted thermometer, the bulb of which was surrounded by a flat cylindrical closed vessel of silver foil. This contained a known quantity of water. Its upper surface was blackened by a coating of lampblack so as to raise its absorbing power to the highest point. The pyrheliometer was mounted (see illustration) so that its axis could be set parallel to the sun's rays. The lower disk (to the left in the illustration) was designed to facilitate this adjustment, since



it was only necessary to bring it entirely within the shadow of the cylinder.

E. L. NICHOLS.

Pyridine (C₅H₅N): an oily base found in bone oil, shale oil, peat-tar, coal-naphtha, and the products of the destructive distillation of cinchonine. It was discovered by Anderson, together with a number of other similar bases, in 1851, in bone-oil. It occurs in tobacco-smoke. It is produced artificially by the dehydration of amyl nitrate, by heating piperidine with nitrobenzene, and together with other similar substances by heating glycerin with ammonium sulphate and sulphuric acid. In medicine it has been used in the treatment of asthma by placing a few minims on a warm shovel or metal plate so that it is volatilized in the air of the room at some distance from the patient. The patient should not be exposed to the fumes for more than twenty minutes, three times a day.

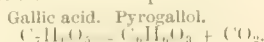
Revised by IRA REMSEN.

Pyrites [Lat. = Gr. *πυρίτης*, flint, a stone that strikes fire, deriv. of *πῦρ*, fire]: in its widest sense, a native mineral, mas-

sive or crystalline, composed of a metallic sulphide or arsenide, or both. Iron, copper, nickel, and cobalt pyrites are the ones generally mentioned. Iron pyrites is often found crystallized in cubes or in other forms. It is sometimes massive, and occasionally globular. From its bright-yellow color it is sometimes mistaken for gold. It is a more or less pure iron bisulphide. It is of great value for the manufacture of sulphuric acid and the sulphates and other commercial sulphur compounds. It also yields not unfrequently a considerable amount of silver, copper, or gold. Chemical reagents derived even remotely from it are apt to contain appreciable amounts of arsenic. Copper pyrites is an impure double sulphide of iron and copper. It is extensively employed, not only as a source of sulphuric acid, but of metallic copper.

Pyro-acetic Spirit: See ACETONE.

Pyrogallol, called also **Pyrogallie Acid** [*pyrogallie* is from Gr. *πῦρ*, fire, + Eng. *gallie*]: a substance discovered by Scheele by subliming gallic acid of gallnuts, but considered by him to be identical with it. Leopold Gmelin and Braconot proved it to be a peculiar substance. It forms a beautiful mass of snow-white crystals, extremely light and feathery. As it has been shown to belong to the class of bodies known as PHENOLS (q. v.), its name has been changed from pyrogallie acid to pyrogallol. Its formation from gallic acid by the action of heat is represented thus:



Pyrogallol is a useful reagent in the laboratory, by reason of the fact that in the presence of alkaline substances it unites readily with atmospheric oxygen at ordinary temperatures; it was therefore proposed by Liebig as an agent in analysis of gaseous mixtures containing oxygen, a method since in universal use.

Revised by IRA REMSEN.

Pyr'ola [Mod. Lat., properly *Pir'ola*, dimin. of Lat. *pīrus*, pear-tree; named from the aspect of its leaves]: a genus of *Pyroleæ*, a tribe of the *Ericaceæ* or HEATH FAMILY (q. v.), characterized by a calyx free from the ovary; the corolla polypetalous; anthers extrorse in the bud; seeds with a loose and translucent cellular coat much larger than the body. The species are nearly herbaceous and evergreen, with broad leaves. The tribe contains also *Moneses* and *Chimaphila*, the latter including the pipsissewa. CHARLES E. BESSEY.

Pyroligneous Acid [*pyroligneous* is from Gr. *πῦρ*, fire + Lat. *lignum*, wood]: a name often applied to impure acetic acid produced by the distillation of wood. It contains empyreumatic tarry matter, which gives it a dark color and peculiar smell. These impurities, however, may be completely removed.

Pyrom'eter [from Gr. *πῦρ*, fire + *μέτρον*, measure]: an instrument for the measurement of high temperatures. The term is applied particularly to apparatus for the determination of the temperature of furnaces and flues. Pyrometry, which has to do with the range of temperatures lying above the red heat, involves great experimental difficulties, and, in spite of the large amount of labor expended upon it, remains in an unsatisfactory state. Pyrometers may be classified in general as *expansion pyrometers* and *electrical pyrometers*. The acoustical pyrometer, suggested by Preston (*Philos. Magazine*, July, 1891) and described in modified form by Sanford (*Physical Review*, p. 140), may furnish a third type, but it is an instrument about which no experimental data are as yet to be had. The only substances available for expansion pyrometers are (1) highly refractory solids and (2) gases inclosed in a refractory and gas-tight bulb or reservoir. The best-known instruments of the first class are the pyrometers designed by Josiah Wedgwood (1782) for the measurement of kiln-temperatures in his celebrated potteries, and by Daniell. The Wedgwood pyrometer, which depended upon the changes in a clay cylinder when subjected to the heat of the furnace, was unreliable, except, possibly, as an arbitrary indicator of the approximate degree of incandescence. Daniell used the relative expansions of a platinum and an earthen bar, and obtained more consistent results.

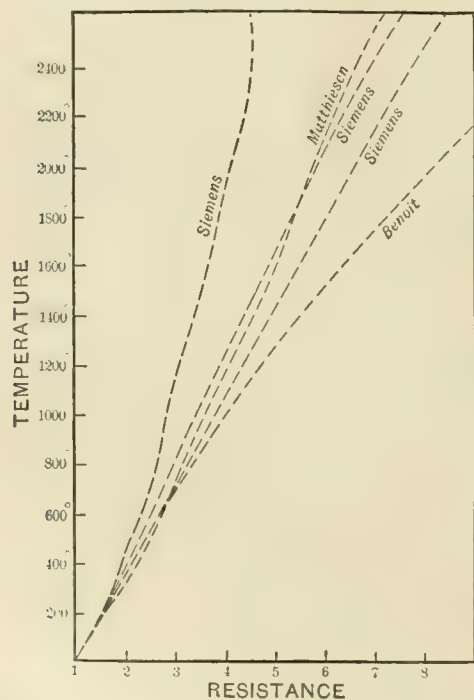
Various gas-thermometers have been used for high temperature measurements, and it is by means of this class of instruments that the most satisfactory absolute determinations have been made. Hydrogen, air, mercury, and iodine are among the gases and vapors thus employed; copper, iron, platinum, and porcelain among the materials for bulbs and reservoirs. Experience has shown that nearly all sub-

stances, with the possible exception of porcelain, become porous at extremely high temperatures, and this fact constitutes an almost insuperable difficulty in the execution of pyrometric measurements with the air-thermometer.

Some observers with pyrometric gas-thermometers have followed methods analogous to those in vogue for the measurement of ordinary temperatures. Others have employed various ingenious indirect methods for the determination of the contents of the bulb. Thus Regnault, working with a reservoir of hydrogen in the computation of furnace-temperatures, passed the gas over cupric oxide and determined the amount of water thus produced. The mercury in his mercury-vapor thermometer the same investigator estimated by weighing the mercury condensed within the cooled bulb. Deville, also, determined the amount of iodine vapor contained in a porcelain bulb at a high temperature by subsequent weighings.

The laborious character of operations with the air-thermometer has led later investigators to adopt the more manageable methods of pyrometry based upon thermo-electricity and the influence of temperature upon electrical resistance. The only metals available for either of these methods are platinum and the rare metals belonging to the same family. Iron is excluded on account of its oxidizability, even in many measurements in which its melting-point would be outside the range of experimentation.

The influence of temperature upon the resistance of platinum was exhaustively studied by C. W. Siemens with a view to the use of this property in pyrometry. The results were not altogether encouraging, it being evident that no general law could be laid down which would be applicable to all specimens, even when every ordinary care was taken with reference to the purity of the metal. The diagram,



constructed from the measurements of Siemens and others, is intended to show graphically the wide divergences which would arise from the attempt to use any single empirical formula for different specimens of platinum.

The diagram, the abscissas of which are resistances, while the ordinates are temperatures, is plotted from formulas obtained by Benoit and by Matthiessen, and from three separate results obtained by Siemens with different samples of platinum. It will be seen that the discrepancies amount to many hundreds of degrees. Later experience in the production of platinum has made it possible to eliminate some of the impurities to which the differences are due, but accuracy is still to be secured only by the direct calibration of each specimen.

Thermo-electric couples consisting of platinum and one of the alloys of platinum with one of the kindred metals,

such as iridium or rhodium, afford a means of measuring high temperatures which is probably less open to objection than any other as yet devised. Couples containing commercial platinum will, it is true, show variations similar to those which characterize the curves of temperature and resistance, but modern methods of purifying platinum have made it possible, as Barns has demonstrated, to produce the metal and its alloys in such condition that the curve for electromotive force and temperatures remains virtually a straight line up to the melting-point of platinum.

The wide discrepancies between the results obtained by different observers and in the use of the different methods would leave the subject of pyrometry in confusion were it not that the melting temperatures of the metals afford fixed points of reference by which we can institute rigorous relative comparison of the above methods with other more indirect determinations—e. g. those based upon the constancy of the specific heat of copper or of platinum, or upon assumed laws of radiating power as a function of the temperature.

By means of such comparisons certain very different methods are found to give concordant results, while others, the claims of which, taken by themselves, would seem to be quite as strong, are not accordant. Thus there has gradually been established a set of values running up to the melting-points of silver, gold, and copper upon which great weight is laid. Above 1,100° C., however, pyrometry is still very far from being an exact science. See further, Barns, *Measurement of High Temperatures*; Guillaume, *Thermométrie de Précision*; Becquerel, *Comptes Rendus*. Deville and Troost, *Annales de Chimie*, vol. iii., 58; Regnault, *ibid.*, vol. iii., 63; Daniell, *Quarterly Journal of Science*, 11 (1821); Wedgwood, *Phil. Transactions*, 72, 74, and 76.

E. L. NICHOLS.

Pyrope [from Gr. *πυρρός*, a kind of red bronze, liter., adj. fiery-eyed; *πῦρ*, fire + *ὤψ*, *ὠπός*, eye]: the precious garnet, a fine dark-red garnet, much used in jewelry, and incorrectly called hyacinth, ruby, and carbuncle. It comes from Ceylon, Germany, Scotland, etc. See GARNET.

Pyroph'ori [Mod. Lat.; Gr. *πῦρ*, fire + *φέρειν*, bear]: a term applied generally to some substances which kindle spontaneously and enter into combustion when exposed to the air, the term being confined, however, to solid substances, and not applied to spontaneously inflammable liquids. Carbon, phosphorus, and many easily oxidable metals may be made pyrophoric by preparation in a state of extreme division. "Homberg's pyrophorus" is formed by mixing intimately alum and sugar, drying and charring first in an open pan, then igniting in a closed vessel. Phosphorus, when left by evaporation of its solutions in very volatile liquids, like bisulphide of carbon, is pyrophoric. Iron may be obtained in pyrophoric form by many methods, even by simple reduction of the oxide with hydrogen gas at a minimum temperature. A lead pyrophorus is obtained by charring dry tartrate of lead in a close tube. If, after cooling, the tube be crushed, a beautiful shower of fire, metallic lead and carbon in combustion, makes its appearance. Some common lignites, very finely pulverized and thoroughly dried by heat, are pyrophoric when warm. Numerous other cases are described in chemical works.

Pyrophosphates: See PHOSPHORIC ACID.

Pyrophosphoric Acid: See PHOSPHORIC ACID.

Pyro'sis [Mod. Lat., from Gr. *πύρωσις*, burning, inflammation, deriv. of *πυρῶν*, to burn, deriv. of *πῦρ*, fire]: an affection of the stomach characterized by the regurgitation of a considerable quantity of liquid when the stomach is empty of food. The liquid expelled may be insipid to the taste or saltish, and it is sometimes acid. It is not vomited, but regurgitated, and the regurgitation is not accompanied by the sense of nausea which usually attends acts of vomiting. The popular name for the affection is water-brash. The regurgitation takes place especially in the morning, before food has been taken. A sensation of burning is generally felt in the region of the stomach, and frequently in the throat during and after the passage of the liquid. This burning sensation is implied in the name *pyrosis*. The regurgitation in pyrosis is to be distinguished from that of food or drink which has been taken into the stomach in other cases of dyspepsia. The liquid regurgitated in pyrosis is the morbid product of secretion from the glands of the stomach, the abnormality as a rule consisting in excessive acidity of the gastric juice. The affection occurs oftener in

women than in men, and is somewhat dependent on disturbance of the nervous system. Persons living on a poor, insufficient diet are more likely to suffer from it than those who live well or generously. It is not a grave affection, nor does it denote a tendency to any important disease in the stomach or elsewhere. It is generally relieved very speedily by the carbonate or subnitrate of bismuth in doses of from 20 to 50 grains, given twice or three daily. The treatment, in other respects, embraces the use of tonic remedies, nutritious alimentation, and hygienic influences to invigorate the system.

Revised by W. PEPPER.

Pyrotechny [Gr. *πῦρ*, fire + *τέχνη*, art]: the art of making fireworks for the purpose of amusement or for signals. The methods in use have been developed almost independently of the direct aid of science, and largely "by rule of thumb." Fireworks are said to have originated in the East. It is certain that there were firework displays in China centuries before their introduction into Europe, and the Chinese and Japanese still excel in some branches of the art. The subject of pyrotechny covers both the mechanical and chemical branches. For the purposes of this article it is only necessary to treat briefly of the chemical features. All fireworks contain a substance or mixture of substances capable of burning, and therefore called the *fuel*, and a substance or substances rich in oxygen. Among the substances used as fuel the following may be mentioned: Sulphur, charcoal, shell-lac, resin, pitch. The chief supporters of combustion, or oxygen compounds, employed are saltpeter (potassium nitrate) and chlorate of potash (potassium chlorate). For the production of colored lights and stars different substances are introduced into the filling. The accompanying table gives the names of the substances and the proportions in which they should be mixed to produce red, green, blue, yellow, and white:

SUBSTANCES.	Red.	Green.	Blue.	Yellow.	White.
Potassium chlorate.....	2		5	4	
Sulphur.....	2	1	2		4
Charcoal.....	1				
Shell-lac.....		3	1	1	
Calomel.....			2		
Magnesium filings.....	2	2	2	1	2
Strontium nitrate.....	8				
Barium chlorate.....		12			
Copper oxychloride.....			2		
Sodium oxalate.....				2	
Potassium nitrate.....					12
Antimony sulphide.....					1

Iron-filings are frequently introduced into the mixtures to cause brilliant scintillations; long filings or those made with a coarse file are preferred. The famous Bengal lights are made with niter, 7 parts; sulphur, 2; antimony sulphide, 1. Rocket and Roman-candle stars are compressed portions of the powder. They usually contain the same constituents as ordinary gunpowder, the proportion of charcoal being somewhat reduced; steel-filings are sometimes added. Camphor, gum benzoin, and storax are frequently mixed with the powders to give an aromatic odor and mask the unpleasant odors arising from the firing of the mixtures without such addition. See Thorpe's *Dictionary of Applied Chemistry*, vol. iii.

Revised by IRA REMSEN.

Pyroxene: See AUGITE.

Pyroxylic Spirit: See METHYL ALCOHOL.

Pyrox'ylin [Gr. *πῦρ*, fire + *ξύλον*, wood]: the technical name for guncotton. (See EXPLOSIVES.) When cellulose (cotton) is treated with concentrated nitric and sulphuric acids, it undergoes changes of the same kind as those effected in glycerin by the action of these acids. Different products are obtained, according to the strength of the acids, the temperature, and the time. The final product is the *hexanitrate*, $C_{12}H_{11}(NO_3)_6O_4$. Other products are the *pentanitate*, $C_{12}H_{15}(NO_3)_5O_6$, the *tetra-*, *tri-*, and *di-nitrates*. The hexanitrate is the most explosive and is the true guncotton. It is made by treating dried cotton for twenty-four hours at 10° C. with a mixture of 1 volume nitric acid (sp. gr. 1.5) and 3 volumes sulphuric (sp. gr. 1.845). The lower nitrates are used for making COLLODION (*q. v.*) for photographic purposes. These are principally the tetra- and pentanitrates, which are made by using less concentrated nitric acid and a somewhat higher temperature than in the manufacture of guncotton. Among the directions given for its preparation is the following: Add 1 part cotton to a mixture of 20 parts saltpeter and 31 parts sulphuric acid (sp. gr. 1.830-1.835), the temperature of the mixture not above 50°

C. The whole is allowed to stand twenty-four hours at $28-30^{\circ}$ C., and then washed with water. The product dissolves in a mixture of 7 to 8 parts ordinary ether and 1 part alcohol. It is mainly the tetranitrate. "The pyroxilin made from tissue-paper for the celluloid manufacturers is made by taking 50 cubic cm. of nitric acid of 1.47 specific gravity, 100 cubic cm. nitric acid of 1.36 specific gravity, and 100 cubic cm. of sulphuric acid of 1.84 specific gravity. In this mixture 18 grammes of the finely shredded tissue-paper are immersed at a temperature of 55° C. for one hour. The paper gains about 40 per cent. in weight in the nitration" (Sadtler).

See REMSEN.

Pyrrha: See DELICATON.

Pyrrhic Dance (in Gr. *Πυρρική ὄρχησις*): a Greek war-dance in full armor. It originated in Dorian Crete, where its prototype was the dance instituted by the Curetes to drown the cries of the infant Zeus, though the Spartans referred it to Castor and Pollux, and the Athenians to Dionysus and Athene. It was a mimic fight, intended to illustrate the art of attack and defense. It became popular in imperial Rome.

J. R. S. STERRETT.

Pyrrho of Elis: Greek philosopher 365-275 B. C.; founder of the skeptical school of philosophy and still used as a type of the doubting spirits. Nothing left in writing. See Ch. Waddington, *Pyrrhon et le pyrrhonisme* (Paris, 1877).

Pyrrhus [= Lat. = Gr. *Πυρρός*, liter., fire-colored, red-headed, deriv. of *πῦρ*, fire]: 1. Another name for Neoptolemus, the son of Achilles and Deidamia. 2. A king of Epirus, who claimed descent from Achilles through Neoptolemus. He was born in 318 B. C. of Eacides and Phthia. Eacides was banished when Pyrrhus was two years old, but trusty servants saved Pyrrhus and brought him to the court of Glaucias, King of the Taulantians. In 307 Glaucias succeeded in placing the boy on the throne, but in 302 he was banished, fled to Demetrius Poliorcetes, distinguished himself in the battle of Ipsus in 301, betook himself to Egypt, married the stepdaughter of Ptolemy, received money and troops from Ptolemy, and in 295 once again became King of all Epirus. He then embarked with varying fortune in wars against the neighboring princes, including Demetrius, King of Macedonia. In 287 he became King of Macedonia also in the stead of the fallen Demetrius, but soon lost it to Lysimachus. In 281 he espoused the cause of the Tarentines against Rome, and in 280 landed in Tarentum with 25,000 troops and 20 elephants, won the battle on the Siris, advanced upon Rome, and won again at Asculum in 279. But when Rome and Carthage combined against him he abandoned Italy and applied himself to the conquest of Sicily, where at first he was received with joy and fought with success, but when he encountered the firm resistance of the Carthaginians at Lilybæum, the fickle Sicilians abandoned his cause for that of Carthage. In disgust he evacuated Sicily and returned to Italy in 276, after his fleet had been defeated by the Carthaginians, and in 275 he was utterly defeated by M. Curius Dentatus at Beneventum. Collecting the remnants of his army, he returned to Epirus in 274, leaving at Tarentum a garrison. He then attacked Antigonus of Macedonia and actually annexed a large part of that kingdom. In 272 he undertook the conquest of the Peloponnesus at the call of Cleonymus, King of Sparta; he attacked Sparta, was repulsed, retreated to Argos, where he was met by the forces of Antigonus of Macedonia; a fight ensued in the streets of Argos; Pyrrhus was knocked senseless by a brick hurled from a housetop by the mother of a man whom Pyrrhus was about to kill. He was then dispatched by one of the soldiers of Antigonus in 272 B. C.

J. R. S. STERRETT.

Pyrus: a genus of rosaceous trees and shrubs of some fifty species, among which are the APPLE, PEAR, and QUINCE (*q. v.*).

Pythag'oras: a Greek philosopher, supposed to have been born at Samos about 582 B. C.; to have been the son of Mnesarchus; his earliest teacher to have been Pherecydes the Syrian, from whom he may have received Egyptian and Zoroastrian lore; his next teacher to have been Anaximander, who taught that the principle (*ἀρχή*) of things is the unlimited or indefinite (*ἄπειρον*); in early life to have traveled through Ionia, Phœnicia, and Egypt, where he was initiated into the mysteries by the priests. Some would have it that he was even carried away to Babylon, with other Egyptian prisoners, by Cambyses, who made his raid on Egypt in the year 525 B. C.; but the weight of authority

favors the view that he repaired to Crotona, in Lower Italy, 529 B. C., and there established a society with ethical, political, and philosophic tendencies. His school was allied with the aristocratic party, and consequently incurred the animosity of the democratic party. This occasioned (about 510 B. C.) the retirement of Pythagoras to Metapontum, where he died soon after. His school spread rapidly, and, after the manner of Oriental systems, was semi-ethical and religious, semi-political and social, tending to produce a fusion of state and hierarchy. It has bequeathed to us a multitude of philosophemes on mathematics, music, and astronomy, as well as on ethics. The doctrines of metempsychosis, of the cyclic return of events, of contraries (*ἐναντίας*)—according to which he added to the principle of his master, Anaximander (which was "the unlimited"), its opposite, the limiting (*περὶ λειψύρα*)—indicate Persian or Egyptian influence. This Oriental tendency may have had another origin than those named (his teachers or his travels), so far as the writings of his school are concerned (for no writing of the master has come down to us), in the Crotonian school of medicine, of whom Democedes, the celebrated physician, had resided at the Persian court under Darius. What belongs to the disciples and what to the master can not be told. Pythagoras is said to have anticipated the Copernican doctrine, making the sun the center of the cosmos; also to have discovered the numerical ratio existing between musical tones of the gamut (either by length of strings or by their degrees of tension). He is famous, according to Aristotle and subsequent writers, for his doctrine that "number is the principle of all things, and that the organization of the universe is an harmonic system of numerical ratios"; but this may be the doctrine of the Pythagoreans rather than of the founder of the school. There is, however, less doubt as to the fact that he sought to establish a new ethical basis for society in place of the unconscious use and wont that had prevailed up to his epoch. He laid the greatest stress on the discipline of the will into obedience, temperance, silence, self-examination, simplicity in personal attire, and self-restraint in all its forms. The original sources of information regarding him are Aristotle (*Met.*, i, 5; *Phys.*, iii, 4; *De Cælo*, ii, 13 and 9; *Eth. Nic.*, v, 8), the writings of Aristotelian commentators, Herodotus (ii, 81; iv, 94-96, etc.), and the (mostly spurious) writings of his disciples, Philolaus, Ocellus Lucanus, Timæus Locrus, Archytes of Tarentum, Epicharmus, and the Neo-Platonists Iamblichus and Porphyry; Diodorus Siculus and Diogenes Lærtius are to be added to this list. W. T. HARRIS.

Pytheas (in Gr. *Πυθέας*): 1. An Athenian orator and antagonist of Demosthenes. 2. A native of Massilia (Marseilles), a geographer and navigator, who in the time of Alexander the Great made two voyages of discovery along the western and northwestern coasts of Europe from Gibraltar to Iceland. His accounts of his travels were received by the ancients with incredulity and disgust as being fables, but it is now known that they were in the main correct. His books, the chief of which was *τὰ περὶ ὠκεανῶν*, are known only from the adverse criticism of later writers.

J. R. S. STERRETT.

Pyth'ia (in Gr. *Πυθία*): the priestess of the Pythian Apollo in Delphi. In early times this priestess was a virgin, but later on she was a married woman, more than fifty years of age, dressed as a virgin. There were two regular priestesses with an assistant, who acted as priestess in case of emergency. Clothed in long rich robes and with golden ornaments in her hair, the Pythia, after prayer, sacrifice, and

the required purifications had been duly performed, took her seat upon the sacred tripod, which stood over the Castalian spring. The vapors that ascended from this spring, sacred to Apollo, were supposed to inspire her answer. The response of the god through the Pythia was usually couched in hexameters, though official versifiers stood ready to turn the answers into verse in case the Pythia made use of prose. In later times the response of the god was given regularly in prose.

J. R. S. STERRETT.

Pythian Games [Gr. *τὰ Πύθια*, deriv. of *Πυθώ*, Pytho or Delphi]: festivals held late in August of the third year of each Olympiad at Delphi, in Phocis, in honor of Apollo, who established them in commemoration of his victory over the Python, a frightful dragon that lived on Mt. Parnassus. Originally the contests were purely musical, and consisted of songs accompanied by the lyre and by the flute, together with contests on the flute alone. After the sacred war (355-346 B. C.) the festivals were conducted under the direction of the Amphictyonic Council. A day devoted to athletic sports similar to those held at Olympia was added and by degrees various forms of horse races and chariot races were introduced. See DELPHI, OLYMPIAN GAMES, and Mommsen, *Delphika*. B. B. HOLMES.

Pyth'ias: See DAMON AND PYTHIAS.

Python: See BOA.

Pyx [from Lat. *pyxis* = Gr. *πύξις*, box, liter., a boxwood box, deriv. of *πύξος*, boxwood]: (1) a sacred vessel, having usually the form of a covered cup with a foot, used in the Roman Catholic Church to contain the sacred wafer when preserved after consecration; (2) the strong box used in the mint for the safe keeping of coins set apart from each successive coinage to be examined by a commission of experts for the purpose of testing their accuracy as to weight and fineness.

The examination of these reserved coins is called the "trial of the pyx," and in Great Britain this trial takes place "at least once in every year in which coins have been issued from the mint" before a sworn jury of at least six goldsmiths. Should the coins have been found accurate in weight and fineness within the limits allowed by law, commonly called *tolerance* or *remedy*, no further proceedings are taken; but in case the coinage in either or both these respects be found inexact, the officers of the mint are liable to censure or more serious penalties.

In the U. S. it is provided that a trial of the pyx shall be made at the mint in Philadelphia on the second Wednesday in February, annually. This takes place before the judge of the district court of the U. S. for the eastern district of Pennsylvania, the comptroller of the currency, the assayer of the New York assay-office, and other persons designated by the President. A majority of the commissioners constitute a competent board. Their examination is to be made in the presence of the director of the mint. The reserved coins from the coinage of other mints besides that at Philadelphia are transmitted quarterly to the Philadelphia mint; and in addition to these the director may at pleasure take any other pieces as tests. If the coins are within the limits of tolerance in fineness and weight, their report is simply filed; but if deviation in either or both respects is discovered, exceeding the limits of tolerance, the fact is to be certified to the President of the U. S., and "if, on a view of the circumstances of the case, he shall so decide, the officer or officers implicated in the error are thenceforward disqualified from holding their respective offices."

Q



the seventeenth letter of the English alphabet.

Form. The form is derived through the Latin alphabet from the Greek, kappa Q. This letter was used in the older Greek writing to indicate the velar or back-guttural sound of *k* occurring before the vowels *o* and *u*. From about 525

B. C. onward it was gradually displaced by kappa, and finally passed entirely out of use except as a numeral sign (= 90). The Semitic form of the letter was φ .

Name. The Greek name kappa or qoppa (κόππα) is an adaptation of the Semitic name *Qoph*, meaning head, back of head. This name was doubtless chosen analogously with the other letter-names, both because of the fancied resemblance of the letter to the human head and neck and because the sound of the letter was initial in the name. The English name *kya* (i. e. *kya*), of which the variant *kyauf* occurs, is successor to O. French *cu*, Lat. *qu*.

Sound.—The letter occurs in English only in the combination *qu*, which generally has the sound *kw*, as in *quite*, *queen*, *equal*. This is a labialized guttural explosive, a single sound in which the *k*-position and the *w*-position are formed simultaneously and not successively; cf. *tw* in *twice*. The digraph *qu* stands for simple *k* in many late loan-words from the French, as *coquette*, *etiquette*, *piquant*, *grotesque*, *critique*, *bouquet*.

Source.—When it has the value *kw* the digraph *qu* commonly represents either (1) O. Eng. *cw* < Indo-Europ. *q* (velar-guttural); thus *queen* < O. Eng. *cwene*, cf. Sanskr. *gnā*, Gr. *γυνή*; *quick* < O. Eng. *cwic*, cf. Lat. *vivus*, Sanskr. *jivā*; or (2) O. Fr. *qu* in loan-words which entered English before the French *qu* became *k*; thus *quart*, *quilt*, *quarrel*, *quest*, *hquest*.

Symbolism.—Q = Quintus, question, farthing (*quadrans*); Q. d. = as if he should say (*quasi dicat*); Q. e. = which is (*quod est*); Q. E. D. = which was to be proved (*quod erat demonstrandum*); Q. v. = which see (*quod vide*).

BENN. IDE WHEELER.

Qua-bird, or Quawk: the NIGHT-HERON (*q. v.*).

Quadrages'ima [= Lat., fortieth]: a name for LENT (*q. v.*), or for the first Sunday in Lent.

Quadrant [from Lat. *quadrans*, *quadrantis*, a fourth part, fourth of a whole, deriv. of *quat' tuor*, four]: in its common signification, a quarter of the circumference of a circle, or ninety degrees; in navigation and astronomy, an instrument for measuring angles, having a limb divided to ninety degrees. Astronomical quadrants of large dimensions were employed by the early observers for measuring meridian altitudes, being for this purpose firmly fixed in the plane of the meridian, but they were superseded by the mural circle, which, in its turn, has given way to the transit circle. In navigation the quadrant is superseded by the sextant. (See SEXTANT.) The invention of the quadrant is commonly ascribed to John Halley, a friend of Newton, on the ground that the instrument was first described by him in a paper read before the Royal Society in 1731, but the invention was independently made in 1730 by Thomas Godfrey, of Philadelphia, whose description was given to the same society in 1732; and the society decided the honor of the invention to belong equally to both. The real originator, however, of the ingenious idea on which the invention is founded was Sir Isaac Newton, who so early as 1727 communicated it to Halley, then astronomer-royal, in a paper which came to light only after the death of the latter in 1742.

Revised by S. NEWCOMB.

Quadratic Equation [*quadratic* is from Lat. *quadra'tus*, squared, deriv. of *quadra're*, make square, (in math.) square, deriv. of *quat' tuor*, four]: an equation of the second degree, containing but one unknown quantity. Every quadratic equation may be reduced to the form

$$x^2 + 2px = q, \quad (1)$$

in which expression *p* and *q* represent known quantities;

and when it has been so reduced the two roots of the equation are

$$-p + \sqrt{q + p^2}, \text{ and } -p - \sqrt{q + p^2}. \quad (2)$$

If $q < p^2$, the roots are both real; if q is negative, and numerically equal to p^2 , the two roots are equal; if q is negative, and numerically greater than p^2 , both roots are imaginary. If p is equal to 0, the equation is said to be incomplete, and its roots are then numerically equal with contrary signs; in this case the roots are real when q is positive and imaginary when q is negative. The following properties are common to all quadratic equations, after being reduced to the form (1): (1) Every quadratic has two roots and only two. (2) If all the terms are transposed to one member, that member can be resolved into two factors of the first degree with respect to the unknown quantity, the first term of each factor being the unknown quantity and the second terms being the two roots, each taken with a contrary sign. (3) The algebraic sum of the two roots is equal to the coefficient of the second term with its sign changed. (4) The product of the two roots is equal to the second member with its sign changed. (5) If the second term is negative, and numerically greater than the square of half the coefficient of the second term, both of the roots are imaginary. See EQUATION and IMAGINARY QUANTITIES.

Quadrature [from Late Lat. *quadratu'ra*, deriv. of *quadra're*, make square, reduce an area to a square]: the operation of finding an expression for the area bounded by a line or lines, straight or curved, on a plane. See MENSURATION.

Quadrature of the Circle: the geometrical problem of finding a square whose area shall be rigorously equal to that of a given circle. It is one of four celebrated problems vainly attacked by the ancients, the other three being (1) the duplication of the cube, or the construction of a line the cube of which shall be double that of a given line; (2) the trisection of an angle; and (3) the insertion of two geometric means between two given lines. All of these problems are shown by modern mathematics to be unsolvable in the ancient sense; that is, it is shown that they can not be constructed by the ruler and compass, as problems in elementary geometry are required to be constructed by Euclid's postulates. The reasoning is very simple: No quantities can be constructed from given quantities except those which can be formed from them algebraically by the solution of quadratic equations; if the algebraic solution appears as the root of an equation of the third or higher degree, unsolvable by quadratics, then it can not be constructed geometrically.

The problem of the quadrature of the circle may be expressed in two different ways, according as an analytical or geometrical solution is required. The geometrical solution would, as we have already said, consist in constructing, by the ruler and compasses, a square which shall be equal to a given circle. The algebraic solution would consist in finding some numerical expression for the ratio between the diameter of a circle and the side of a square equal to it in area. Since the area is known to be equal to the rectangle contained by half the diameter and half the circumference, this problem amounts to the same thing as constructing a line which shall be equal in length to the circumference of a circle whose diameter is given. The question of its possibility could be settled only by showing that the numerical representation can not be made by solving a series of quadratic equations. That this is impossible has long been recognized, but never rigorously proved until the year 1882, when Lindemann, of Königsberg, showed that the ratio of the diameter to the circumference, commonly represented by the symbol π , could not be represented as the root of any algebraic equation whatever with rational coefficients.

The arithmetical solution may be expressed in two ways: (1) to construct an expression which shall represent the number π ; (2) to express π to any extent by decimals. As to the first form, no expression which shall be at the same time rational and finite is possible, a result which follows at

once from Lindemann's theorem; but there are a number of infinite series which are equal to π , among which we may mention the following:

$$\begin{aligned} a &= \frac{1}{2} - \frac{1}{3 \cdot 2^3} + \frac{1}{5 \cdot 2^5} - \frac{1}{7 \cdot 2^7} + \text{etc.} & b &= \frac{1}{1} - \frac{1}{3 \cdot 5^3} + \frac{1}{5 \cdot 5^5} - \frac{1}{7 \cdot 5^7} + \text{etc.} \\ a' &= \frac{1}{5} - \frac{1}{3 \cdot 5^3} + \frac{1}{5 \cdot 5^5} - \frac{1}{7 \cdot 5^7} + \text{etc.} & b' &= \frac{1}{2 \cdot 3} - \frac{1}{3 \cdot 23^3} + \frac{1}{5 \cdot 23^5} - \text{etc.} \\ a'' &= \frac{1}{8} - \frac{1}{3 \cdot 8^3} + \frac{1}{5 \cdot 8^5} - \frac{1}{7 \cdot 8^7} + \text{etc.} & \pi &= 16b - 16b' \\ \pi &= 4(a + a' + a'') \end{aligned}$$

If we attempt to represent the number π as a decimal fraction the decimals will go on without end. The practical question is simply that of computing any number of them. Various computers since the sixteenth century have made the computation to a great number of decimals, among whom the following are worthy of mention: In 1590 Ludolph von Keulen, of Leyden, computed it to thirty-five decimals. This work led to the term Ludolphian number, which the German mathematicians frequently use for π . In 1719 Lagny, a French mathematician, carried the computation to 121 decimals. During the nineteenth century Dr. Clausen, of Dorpat, calculated 250 decimals. In 1844 Dase, of Vienna, carried the computation to 200 figures. Dr. Rutherford, of London, and Shanks, of Durham, then entered into a competition in the matter, and the latter carried the computation to 607 decimals, as follows:

$\pi = 3.14159$	26535	89793	23846	26433
83279	50288	41971	69399	37510
58209	74944	59230	78164	06286
20899	86280	34825	34211	70679
82148	08651	32823	06647	09384
46095	50582	23172	53594	08128
48111	74502	84102	70193	85211
05559	64462	29489	54930	38196
44288	10975	66593	34461	28475
64823	37867	83165	27120	19091
45648	56692	34603	48610	49432
66482	13393	60726	02491	41273
72458	70066	06315	58817	48815
20920	96282	92540	91715	36436
78925	90360	01133	05305	48820
46652	13841	46951	94151	16094
33057	27036	57595	91953	09218
61173	81932	61179	31051	18548
07446	23798	34749	56735	18857
52724	89122	79381	83011	94912
98336	73362	44193	66430	86021
39501	60924	48077	23094	36285
53096	62027	55693	97986	95022
24749	96206	07497	03041	23669
29133	32 +, etc.			

The effect of omitting the decimals which follow the six-hundredth is so slight that if the number as given were used to calculate the circumference of the entire visible universe the error would be inappreciable in the most powerful microscope.

Revised by S. NEWCOMB.

Quadrigarius, **QUINTUS CLAUDIUS**: a Roman historian of the first century B. C., who displayed a greater critical faculty than most of the early annalists. Beginning his history with the capture of Rome by the Gauls, because authentic documents for the early period were lacking, he continued it down to the time of Sulla in at least twenty-three books. For the fragments, see Peter, *Hist. Rom. Frag.*, pp. 136-151 (Leipzig, 1883).

M. W.

Quadrilateral, **The**: the name commonly applied to the four Italian strongholds of Peschiera, Mantua, Verona, and Legnago, or to the trapezoidal-shaped territory the angles of which are indicated by these four towns. The Mincio forms its western and most important defensive line, and the Adige the eastern. From Peschiera to Verona is 15 miles, and from Mantua to Legnago 21 miles. This quadrilateral has formed the base of all military operations against Italy during almost a thousand years; its possession has been supposed to assure control of the peninsula. It has constantly been strengthened with utter disregard of expense. Austria's possession of it was a standing menace to the unification of Italy, but the alliance of the latter power with Prussia forced Austria to withdraw after the disastrous defeat at Sadowa (1866). In like manner Rustchuk, Silistria, Shumla, and Varna, form the quadrilateral of the Balkan peninsula, and were considered the main de-

fense of Constantinople and of the Ottoman possessions in Europe until the Russo-Turkish war of 1877. It was then flanked, and the Ottoman empire conquered, although the Russians had been unable to reduce either of the four strongholds. The third or Asiatic quadrilateral was formed by Batum, Ardahan, Kars, and Baieid at the northeast of the Ottoman possessions in Asia. All but Batum were captured by the Russians in 1877. The Treaty of Berlin ceded Batum, Ardahan, and Kars to Russia, leaving only Baieid to the Ottomans. The four were a defensive, almost impregnable, line of fortresses rather than a real quadrilateral, though so called.

E. A. GROSVENOR.

Quadrumanus [Lat., four-handed; *quattuor*, four + *manus*, hand]: a name employed by Blumenbach (in 1791) as an ordinal designation for the monkeys, lemurs, and related types, man having been isolated as the representative of a peculiar order named *Bimana*. The views thus expressed were for a long time predominant, but a closer study of the structure of the forms indicated by those names has convinced almost all naturalists that they were erroneously separated, and the two types are now generally combined in one order named *Primates*, under which head man and the monkeys are combined in one sub-order (*Anthropoidea*), and contrasted with the lemurs, which constitute another sub-order (*Prosimiae*). See PRIMATES.

Revised by F. A. LUCAS.

Quæstor [Lat. *quæstor*: Oscan, *kraisstur*; Umbrian, *kvestur*, an ancient Italic official title, commonly associated with *quæ'rere*, search, investigate]: a magistrate of ancient Rome, appointed originally, the name would seem to imply, to assist the consuls in the detection of crime and the administration of justice, and later serving as their assistants in various capacities. Their number increased with the growth of Rome from four in 421 B. C. to twenty in the time of Sulla, and was raised to forty by Julius Cæsar, but reduced again to twenty by Augustus. The quæstorship, as being an office subordinate to a superior magistracy, was the lowest in the series of public offices (*cursus honorum*). At first it would seem that quæstors were chosen by the consuls, but from a comparatively early time (which can not be exactly determined) they were elected by the people. The duties of the quæstors may have been originally as extensive and manifold as those of the consul whom they served, but in the course of time certain special spheres of activity were assigned to them. At Rome they were charged with criminal jurisdiction (jurisdiction in civil suits falling to the prætor), with the management of the public finances and of the state archives. In the provinces the duties of the quæstor consisted in the management of financial affairs for his superior officer, at whose request or command he might also perform other tasks. Election to the quæstorship carried with it admission to the senate.

G. L. HENDRICKSON.

Quagga: See ZEBRA.

Quahog, **kwaw'hog**, or **Quahang** [of Am. Ind. origin]: the hard clam, *Venus mercenaria*, of the eastern coast of the U. S. See CLAM.

Quail [from O. Fr. *quaille*, from Mediæv. Lat. *qua'quaila*, from Dutch *kwakkel*, so called from its cry < *kwaken*, quack]: the popular name for various small gallinaceous birds, but strictly speaking belonging to the common quail (*Coturnix communis*) of Europe, Asia, and Northern Africa, a member of the sub-family *Perdicinae*, and a near relative of the PARTRIDGE (*g. v.*). The European quail is 7 inches long, brownish or reddish gray above, marked with streaks of buff; below, general pale buff, fading into white on the belly. It is believed to be the quail mentioned in Exodus, but that bird may have been the sand-grouse (*Pterocles arenaria*). The great majority of European quails winter in Africa, and vast numbers are taken for market in Southern Europe during their migrations. Other members of the genus occur in Asia, Australia, and New Zealand. In the U. S. the name is commonly bestowed on the well-known bob-white (*Colinus virginianus*), the "partridge" of the Southern States, but is often extended to other species, such as the California quail (*Callipepla californica*). The New World birds belong in the sub-family *Odontophorinae*.

F. A. LUCAS.

Quain, **RICHARD**, F. R. C. S., F. R. S.: anatomist and surgeon; b. at Fermoy, Cork, Ireland, in 1800; studied at the Windmill Street and Aldersgate schools of medicine, London; in 1825 went to Paris to study; in 1828 became a demonstrator and in 1832 Professor of Anatomy in the Uni-

versity of London; in 1834 became assistant surgeon and in 1850 surgeon to the North London Hospital; retired in 1866. He held a number of official positions in the Royal College of Surgeons, being its president in 1868. In 1860 he delivered the Hunterian oration, his subject being *Some Defects in General Education*. He was surgeon-extraordinary to the Queen. His elaborate treatise on the *Anatomy of the Arteries of the Human Body* ranks as a classical work. Among his other publications are *Diseases of the Rectum* (London, 1854) and *Chambers Lectures* (London, 1884). He edited, with others, the fifth edition of *Quain's Anatomy*, originally written by his brother, Jones Quain (1796-1865). D. in London, Sept. 15, 1887.—His cousin, Sir RICHARD QUAIN, LL. D., b. at Malloy, Ireland, Oct. 30, 1816, became in 1857 a fellow, and in 1889 was vice-president of the Royal College of Physicians. He is physician extraordinary to the Queen and has edited the *Dictionary of Medicine* (1883; 2d ed. 1894). S. T. ARMSTRONG.

Quakers: See FRIENDS, SOCIETY OF.

Quaking-grass: any grass of the genus *Bromus*. The spikelets are ovate, and have such delicate stalks that a light wind sets them quaking and rattling. *B. maritima* and *B. media*, from Europe, are cultivated in gardens, and the latter is partly naturalized in the U. S. In Europe it is considered a good pasture-grass for poor mountain lands. Its seeds lose their vitality in a short time after their ripening.

Quang-See: an old spelling of KWANGSI (q. v.).

Quang-Tong: an old spelling of KWANGTUNG (q. v.).

Quantin. *quantin* (n.). ALBERT MARIE JÉRÔME; printer; b. at Bréhémont, Indre-et-Loire, France, Jan. 19, 1850; studied law in Paris; became director of the Claye printing-establishment, at Tours, in 1873; moved to Paris; became printer to the Chamber of Deputies; published *Bibliothèque de l'Enseignement des Beaux-Arts* (to comprise 100 vols.) and special *Annuaire*s, and wrote *Origines de l'Imprimerie et son Introduction en Angleterre* (1877).

Quantity (in meter): the time consumed in uttering syllables, or the duration of syllables. It is, of course, relative. The duration of a short syllable in slow utterance may be as great as that of a long syllable in rapid utterance.

Quantity and quality (nature, timbre) are often confounded. When the first *o* in "co-operate" is called "long" and the second one "short," these terms should be understood only of the quality. The confusion is increased, or rather the error is emphasized, by the use of quantity marks (—, ~) to indicate these sounds. The same remark applies also to *e* and *u*. Difference of quantity is, no doubt, often associated with difference of quality, but the latter does not constitute the former.

Among the ancient Greeks there was a dispute between the so-called rhythmists (*ρυθμικοί*) and the metricians (*μετρικοί*) concerning quantity. The rhythmists held that syllables had a great variety of lengths. To illustrate this, some of them assumed the short vowel as a fixed unit, regarded a long vowel as equal to two short ones, and counted each consonant added to a vowel as equal to half a short vowel; hence they placed, for instance, $\epsilon = 1$, $\epsilon\upsilon = 1\frac{1}{2}$, $\epsilon\upsilon\tau = 2$, etc., $\eta = 2$, $\eta\upsilon = 2\frac{1}{2}$, $\eta\upsilon\tau = 3$, etc. The metricians, on the other hand, held that short syllables had a uniform length, and that long syllables were just twice as long. One writer, Aristoxenus, appears to have seen that syllables had no fixed length nor definite relation to each other, but were vaguely divisible into longer and shorter, with some doubtful cases. In constructing rhythm the long syllable was given twice the length of a short one, while the doubtful syllables were made either long or short, and were called "common." In particular cases any syllable, however long, could be shortened into an irrational (*ἄλογος*), so as to count as a short. Such syllables are not to be confounded with the "common" ones. Also in special cases a syllable could be made equal to three short ones, or four, or even more; but such prolongation, especially within a word, was confined, for the most part, to poetry intended to be sung.

While the ancient languages had great variety of quantity, that of each particular syllable was more fixed than with us. This may be seen by applying English analogy to ancient words. All pronounce "amicus," "amavi" with the second syllables long; but in "amicitia," "amavisti" many make those same syllables short, whereas they were just as long as in the former words. To the Roman ear *āmābāmūs* would have been as barbarous as "āmābam."

In Greek and Latin, syllables are long "by nature" (*φύσει*,

natura) when their vowel element is a long vowel or a diphthong; and long "by position" (*θέσει, positione*, i. e. by convention) when a short vowel is followed by a double consonant (ζ , ξ , ψ), or two or more consonants; but certain mutes followed by certain liquids do not necessarily lengthen a syllable. It will thus be seen that, while in syllabification we follow the musicians and connect as many consonants as possible with the vowel following, as $\kappa\lambda\acute{\epsilon}\pi\tau\omega$, in prosody we connect as many as possible with the preceding vowel, as $\kappa\lambda\acute{\epsilon}\pi\tau\omega$. In fact, in speaking, it is the vowel before several consonants, rather the one after them, that is felt to drag. In singing, consonants are reduced to a minimum and carried forward.

It has often been denied that there is any consciousness of quantity in English. It is true that we do not feel any definite relation of long syllables to short ones in reading or speaking as we do in singing (and, indeed, this was the case with the ancients); but that there is sometimes difference of quantity can be perceived by comparing "furrow" with "furlough," "bonnie" with "spondee," "tory" with "turnkey," etc. In reading verse, however, we merely make the feet approximately equal without feeling or perceiving exactly how it is accomplished, just as in singing we can give the voice a definite pitch without any consciousness of the vibrations that determine the pitch.

MILTON W. HUMPHREYS.

Quantity, Imaginary: See IMAGINARY QUANTITIES.

Quanza: See CUANZA.

Quarantine [liter., a space of forty days, from O. Fr. *quarantaine*: Ital. *quaranti na*, a forty of anything, deriv. of *quaran'ta*: O. Fr. and Fr. *quarante*, forty]: the time (formerly forty days) during which vessels and their passengers, cargo, etc., are detained and isolated on entering a port when they carry or are suspected of carrying contagion. The term is also used to denote such detention and isolation and, collectively, all the means employed therein.

History of Quarantine Regulation.—The necessity for quarantine, as now understood, arose out of the development of commerce, and it is generally believed that the earliest quarantine regulations were those promulgated about the beginning of the fifteenth century by Venice (then the greatest sea mart of the world) as a protection against the plagues of the East—the black plague and the Egyptian plague. As early as 1348 the household goods of those that died were destroyed, and health officers were appointed; the first lazaretto was established in 1403, and suspected incoming vessels, with their passengers and cargoes, were detained and isolated for forty days. Later, and especially in the eighteenth century, lazarettoes were established and maintained at most of the Mediterranean ports. These early lazarettoes, together with the sanitary cordons established about nearly all the principal cities, were directed only against the plague. Their measures taken for protection were often needlessly harsh, owing to the lack of scientific knowledge of the cause of the malady and of the means by which it spread. In the latter part of the eighteenth century efforts were made by John Howard and others to improve the lazarettoes and hospitals and to combat foolish superstitious and practices, and in the early part of the nineteenth century a call was made for an international congress to consider quarantine measures. By this time the plague had waned in power and had invaded Europe as an epidemic for almost the last time. Since the year 1821 quarantine regulations have, in the main, been directed against the yellow fever and cholera, although they are intended to act likewise as barriers to the ingress of all contagious or infectious maladies.

Quarantine Regulations in the U. S.—The present U. S. quarantine laws and regulations, the latter promulgated Apr. 26, 1894, are designed to obviate the detention of incoming vessels and passengers in so far as this is compatible with the practically absolute exclusion of infectious diseases, which is, of course, their paramount aim. As a means both to prevent delay and to exclude contagion, quarantines have been established by the U. S. Government at all foreign ports of departure, and every vessel leaving such a port for that country must have a bill of health from the proper U. S. officer, consular or medical, "setting forth the sanitary condition and history of the vessel, and that it has in all respects complied with the rules and regulations." There must be a personal inspection by the officer of "all vessels from ports at which cholera prevails, or at which yellow fever, smallpox, or typhus fever prevails in epidemic form,"

and "all vessels carrying steerage passengers." It is also required that all vessels shall be thoroughly clean before receiving cargo, crew, or passengers; that the bedding for steerage passengers must be renewed or disinfected before being used on the voyage; and that, if there were any case of infectious disease on the last voyage, all parts of the vessel that could possibly have been infected must be disinfected. The regulations as to the cargo vary according to its character.

The treatment of passengers is somewhat different according as they belong to the cabin or steerage class; but no one with cholera, smallpox, yellow, typhoid, or scarlet fever, measles, or diphtheria is allowed to ship, nor should any be received from an infected port. The weekly reports of the consular officers keep the Government well informed as to the exact sanitary condition of all ports of departure and the districts adjacent thereto or in direct communication with them.

Cabin passengers from ports or districts where cholera or other infectious diseases are prevalent are subject to inquiry as to their place of abode for the five days immediately preceding departure, and may be detained as long as the inspecting officer thinks best, and may also be required to have their baggage disinfected if there is any suspicion of exposure to infection. Steerage passengers and members of the crew from cholera-infected districts must be detained five days, those who have been exposed to typhus fever fourteen days, in suitable quarters, "the said periods to begin only after the bathing of the passengers, disinfection of all their baggage and apparel, removal of all food brought with them, and isolation from others not so treated." The same rules are applicable to those from districts where plague, smallpox, or yellow fever is prevailing and epidemic, and if any one of these five diseases should appear among those thus detained there must be a second isolation for the prescribed time, disinfection, etc., the new detention counting from the removal of the last case from the detention-barracks. Every passenger must have an inspection-card bearing the stamp of the proper officer, the name of the passenger, ship, and port of departure, and date of the latter, and all baggage must have labels with similar data (excepting passenger's name), and with statement and date of inspection or disinfection.

Under the terms of the statute the President has power, whenever existing conditions appear to justify it, "to prohibit, in whole or in part, the introduction of persons and property from such countries or places as he shall designate, and for such periods of time as he shall deem necessary."

The regulations require during the voyage a daily inspection, free ventilation, and thorough cleanliness of the vessel, isolation of the sick, etc., and at the port of entry the only delay required is that which will enable the proper officials to inspect the ship, crew, passengers, baggage-labels, ship's bill of health, physician's record, etc.

The Government provides for the maintenance of this inspection service at every port of entry under its jurisdiction throughout the year, and it applies to all vessels from foreign ports, all vessels with sickness on board or in which sickness has appeared since leaving the port of departure, and vessels from domestic ports where cholera or yellow fever prevails or where smallpox or yellow fever is epidemic. To these requirements the proper State or local authorities may add such others as may seem to them to be advisable or necessary.

The inspection being completed, and everything proving satisfactory to the inspecting officer, he fills out his certificate, which, together with the bill of health from the officer at the port of departure, must then be given to the collector of customs of the port, and without these two papers no vessel is permitted to disembark any of its passengers or cargo. Should there be any evidence or belief that there is possibly infectious matter on board, the inspector orders the vessel to proceed at once to the nearest national or other quarantine station, there to undergo treatment.

The following extracts from the regulations indicate the vessels that are to be remanded to quarantine at once by the inspecting officer of the port of entry: A. Those with quarantinable disease on board, the quarantinable diseases for the purposes of these regulations being cholera (cholerae), yellow fever, smallpox, typhus fever, and leprosy. B. Those having had such on board during the voyage or within thirty days next preceding arrival; or, if arriving in the quarantine season, having had yellow fever on board after Mar. 1 of the current year, unless satisfactorily disinfected thereafter. C. With some exceptions, those from ports in-

fectured with cholera, or where typhus fever prevails in epidemic form, coming directly or via another foreign port, or via United States ports, unless they have complied with the United States quarantine regulations for foreign ports; also vessels from non-infected ports, but bringing persons or cargo from places infected with cholera, yellow fever, or where typhus fever prevails in epidemic form. D. With some exceptions, those from ports where yellow fever prevails, unless disinfected in accordance with these regulations, and not less than five days have elapsed since such disinfection. Certain exceptions, with respect to vessels that would otherwise be quarantined on account of yellow fever, are made to rules C and D in consideration of (1) the time of arrival, as vessels arriving from Nov. 1 to May 1 may be admitted to entry; (2) the port of destination, as vessels with clean bills of health, etc., bound for ports in the U. S. N. of the southern boundary of Maryland, provided they have been five days from last infected or suspected port; (3) the nature of the cargo, as vessels engaged in the fruit-trade from ports declared safe, etc.

"No case of leprosy will be landed, and vessels arriving at quarantine with leprosy on board shall not be granted pratique until the leper with his or her baggage has been removed to the quarantine station"; and if the leper is an alien, measures are to be taken to have him returned to his native country.

In addition to the foregoing, all persons on vessels that have had smallpox on board during the voyage, and all but first and second cabin passengers on other vessels, must show evidence of recent vaccination or of a previous attack of smallpox, or be vaccinated, or be detained in quarantine for at least fourteen days.

There are a number of quarantine stations, more or less completely equipped, along the Atlantic and Gulf coasts of the U. S., and three on the Pacific coast, eleven being national and the rest maintained by the States in which they are located, or by the cities which they are designed to protect.

The treatment of a vessel, passengers, and cargo at quarantine is governed very materially by the disease which has caused its detention, cholera and yellow fever demanding the most prompt and energetic action. With either of these maladies the vessel is at once dispatched to the anchorage for infected vessels, and must remain there till she has been thoroughly purified and disinfected; the passengers in the meanwhile having been transferred to the lazaretto and barracks for suspects, or to other quarters where they may be isolated during the period of detention and observation, and such part of the cargo as may be necessary being removed, disinfected, and stored.

Within the barracks the passengers and others are separated into convenient groups, each of which is inspected twice daily by the physician, receives a separate water and food supply, and the individuals of which may not communicate with members of other groups except through the quarantine officer. Should a new case occur in any of the groups, the patient is immediately conveyed to the lazaretto, the other members of the group bathed, their clothing again disinfected, etc., and the whole group transferred to other quarters and sleeping apartments. There is the same isolation and segregation into groups in case of yellow fever, but infection by other diseases does not warrant so severe treatment. The duration of detention for cholera and yellow fever is five days after the last opportunity for infection and after the last disinfection of all articles taken by passengers into barracks; for smallpox the detention is extended to fourteen, and for typhus fever to twenty days.

The cargo and infected baggage are disinfected as far as practicable at the wharf or *in situ* in the vessel by means of steam, sulphurous acid gas, and strong corrosive sublimate solution. As to the vessel, nothing is thrown overboard if the infection is from cholera, though ballast may be discharged at sea, and ballast-tanks refilled with seawater. A certificate from the quarantine officer, stating that the vessel has thoroughly complied with the regulations, and that he believes her to be free from infection, is necessary before the vessel may leave quarantine. She is then said to be granted free pratique.

To secure the U. S. against the entrance of infection by way of the Canadian and Mexican frontiers, the regulations provide that, "when practicable, alien immigrants arriving at Canadian and Mexican ports destined for the United States shall be inspected at the port of arrival by the United States consular or medical officer, and be subjected to the

same sanitary restrictions as are called for by the rules and regulations governing United States ports; and where such immigrants are not inspected at the port of arrival, they shall enter the United States only at certain designated points on the frontier, and then only after such inspection, detention, disinfection, vaccination, etc., as may be necessary or required by the officers there stationed."

INLAND QUARANTINE has practically the same object as that of maritime quarantine, viz., the prevention of the transference of infectious disease from one locality to another, and the defining of certain portals through which all persons and things capable of conveying infection may be compelled to pass and undergo the necessary inspection, detention, etc. Such quarantine is in most cases invoked to limit the extension of epidemics, and depends for its efficacy upon two main features—the *sanitary cordon* and *camps of probation*.

The former "consists of a line of guards, military or civil, thrown around a district or locality, either to protect the same from the surrounding country when infected or to protect the surrounding country from the infected district or locality." The line may be a double one, in which case the innermost one encircles as much as possible of the area known to be infected, while the other includes all probable or possible cases. Of course, as soon as the zone between the two lines can be shown to be free from the particular infection, the necessity for the outer line vanishes, and it may be withdrawn; but as long as either exists, to be of any utility whatsoever, it must be so complete as to prevent all ingress or egress through it except at certain specified points—the camps of probation. The camps of probation must be distinguished from *camps of refuge*, which are "simply residence camps established to receive the population of an infected community when it has been determined to depopulate the infected district."

It may also be advisable at times to establish a *railway quarantine* at certain points, where all baggage and freight from a suspected district may be disinfected, and all passengers from the infected locality or without the requisite certificate from some authorized health officer may be remanded to the nearest camp of probation, and detained under observation the necessary length of time. See HYGIENE.

SENECA EGBERT.

Quarles, FRANCIS: poet; b. near Romford, Essex, England, in 1592; was educated at Christ's College, Cambridge; studied law at Lincoln's Inn; afterward secretary to Archbishop Usher in Dublin; driven from Ireland, with the loss of his property, by the rebellion of 1641; espoused the royal cause in the great rebellion, joining King Charles I. at Oxford, and suffered sequestration of his property. D. in London, Sept. 8, 1644. Author of *Divine Emblems* (1635); *The Enchiridion of Meditations* (1641); and other moral works filled with quaint conceits, and of *The Loyal Convert* (1644), a defense of the royal cause, besides a number of poetical works; *Feast for Worms*, or *the History of Jonah* (1620); *Argalus and Parthenia* (1621); *The Shepherd's Garland* (1644); etc.

Revised by H. A. BEERS.

Quartan: See FEVER and CHILL.

Quarter-crack: See FARRIERY.

Quarter Evil: See BLACK QUARTER.

Quartering: See HERALDRY.

Quartermaster-general: a military officer who has, in the U. S. army, the rank of brigadier-general—in the British army that of major-general or colonel. He is at the head of the quartermaster's department, which is charged with the duty of transporting troops and materials of war, of clothing, feeding, and sheltering troops, of constructing and repairing roads, military telegraphs, railways and bridges, docks and wharves, and generally with all disbursements attending military operations not expressly assigned by law or regulation to other staff departments. He has a number of assistants, and there is for each regiment of the line a regimental quartermaster, selected from among the lieutenants of the regiment, who is assisted in his duties by a quartermaster-sergeant.

Quartley, ARTHUR: marine painter; b. of English parents in Paris, France, May 24, 1839. He was self-taught; was taken to the U. S. when a child and passed the early years of his professional life in Baltimore, Md.; National Academician 1886; member of the Society of American Artists 1881; member of the American Water-color Society. D. in New York, May 19, 1886. A shore view, *Off the Isles*

of Shoals, is in the Union League Club, New York; *Low Water, Long Island Shore*, in the collection of T. B. Clarke, New York.

WILLIAM A. COFFIN.

Quartz [from Germ. *quarz*]: a very abundant and important mineral, including a great variety of precious and semi-precious stones, all of them being essentially silica (oxide of silicon) more or less pure. These minerals may be divided into four groups—the crystalline varieties, the crystalline with foreign inclusions, the crypto-crystalline, and the amorphous, or non-crystalline. The first are more or less transparent, as also the second, the leading varieties being amethyst, rock-crystal, etc. The third group comprises the chalcedonies, agates, etc., which are translucent (see CHALCEDONY); and the fourth, the jaspers, which are opaque (see JASPER). The principal varieties of the crystalline group, or quartz proper, are the following, all of them having a hardness of 7, and usually crystallizing in hexagonal prisms with pyramidal terminations:

Amethyst is a transparent purple variety, owing its color to oxide of manganese. It was much used by the ancients in engraving and in jewelry. Superb deep-purple gems that change to red by artificial light are found near Mursinka, in the Ural Mountains, and single gems sell for several hundred dollars. Oriental amethyst is a purple variety of corundum or sapphire, and is a far more valuable gem than the ordinary amethyst. See AMETHYST.

Cairngorm stone, citrine, false topaz, Saxon topaz, Scotch topaz, and Spanish topaz are names given to transparent quartz colored by oxide of iron or by carbonaceous matter, and having various shades of yellow to brown. The yellow and brown are produced by heating smoky quartz (see below), which is partially decolorized by high temperature. Much that is called topaz is this yellow quartz, which is quite different from true topaz (see TOPAZ), and less valuable as a gem. Oriental topaz is the yellow variety of sapphire.

Prase is a deep-green quartz, sometimes crystallized. It is somewhat rare, but is not much valued or used by the moderns.

Rock-crystal is the purest form of quartz, transparent and colorless, and exhibits the properties of the mineral in the most perfect degree. It is widely distributed, but is brought chiefly from Brazil, Madagascar, and North Carolina. It is wrought, especially by the Japanese and Chinese, into the polished "crystal balls" and other articles of elegant ornament. Superb coupes, ewers, caskets, etc., made in Italy, Austria, and Germany from the sixteenth to the eighteenth century, adorn the collections of the Louvre, the South Kensington Museum, the Dresden Green Vaults, the Imperial Museum at Vienna, etc. What are known as "Rhine stones," "Lake George diamonds," etc., are not quartz or rock-crystal, as generally believed, but only paste or lead-glass.

Rose-quartz is a pink or rose-tinted variety, rarely found crystallized, exceedingly beautiful if of pronounced color. Although occasionally employed for ornamental work, it is little used, owing to its liability to fade by long exposure to light. It is found in Maine, Moravia, and elsewhere.

Smoky quartz and smoky topaz are brown to almost black and probably are colored by carbonaceous matter. The lighter shades are occasionally cut for ornament, and are beautiful stones, but of little value. The finest crystals of smoky quartz from Mt. St. Gothard, in Switzerland, are now in the museum at Berne. It is also found at Pike's Peak, Col. The black quartz is called *morion*. By heating, smoky quartz is partially decolorized, yielding paler shades and yellows which then are called cairngorm stone, Spanish topaz, etc. (see above).

The varieties containing inclusions are as follows:

Aventurine, called also *gold-stone*, a brown ferruginous quartz containing spangles of mica or göthite, is found at Aventura, in Spain, and in Asiatic Russia. The artificial gold-stone, a brown glass filled with minute crystallized crystals of copper, is handsomer than the natural stone; it is made in Venice and is used for inlaid work, etc.

Cal's-eye quartz: See CAL'S-EYE.

Thetis's hair-stone, Venus's hair-stone, Sagenite, and Flèches d'Amour are names given to quartz penetrated by needle-like crystals of hornblende, rutile, göthite, and similar minerals. Quartz of this variety is occasionally cut and mounted.

There are many other semi-precious varieties of quartz, but they are rare, and of little importance save to collectors and students of mineralogy.

GEORGE F. KUNZ.

Quasi-Contract: an obligation imposed by law for the enforcement of which the law gives the action resorted to for breach of contract. The distinction between a contract and a quasi-contract is as marked as is the difference between *assent* and *dissent*. While the *assent*—as that term is used in law—of the party to be charged is necessary to the existence of a contract, a quasi-contract may exist notwithstanding the dissent of the defendant. A contract is an obligation created by act of the parties. A quasi-contract is an obligation imposed by law. Although the source of the obligations is different, the remedy given to one seeking to enforce a quasi-contractual obligation is the action given for a breach of contract, the action of *assumpsit*, hence the use of the term quasi-contract in our law. The fact that the contractual remedy is used where an action is brought on a quasi-contract has given rise to the expression “contract in law,” and this expression is too often abbreviated into the expression “implied contract.” The use of the term “contract implied in law” is unscientific, since a contract depends upon the act of the parties, and can not exist without assent, and is therefore something which the law can not imply. The term means, however, nothing more than obligation imposed by law. The use of the term “implied contract” to represent quasi-contractual obligations is not only unscientific, but is misleading, and has caused great confusion. There is an “implied contract,” but it is a genuine contract, not a quasi-contract, and differs from the ordinary simple contract, usually called an express contract, only as to the evidence by which its existence is proved. The express contract is so called because its existence is proved by the language used when the contract was entered into, while the implied contract is proved by circumstantial evidence. Implied and express contracts are genuine contracts, while a quasi-contract, as the term implies, is no contract at all. (*Steamship Co. vs. Joliffe*, 2 Wall. 450; *Louisiana vs. New Orleans*, 109 U. S. 285; *Dusenbury vs. Speir*, 77 N. Y. 144.) The terms “implied” and “express,” when used properly with reference to contracts, are terms of evidence and not of contract. (*Martzetti vs. Williams*, 1 B. & Ad. 415; *Dusenbury vs. Speir*, 77 N. Y. 144.) If A should say to B “lend me \$100 and I will repay it in one month,” and B should lend the money, there would be an express contract, for the reason that A has used the language of promise, has promised in words. If A should say to B “C is pressing me for the payment of \$100 which I owe him; if I send him to you please pay him that amount,” and B should do so, there would be a contract on A’s part to reimburse B, but it would be an implied contract, because words of promise can not be found, and the understanding of the parties is left to inference and must be gathered from the circumstances. The circumstances, however, leave no one in doubt as to the intention of A. Because of the use of the phrase “contract implied in law,” it is usual to describe genuine contracts which are not created by the use of words of promise, as “contracts implied in fact.”

It may be asked why not treat a quasi-contract as a tort if it differs so radically from a contract? The obligation giving rise to a right of action in tort is an obligation imposed upon persons in general, not upon any particular individual, to respect the inherent right which every man has to his person and property. This obligation is usually performed simply by refraining from interfering, by remaining inactive. In the case of a quasi-contract the obligation usually, if not always, exists in favor, not of the world at large, but of some particular person, and arises out of a relationship existing, or dealings had, between the plaintiff and the defendant. Furthermore, the obligation imposed by a quasi-contract requires the obligor to act. It can not be discharged simply by a failure or refusal to act.

The source of the quasi-contractual obligation is threefold:

1. Obligations of record.
2. Statutory, official, or customary obligations.
3. Obligations resting upon the doctrine that no one shall be allowed to enrich himself unjustly at the expense of another.

The typical obligation of record is a judgment, and it needs no argument to establish that an obligation which is created by law without regard to the will of the obligor, and in most cases notwithstanding his dissent and protest, has none of the elements of a contract, and is therefore quasi-contractual, and it is so regarded. (*Biddleston vs. Whytel*, 3 Burr 1545; *State of Louisiana vs. New Orleans*, 109 U. S. 285; *O’Brien vs. Young*, 95 N. Y. 428.) As a

statutory obligation exists without regard to the assent or dissent of the defendant, such an obligation is, and must be, regarded as quasi-contractual. (*Steamship Co. vs. Joliffe*, 2 Wall. 450; *Louisiana vs. New Orleans*, 109 U. S. 285; *Inhabitants of Milford vs. Commonwealth*, 144 Mass. 64; *McCoun vs. R. R. Co.*, 50 N. Y. 176.) An example is the obligation imposed upon the owner of a vessel without a pilot to pay half pilotage fees in the event of his refusing to accept a pilot who tenders his services. Of the same character, it is submitted, are customary duties where the obligation is imposed regardless of the will of the party charged with the duty, as the duty of an innkeeper to receive guests, of a carrier to receive goods. An example of a quasi-contractual obligation founded on an official duty is the obligation of a sheriff to levy execution and pay the proceeds of the sale thereunder to the judgment creditor. (*Speake vs. Richards*, Hobart 206.) The great and important source of the quasi-contractual obligation, however, is the equitable principle that no one shall be allowed to enrich himself unjustly at the expense of another. But for this principle there would be a gross failure of justice in many cases, as, for example, where money has been paid under mistake as to the existence of an indebtedness, not to create but to extinguish an obligation; where a person has committed a tort and has enriched himself thereby, and yet the remedies in tort have, in the absence of statute, been lost because of the death of the tort-feasor. It is proposed to consider briefly some of the cases showing the importance of the doctrine of unjust enrichment and the necessity for its existence in our law.

That the remedy to recover money paid under mistake as to the existence or amount of an indebtedness must be quasi-contractual is evident, as neither party intended to create an obligation in favor of the person making the payment, and the latter, if not both parties, thought that the payment would extinguish an existing obligation. To recover money paid under mistake, it must appear not only that the money was paid because of mistake in a case where there was no enforceable claim, or none enforceable to the extent of the payment, but in addition thereto it must also appear that the circumstances are such that it would be against conscience to allow the defendant to retain the money so paid. Thus if one should pay a debt barred by the statute of limitations, in ignorance of the bar, because of a mistake as to the date when the debt became payable, there could be no recovery of the money so paid, notwithstanding the plaintiff’s ability to prove that he would not have paid the debt but for the mistake. In paying the debt he only did what in conscience he should have done, notwithstanding the existence of a statute protecting him from liability, and the party to whom the money was paid is certainly not unjustly enriched in retaining what in conscience should have been paid to him. If the payment in any case is caused by ignorance or mistake of law, then, notwithstanding the retention of the money by the defendant is against conscience in that nothing was owing to him, there can not, according to the weight of authority, be a recovery of the money so paid. See *IGNORANTIO JURIS*.

If in the commission of a tort the tort-feasor enriches himself by taking from the injured party’s property and adding to his own, he may be sued in tort, in which event the measure of the plaintiff’s recovery would be the damage done the plaintiff, or he may be sued in quasi-contract, where the measure of recovery would be the extent of the unjust enrichment. When one having the right to sue either in tort or in quasi-contract uses the latter remedy he is said to “waive the tort.” These words are misleading. “Waiver of tort,” so called, is nothing but an election of remedies. What was a tort before does not cease to be a wrong by the bringing of the action in quasi-contract, for unless the plaintiff proves the commission of a tort he will not be able to recover. The plaintiff is said to waive the tort for the reason that it is a rule of law that a plaintiff loses his right to sue in tort by suing in quasi-contract. It is equally true that he loses the right to sue in quasi-contract by suing in tort. We do not hear, however, of the doctrine of waiver of quasi-contract, for the reason that the older remedy is the action of tort. Whether a plaintiff shall or shall not waive the tort and sue in quasi-contract is often a question of great practical importance. If, for example, A should take B’s horse, of the value of \$500, and sell him for \$300, it would be to B’s advantage to sue in tort, since in that form of action he will recover to the extent of the damage suffered by him, which would be \$500, whereas if he sued in quasi-con-

tract, in a count for money had and received, he would recover only \$300, as that was the sum received by A. In jurisdictions where in such circumstances a tort-feasor can be sued in quasi-contract in a count for goods sold and delivered, it would be immaterial whether B sued in tort or in a count for goods sold and delivered. If, however, the property is wrongfully taken and the value thereof increased by the labor of the tort-feasor, then in jurisdictions where the measure of recovery is the value of the property at the time of the wrongful taking it is advantageous to sue in quasi-contract, since the extent of the tort-feasor's enrichment exceeds the injury done the owner, and in quasi-contract the plaintiff will be entitled to recover to the extent of the defendant's enrichment. For the reason that unjust enrichment is the basis of recovery where the tort is waived, no action can be brought in quasi-contract where the tort does not enrich the tort-feasor. (*Finnan vs. Linsley*, 20 Kan. 235; *National Trust Co. vs. Gleason*, 77 N. Y. 400.) Thus, if A should slander B or commit an assault upon him, B's only remedy would be in tort.

To recover the proceeds arising from the sale of property wrongfully taken, the plaintiff must have had a right to the property at the time of the sale. If A, for example, should wrongfully take B's horse and retain possession thereof until the lapse of time within which an action for the wrongful taking is required by statute to be brought, and should then sell him, he could retain the proceeds, since the effect of B's failure to bring an action for the wrongful taking within the statutory period of time was to vest the title to the horse in A, and A therefore sold his own horse. The loss of the right to sue in tort does not necessarily, however, mean the loss of the right to sue in quasi-contract. If, for example, the right of action in tort existed at the time when the proceeds of the sale were received, then, notwithstanding the right to sue in tort is subsequently lost by a failure to bring an action within the statutory period of time, an action may still be brought to recover the proceeds until the statutory period of time as to quasi-contractual rights has run. So the common-law rule that the tort died with the person did not prevent an action against the estate of the deceased tort-feasor, notwithstanding the loss of the remedy in tort, if it were a case where the tort-feasor could have been sued in quasi-contract had he been alive.

It frequently happens that a person who has not sufficiently performed a contract to entitle him to sue thereon has nevertheless materially enriched the other party to the contract by a partial performance thereof. In such cases, if there is to be a recovery by the person who has partly performed, it must be on principle of unjust enrichment, and the right will therefore be quasi-contractual, as the case assumes that the defendant is not liable for a breach of contract. A plaintiff may in these circumstances seek a recovery where he makes no attempt to justify or excuse his failure to perform, or he may rely upon the fact that he endeavored in good faith to perform the contract, or upon the fact that he can not be sued for a breach of contract, because of the fact that the contract was an oral contract, with no memorandum thereof in writing complying with the Statute of Frauds, or for the reason that the contract was illegal or impossible of performance. It is generally held that one who willfully refuses to perform a contract to the extent necessary to entitle him to recover thereon can not recover in quasi-contract, notwithstanding the enrichment of the defendant arising from the part performance. (*Collins vs. Stimson*, 11 Q. B. D. 142; *Stark vs. Parker*, 2 Pick. 267; *Lantry vs. Parks*, 8 Cow. 63; *Moritz vs. Larsen*, 70 Wis. 569; but see *contra Britton vs. Turner*, 6 N. H. 481.) To this rule there seems to be one exception—namely, where the plaintiff has supplied property under a contract and the defendant can return the property, but refuses to do so. In some jurisdictions, where the rule is recognized that in the case of a deliberate refusal to perform a contract there can be no recovery for benefits conferred by a partial performance thereof, a recovery is allowed in quasi-contract if it appears that the plaintiff endeavored in good faith to perform the contract.

The fact that the plaintiff by reason of the Statute of Frauds can not be sued for a breach of contract will not entitle him to recover in quasi-contract, as the Statute of Frauds was intended not to confer a right of action, but to give a defense to an action on a contract which, though oral, was not illegal, and the performance of which was therefore permissible in point of law. (*Collier vs. Coates*, 17 Barb. 471; *Gretton vs. Smith*, 33 N. Y. 245; *Clark vs. Terry*, 25

Conn. 395; *Abbott vs. Inskip*, 29 Oh. St. 59; see *contra King vs. Welcome*, 5 Gray 41.

If the contract which the plaintiff has partly performed is illegal, there can be no recovery on the contract because of the illegality thereof. If, therefore, the plaintiff recovers it must be in quasi-contract. If the plaintiff, having partly performed an illegal contract refuses to perform further, he is regarded as acting in disaffirmance thereof, and if the illegality is merely *malum prohibitum*, not *malum in se*, i. e. is not inherently wrong, but wrong simply because of a positive prohibition, there can be a recovery if the defendant has in fact or in legal contemplation been enriched by the performance. If the act is *malum in se*, there can be no recovery, notwithstanding the defendant's enrichment. (*Taylor vs. Boone*, 1 Q. B. D. 291; *White vs. Franklin Bank*, 22 Pick. 181; *Tracy vs. Talmage*, 14 N. Y. 162.

In the U. S., differing from the law of England (*Cutter vs. Powell*, 6 T. R. 320), if after part performance further performance becomes impossible, and it can be fairly said that the contingency which has happened was not within the contemplation of the parties, as, for example, where full performance is prevented by sickness or death, there can be a recovery to the extent of the benefit conferred. (*Wolfe vs. Howes*, 20 N. Y. 197; *Green vs. Gilbert*, 21 Wis. 395.)

One who has performed a contract either in whole or in part, and who has been prevented from fully performing by the other party to the contract, may find himself unable to recover for a breach of contract, and yet the circumstances may be such that not to allow a recovery for what was done thereunder would work great injustice. Suppose, for example, that A should agree to work for B for the period of two years, for a lump sum to be paid by B at the end of two years, and at the end of that time B should refuse to pay for the services, relying upon the Statute of Frauds, requiring a written memorandum of such contracts, or suppose that after A had served him for six months B should discharge him without cause, relying upon the statute aforesaid. Clearly it would be the grossest injustice to hold in such a case that A had no enforceable rights against B, and yet, if he must rely upon the contract, he clearly can not recover for the services rendered, since the statute gives B an absolute defense. Upon the principle of unjust enrichment, however, the law imposes an obligation upon him to compensate A for the services rendered. So, when, after a complete or partial performance by the plaintiff, performance on the other side has become impossible in circumstances affording a defense to an action for a breach of the contract, the law will in case of full performance and also in the case of partial performance, where the amount is ascertainable, compel restitution or compensation to be made. It may be that a defendant who has no scruples in allowing a plaintiff to perform an illegal contract is averse to performing his side of the contract. In such a case there can be no recovery on the contract because of its illegality, and if, in the eyes of the law, the parties are *in pari delicto*, there can be no recovery in quasi-contract, notwithstanding the enrichment of the defendant. This result is justified only on grounds of public policy. If, however, the parties are not *in pari delicto*, but the position of the defendant is regarded as the more reprehensible, then a recovery in quasi-contract can be had.

A recovery in quasi-contract against a defendant refusing to perform a contract is not only allowed in cases where there can be no recovery on the contract, and yet where the plaintiff should have relief of some kind, but is also allowed in quasi-contract, notwithstanding the plaintiff's right to sue for a breach of the contract, in cases where the defendant received a benefit from the plaintiff's performance. This right to sue in quasi-contract is often of great value to a plaintiff. For example, suppose that A should pay in advance to B the sum of \$500 in exchange for a promise on B's part to deliver to A certain goods on a certain day, and that on the day when the goods were to be delivered the goods were worth only \$450. Should B fail to perform the contract in circumstances rendering him liable for breach thereof, the measure of A's recovery would be the expense involved in his purchasing the goods at that time, which would be \$450. In an action in quasi-contract, however, the law would compel B to make restitution to A of the \$500 which he received from A. (*Nash vs. Towne*, 5 Wall. 689.)

Whether the plaintiff or the defendant be in default, and whether the defendant be or be not liable on the contract, there can be no liability in quasi-contract unless the defendant has in fact or in legal contemplation been enriched by

the plaintiff's performance; hence it is that a guarantor who has made an oral contract to answer for the debt, default, or miscarriage of another, and who, because the contract does not comply with the Statute of Frauds, can not be sued on the contract—can not be sued in quasi-contract. The principal debtor, not the guarantor, was enriched by the plaintiff's performance. It is for this reason that a plaintiff who has bestowed labor upon chattel belonging not to the defendant but to the plaintiff, under a contract not enforceable because of the Statute of Frauds, can not recover in quasi-contract. *Dowling vs. McKenny*, 124 Mass. 478.

It not infrequently happens that one who is unable to establish a contract is able to show that he has conferred a benefit at the request or with the consent of the party benefited. If it can be shown that the benefit was conferred with an expectation on the part of the defendant to pay therefor, and that the plaintiff expected to receive compensation therefor, the fact that for some technical reason a contract which the parties attempted to create did not come into existence does not necessarily mean that the plaintiff is without remedy. Suppose, for example, that services have been rendered under a mutual mistake as to the terms of an offer and acceptance without fault on either side, or that goods have been furnished to a principal through his agent who had authority to purchase but exceeded his authority in executing a contract under seal. In such cases the plaintiff will not be without remedy, but will be allowed to recover in quasi-contract for the benefit conferred. (*Turner vs. Webster*, 24 Kan. 38; *Van Deusen vs. Blum*, 18 Pick. 229.) That the plaintiff intended to make a gift to the defendant of the services or property is, however, always fatal to a recovery, even though the act was done at the request or with the consent of the defendant. (*Osborn vs. Guy's Hospital*, 3 Strange 728; *Doyle vs. Trinity Church*, 133 N. Y. 372.) The motive that prompted the gift resulting in disappointed expectations is immaterial. It is for this reason that persons who have rendered services gratuitously in the hope of receiving a legacy on the death of the beneficiary are unable to establish a claim against the estate. (*Houck's Executors vs. Houck*, 99 Pa. St. 552.) If the gift was made under a mistake known to the defendant, or if the gift was induced by the fraud of the defendant, it would seem that the plaintiff should be allowed to recover in quasi-contract. *Peter vs. Steel*, 13 Yeates 250; *Kinney vs. Cook*, 4 Ill. 232; *Hickam vs. Hickam*, 46 Mo. App. 496. See also *Franklin vs. Waters*, 8 Gill 322.

There can not, as a rule, be a recovery for benefits conferred without the request or consent of the party benefited, even though the plaintiff did not intend to make a gift of his services. A person so acting is usually regarded as an officious volunteer, and no rights will be given him, as, for example, when one under no necessity of doing so pays the debt of another. In such a case the payment gives him no rights against the debtor. If, however, without any fault on the part of the person paying the debt of another, such payment is necessary to protect the person or property of person paying from seizure for the debt, the money so paid can be recovered from the debtor. In some cases, also, even where the plaintiff acts without the necessity therefor on his part, as where necessities are supplied to a wife whom the husband wrongfully refuses to support, a right of recovery exists.

While money voluntarily paid can not be recovered even if paid under protest, money paid to protect one's person or property from unlawful seizure, or to prevent serious injury to one's business, can be recovered from the person to whom it was paid. That the money was paid to avoid a threatened suit will not, however, entitle the plaintiff to recover the money as paid under compulsion. In legal contemplation the money if not owing can not be collected, and if the party upon whom the claim is made desires to contest it, he is required to do it as a defendant in an action brought by the claimant. For a full treatment of the subject, see Keener on *Quasi-Contracts*. WILLIAM A. KEENER.

Quass Beer: See BEER.

Quas'sia [Mod. Lat., named from *Quassi*, a Negro slave in Surinam who used it as a remedy for fever]: in medicine, the wood of certain trees of the family *Simarubaceæ*. All the species of this family are noted for the intense bitterness of their wood, and until about the end of the eighteenth century quassia-wood was obtained from a small tree or shrub native in Panama, Venezuela, Guiana, and Northern Brazil, the *Quassia amara*. The wood of *Pierina excelsa*

being found to have the same properties, and the latter being a tree of much greater size, the quassia of commerce is now almost wholly obtained from this source. *P. excelsa* is a tree from 50 to 60 feet high, with small yellowish and greenish flowers; the fruit is a drupe, black and shining, and about as big as a pea. It is a native of Jamaica and the Caribbean islands, where it goes by the name of *bitter ash*. The wood is whitish, but turns yellow on exposure. It has no smell, but a most intense, though pure, bitter taste. The bitterness depends upon a neutral crystallizable principle called *quassine* which is somewhat poisonous. Commercial quassia-wood consists of pieces of the trunk and branches of the tree of various sizes. For use by the druggist it is supplied in the form of raspings or turnings. Quassia, like other pure vegetable bitters, tends in small quantity to excite appetite and promote digestion. In large dose it nauseates. It is sometimes used in medicine as a stomachic bitter, but other less harsh and disagreeable bitters are generally preferred. Cups turned out of the solid wood are sometimes employed to prepare a weak quassia infusion by simply allowing cold water to stand for a few minutes in them. The water speedily becomes impregnated with the bitter principle, and may then be drunk. Quassia in infusion is the best remedy against the seatworm or *Oxyuris vermicularis*. Revised by H. A. HARE.

Quaternary Era: a division of geologic time co-ordinate with Primary, Secondary, and Tertiary. The term Primary has almost ceased to be used, and though Secondary and Tertiary are still employed, there is a growing tendency to substitute as general classic terms Paleozoic, Mesozoic, and Cenozoic, the term Cenozoic being made to include the divisions once called Tertiary and Quaternary. The same tendency replaces Quaternary Era by **PLEISTOCENE PERIOD** (q. v.). G. K. G.

Quater'nions [from Lat. *quater'nio*, the number four, a body or group of four, quaternion, deriv. of *quater'ni*, four at a time, by fours, deriv. of *quat'wur*, four]: a mathematical method invented by Sir William Rowan Hamilton about 1840. Its fundamental idea is that of a vector. This latter is defined as a line passing from one (initial) point in space to another (terminal) point. It has two elements, *length* and *direction*. Two vectors are considered equal only when these two elements are the same in each. A vector moved about in space will remain the same vector so long as it remains parallel to itself and unchanged in length; but if either length or direction are changed, it becomes a different vector. The sum of two vectors is the vector joining the initial point of the first to the terminal point of the second when the two are placed end to end without changing the direction of either, as already explained. Any number of vectors may be added on this principle. See **IMAGINARY QUANTITIES**.

A quaternion is first defined as an operator, of which the function is to change one vector into another by altering its direction and its length. The operation which changes the length of the vector is in this case called the *tensor* of the quaternion, and that which changes the direction is called the *versor*. One quantity, a number, determines the tensor, and three are required to determine the versor, making four in all. Hence the term *quaternion*.

The great principle, however, of Hamilton's method consists in assigning to the vector itself the function of a quaternion, which it fulfills by turning a line at right angles to itself through ninety degrees around the vector itself as an axis. Comparing with the analogous operation of multiplying by the imaginary unit, as explained in the article **IMAGINARY QUANTITIES**, it will be seen that a quaternion has a close analogy to an imaginary quantity extended to space. From the definition of vectors and their sums it follows that every vector can be made up of the sum of three vectors at right angles to each other. These three vectors correspond to the co-ordinates used in solid analytic geometry. The unit lengths in the three directions are designated as *i*, *j*, and *k*. Then if *x*, *y*, and *z* are numbers, any vector can be represented in the form

$$ix + jy + kz.$$

A quaternion is formed by adding a pure number called a scalar to the vector as thus represented, and may therefore be written in the form

$$w + ix + jy + kz.$$

The reader must refer for a complete development of the method to special treatises on the subject, of which the



NOVA SCOTIA
AND
PRINCE EDWARD I.

PRINCE EDWARD I.
PRINCETOWN

CAPE BRETON

ISLAND

MAP OF
NEW BRUNSWICK
AND
QUEBEC,
DOMINION OF CANADA
Drawn and Engraved on Copper Plate
EXPRESSLY
FOR
JOHNSON'S CYCLOPEDIA.

Scale of Miles
0 10 20 30
E Len East from Washington

most complete and generally accessible to the student is that of Tait, *Elementary Treatise on Quaternions* (3d ed., Edinburgh, 1890). There are also American works on the subject, one of which is by Prof. Arthur S. Hardy, of Dartmouth College.

The question of the real scientific value or usefulness of the method of quaternions is one on which opinions differ widely. In the U. S. it is a popular subject of study in advanced mathematics, and in Great Britain it is regarded by Tait and others as the most simple and useful method of developing many problems in physics. Very little attention has, however, been paid to it in France, and scarcely any in Germany, where the general opinion is that it leads to no result which can not be reached as readily by other methods. But there can be no question of its value as a training in the logical methods of modern mathematics. S. NEWCOMB.

Quatre Bras, *kaüt brä'*: See WATERLOO.

Quatrefages de Bréau, *kaüt fäsh de-bräü*, JEAN-LOUIS ARMAND, de, D. Sc., M. D.: anthropologist; b. at Berthezème, department of Gard, France, Feb. 10, 1810; studied at Strassburg, Toulouse, and Paris; was appointed Professor of Natural History at Toulouse in 1838, at the Lycée Napoléon in 1850, and in 1855 at the Historical Museum of Anatomy and Ethnology. In the early years of his career he devoted himself to natural science, especially the study of marine invertebrata, but on his election to the chair of Ethnology he devoted himself exclusively to anthropology, becoming its foremost exponent. Of his writings, several have been translated into English: *Souvenirs d'un Naturaliste* (1854; London, 1857); *Métamorphose de l'Homme et des Animaux* (1862; London, by H. Lawson, 1864); *Histoire de l'Homme* (1869; New York, by Miss E. Youmans, 1875); *Charles Darwin* (1870); *La Race péruvienne* (1871); *L'Espèce humaine* (1877); *Hommes fossiles et Hommes sauvages* (1884); *Les Pygmées* (1887). D. Jan. 13, 1892.

Revised by S. T. ARMSTRONG.

Quatremère, -mâr', ÉTIENNE MARC: Orientalist; b. in Paris, France, July 12, 1782; became Professor of Greek at Rouen in 1809, of Hebrew, Aramaic, and Syriac at the Collège de France in 1819, and of Persian in the École des Langues Orientales Vivantes in 1827. His principal works were *Recherches historiques et critiques sur la Langue et la Littérature de l'Égypte* (1808); *Mémoires géographiques et historiques sur l'Égypte* (1810); *Observations sur quelques points de la Géographie de l'Égypte* (1812); *Mémoire sur les Nabatéens* (1835). He also translated and edited Rashid ed-Din's *Histoire des Mongols de la Perse* (1836), and Makrizi's *Histoire des Sultans Mamlouks* (1837-40). He was also a contributor to the *Journal Asiatique* and to the *Journal des Savants*. D. in Paris, Sept. 18, 1857. C. R. G.

Quatremère de Quincy, -de-kan see, ANTOINE CHRYSOTOME: archaeologist; b. in Paris, France, Oct. 28, 1755; studied archaeology and art; took part very actively, but always as a stanch royalist, in the various movements of the Revolution; was appointed superintendent of public monuments in 1815; Professor of Archaeology in the Royal Library in 1818; censor in 1824. D. in Paris, Dec. 28, 1849. His most remarkable works are *Le Jupiter olympien* (1814); *De l'Imitation dans les Beaux-Arts* (1823); *Raphaël* (1824); *Canova* (1834); *Michel-Ange* (1835); and a *Dictionnaire historique d'Architecture* (2d edition, 2 vols., 1833). Cf. *Biographie Universelle*, pp. 608-612.

Revised by A. GUDEMAN.

Quauhquemotzin, or **Quauhquemotzin**: See GUATEMALA.

Quay, MATTHEW STANLEY: U. S. Senator; b. at Dillsburgh, Pa., Sept. 30, 1833; graduated at Jefferson College 1850; admitted to the bar 1854; prothonotary of Beaver County 1856; re-elected 1859; colonel of the 134th Pennsylvania Volunteers; military secretary to the Governor of Pennsylvania 1861-65; member of Legislature 1865-67; secretary of the commonwealth 1872-78; recorder of Philadelphia and chairman of the Republican State committee 1878-79; again secretary of the commonwealth 1879-82; delegate to the Republican national convention 1872-76, 1880-92; State treasurer 1885; elected to U. S. Senate as Republican, and took his seat Mar. 4, 1887; chairman of the Republican national committee 1888. C. H. THURBER.

Quebec, *kwêe-bek'*: a province of British America, formerly known as Lower Canada, lying N. and S. of the St. Lawrence, extending E. and W. from the Peninsula of Gaspé to the head of Lake St. Francis, an expansion of the great waterway N. W. of the county of Huntingdon, and N. and

S. from 52° 30' N. lat. to the forty-fifth parallel, or the boundary-line of the U. S. The length within these limits is about 700 miles, and the breadth about 300 miles. The land surface is 227,500 sq. miles in extent, the water area 1,400 sq. miles, making a total area of 228,900 sq. miles.

Physical Features.—The natural features surpass in boldness those of the adjacent provinces, chiefly along and near the backbone or chief mountain-range of the country, the Laurentides, as they extend eastward from the vicinity of the city of Quebec to the Labrador coast. This range of highlands, in many places over 1,000 feet high, marks the plain watered by the St. Lawrence and its tributaries, and extending to the Ottawa, loses itself in the milder altitudes of the great watershed of the sister province of Ontario. The scenery along this chain of heights is of the most attractive character. There are many districts that rival the rugged grandeur of the Grampians, such as the highlands of Val Cartier, Laval, Murray Bay, and the Saguenay region. In the Peninsula of Gaspé is the Notre Dame range, an extension of the Alleghenies from the New England States through New Brunswick. The tract between these great ridges and the shores of the St. Lawrence is for the most part undulating and fertile, equaling in fertility the great southern plain of the Eastern Townships.

The distinguishing feature is the waterway of the St. LAWRENCE RIVER (*q. v.*) and its numerous tributaries, the most important being the Ottawa, the St. Maurice, and the Saguenay on the N., and the Richelieu, the St. Francis, and the Chaudière on the S. The St. Lawrence is navigable as far as Montreal, 520 miles from the sea. The first interruption to navigation is at the Lachine Rapids, 9 miles from that city. The Carillon Rapids, 12 miles in length, prevent passenger steamboats sailing from Ottawa to the Lachine Canal, unless advantage is taken of the canal at Grenville. Beyond the Chaudière Falls at Ottawa the river is navigable. The St. Maurice is interrupted by the Shawenegan Falls, 24 miles from Three Rivers; their height is 150 feet. The Montmorency river falls abruptly into the St. Lawrence over a ledge 250 feet high. Between the St. Lawrence and the Bay Chaleurs, as well as on the N. of that river near the gulf, are innumerable streams famous in the legends of the sportsman and angler; while all over the province, irrigated in every part by the main tributaries of the St. Lawrence and their streamlet tributaries, the province presents every variety of scenery. The most important lakes are St. John, a circular basin drained by the Saguenay and having an area of 360 sq. miles; Temiscaming, drained by the Ottawa, having an area of 126 sq. miles; Champlain, partly belonging to Canada, partly to the U. S., and by a system of canals connecting the trade of the St. Lawrence with that of the Hudson; St. Peter, an expansion of the St. Lawrence above Three Rivers; Memphremagog, the greater part of which lies in the province; Metapedia; Massawippi, near Stanstead; and Megantic, the source of the River Chaudière. The principal islands are Anticosti; Bonaventure, a fishing station near Gaspé; the Magdalen islands, a group in the gulf, N. of Prince Edward island; and, in the river, Bic island, Hare island, Île aux Coudres, Grosse île, the quarantine station, Crane island, Island of Orleans, and the river-girt lands near the confluence of the Ottawa and the St. Lawrence at Montreal, and on the Ottawa at Calumet and Allumette.

Climate.—The climate is on the whole agreeable and bracing. The extremes of heat and cold are more intense than in districts of a corresponding latitude in Europe. There may be said to be but two seasons—winter and summer, the winter extending from about the middle of October to the middle of April. The thermometer in summer seldom registers beyond 90° F., and in winter it sometimes falls 20° below zero. The farmer has his sowings finished early in May, and begins his harvesting in August. September is perhaps the pleasantest month of the year, with its warm days and cool evenings. In November the snow begins to fall, and, in the districts N. of the St. Lawrence, covers the ground until March or April. In the Eastern Townships the snow does not fall so early nor does it lie so late. All over the province the climate is exceedingly healthful, the air being clear and dry both in summer and winter.

Geology, Mineral Resources, etc.—The geological formation is represented by the usual superficial drifts. The Lower Carboniferous series is seen in the thin strips on the southeastern coast of the Gaspé peninsula that form the northern limit of the coal-measures of the maritime prov-

inces; the Devonian system is represented by the Gaspé sandstones and limestones, in which are to be found indications of petroleum; the Silurian and Cambro-Silurian formations occupy the valley of the St. Lawrence between Quebec and Montreal, and constitute the northwestern limit of the Eastern Townships' mineral district; the Cambrian system constitutes the mineral deposits of the Eastern Townships and their crystalline schists; the Huronian formation occurs in the neighborhood of Lake Temis, coming where galena occurs; and the Laurentian formation occupies the northern portion of the St. Lawrence river and gulf.

The mineral wealth is incalculable, but is in an undeveloped condition. There are valuable gold mines at Beauce, copper mines in Megantic and Brome Counties, nickel mines in Pontiac, and the best of iron ore to be found in St. Maurice. Slate-stone, mica, and asbestos also abound.

In the Laurentides, with their rich crop of beautiful crystalline specimens, are to be found indications of iron in the phosphate and magnetic condition, plumbago, mica, and splendid building granites and limestones. Slate-stone for roofing purposes has been quarried in large quantities from the clay schists of Kingsbury, while the copper mines near Lennoxville are very valuable. The Trenton limestones of the Silurian deposits have supplied building material for Quebec and Montreal, while the gray and white granites of Compton and Stanstead Counties have also been utilized for purposes of building and ornamentation.

Fauna.—The fur-bearing animals that exist, though in diminished numbers, are beavers, minks, bears, muskrats, foxes, caribou, squirrels, and rabbits. Of the game-birds there are still to be found duck, geese, partridge, and snipe. Eagles, hawks, and loons are often taken by the woodsman.

Industries.—Fifty per cent. of the population farm the lands on and near the rivers. The principal agricultural products are hay, oats, potatoes, barley, wheat, turnips, peas, buckwheat, maize, and tobacco, and the chief domestic animals, sheep, swine, horses, and cattle. The most fertile districts are to be found in the Eastern Townships, where creameries and cheese-factories yield great profit.

The forest wealth is very considerable, and can be extensively utilized, as there is hardly a stream which does not provide water-power. The ship-building interest has all but disappeared, but the export of lumber is still an active branch of trade. The practice of squaring the timber for exportation has very much declined. Most of the timber exported is pine and spruce. The forest-trees include also maple, birch, elm, beech, cedar, oak, ash, and cherry.

While in the fishery industry Quebec occupies only the fourth place among the provinces of the Dominion, there is perhaps no district in the world that is so famous for its inland fisheries. At the mouth of the St. Lawrence and on the Chaleurs Bay are to be found large quantities of cod, haddock, salmon, mackerel, and lobster; and in the lakes of the province the trout-fisheries all but equal the fame of the salmon-fisheries of its coast waters. The government of the province holds in its own hands the leasing of the inland waters, and a considerable revenue is realized from the letting of these waters to fish and game clubs. Over \$2,000,000 is realized annually from the fisheries.

Railways and Canals.—The principal railway companies are the Grand Trunk, the Canadian Pacific, and the Intercolonial. The Grand Trunk and the Intercolonial have their eastern terminus at Levis, the Canadian Pacific in the city of Quebec. The minor lines are the Quebec Central from Quebec to Sherbrooke, the Lake St. John from Quebec to Chicoutimi, the line between Montreal and Sorel, the Central Vermont, from Montreal to the U. S., the Maine Central, the Boston and Maine, the Canada Atlantic, and the Pontiac and Pacific Junction Railway. The principal canals, forming a system the largest and most important in the world, are the Beauharnais (11½ miles, with 6 locks), the Soulanges (14 miles, with 5 locks), the Lachine (8½ miles, with 5 locks), the Carillon and Grenville, and the Chambly. Highways between all places of importance and by-roads between the outlying portions of remote settlements are kept in repair by the provincial government.

Political Divisions and Government.—The province is divided into sixty-three counties, which send to the Legislative Assembly at Quebec seventy-three members. The head of the provincial government is the Lieutenant-Governor, appointed by the Governor-General of the Dominion. His councilors, generally six in number, form the executive, subject to the Legislative Council (of twenty-four members) and the seventy-three members of the Assembly. Thus there are

represented the three estates of Great Britain—the Lieutenant-Governor (as the sovereign), the Legislative Council (as the House of Lords), and the Legislative Assembly (as the House of Commons). To the Dominion House of Commons Quebec sends sixty-five members, and is expected to have twenty-four Senators appointed by the Governor-General to the Dominion Senate.

In 1894 the provincial auditor reported the gross receipts from all sources to be \$11,792,577, and the expenditure to be \$11,769,868. The net revenue is \$4,270,694, and the net expenditure \$4,550,540. The gross provincial debt amounts to \$28,196,754.

The judiciary, except the local magistracy, is in the appointment of the Dominion Government, and consists of the court of queen's bench, the superior court, and the court of review. In addition to these there are the admiralty court, the court of quarter sessions, and the courts for petty causes.

Population.—In 1871 the population was 1,191,516; in 1881, 1,359,027; in 1891, 1,488,535. The English-speaking persons number about 300,000. In 1891 there were 1,291,709 Roman Catholics, 75,472 members of the Church of England, 52,659 Presbyterians, 39,416 Methodists, 6,854 Baptists, 4,296 Congregationalists, 3,364 Adventists, and 2,703 Jews.

The principal towns are Montreal (pop., 1891, 216,650), Quebec (63,090), Hull (11,265), Three Rivers (8,334), St. Hyacinthe (7,016), Sorel (6,669), Valleyfield (5,516), St. Johns (4,722), and Fraserville or Rivière du Loup (4,175).

Education.—The education of the people is in the hands of the Department of Public Instruction, at the head of which is a superintendent. The Council of Public Instruction consists of two committees, the Roman Catholic and the Protestant, each having control of the schools according to the religion of the majority of ratepayers in any municipality. The schools supported by the minority in any municipality are called dissentient schools. The common schools are for the most part under the supervision of the department, with its forty inspectors and other officers. The Protestant committee has the immediate supervision of what are called the Protestant superior schools, and has an inspector of its own to visit and examine the model schools, academies, high schools, and colleges under Protestant control. These schools have a course of study of their own which brings them in line with McGill University in Montreal, and Bishop's College University at Lennoxville. Affiliated to these institutions are Stanstead Wesleyan College, St. Francis College at Richmond, and Morrin College at Quebec. The Roman Catholic University is at Quebec, a development of the two seminaries founded by the first Roman Catholic bishop, and is known as Laval University.

The public revenue, derived from the subsidy of the central Government, the sale of crown lands, lease of inland fisheries, and direct taxation, amounts to nearly \$5,000,000. The amount spent on education by the Government is less than \$400,000, and the amount for charitable institutions over \$300,000.

History.—The early history of Quebec is that of Canada. Jacques Cartier in 1534 sailed up the gulf, passing Anticosti, and exploring Chaleurs Bay and Gaspé Peninsula. He returned in 1535 and sailed up the St. Lawrence as far as Montreal (then Hochelaga). Champlain founded Quebec in 1608, and after exploring the upper waters of the St. Lawrence and its tributaries established forts and fur-stations in various parts. The early colonization of Quebec was more or less a religious enterprise, an adjunct to the Recollet and Jesuit missions. The government was French up to 1759, when the battle of the Plains of Abraham was fought by Gen. Wolfe and the government became English. In 1791 Quebec was known as Lower Canada, and as such was united to Upper Canada in 1841. In 1867, by the Act of Confederation, it became a province of the Dominion of Canada.

J. M. HARPER.

Quebec: the capital of the province of Quebec and the oldest city in Canada; situated mostly on a plateau and its ridges, at the confluence of the St. Charles and the St. Lawrence (see map of Quebec, ref. 4-D). The plateau extends from Cap Rouge, the site of Roberval's encampment, for a distance of 8 or 9 miles toward the island of Orleans, just below Quebec and about 180 miles from Montreal and 300 miles from what is generally called the Gulf of St. Lawrence.

Area and General Plan.—Quebec is one of the most interesting cities in America, and has often been called a bit of the Old World set down on the shores of the New. The city, which covers an area of 16,000 acres, may be divided

into three sections for purposes of description: the Upper Town, crowned by the citadel and facing the harbor at the Dufferin Terrace and the Grand Battery; the St. John Suburbs, on the northern slope of the plateau beyond the walls, meeting the level tract of St. Roch and St. Sauveur; and Champlain Street, running along the shore of the St. Lawrence under the steep sides of the plateau on the S. Dufferin Terrace stretches along the rock for a quarter of a mile at a height of 180 feet. It forms part of the line of fortifications around the city proper, and in summer is the favorite promenade of the citizens. The plateau is intersected by two main thoroughfares, St. John Street, within and without, vanishing in the St. Foye Road, and St. Louis Street, with Grande Allée, having for its prolongation the St. Louis Road. These run parallel with Champlain Street, and meet at the one end at Cap Rouge and at the other by means of the short connecting links of Fabrique Street, Buade Street, and the Place d'Armes at or near the Château Frontenac, a hotel built near the site of the old Château St. Louis, once the residence of the French governors.

Public Buildings.—On approaching the city from the harbor the principal structures are the Parliament buildings on the height of land just outside St. Louis Gate, Laval University to the right, the citadel to the left, and the Basilica, the English cathedral, the court-house, and the Château Frontenac with Dufferin Terrace between. Of these, the Laval University is the largest Roman Catholic educational institution in Canada. It receives its name from Bishop Laval, who founded the adjacent seminary in 1663, and has a valuable collection of pictures and scientific apparatus and specimens. Within the magnificent group of buildings behind the Grand Battery are the two seminaries. The Parliament buildings form a majestic quadrangle, and contain the chambers in which the Legislature holds its sessions, with the adjacent offices. The façade of the building, with its bronzes of men illustrious in Canadian history, is very striking. The citadel is the most prominent feature of the city proper. It covers an area of 40 acres on the summit of Cape Diamond, and is in charge of a small troop of Canadian regulars. Passing along St. Louis Street toward the St. Louis Gate, the principal buildings are the Ursuline Convent, founded in 1641, the St. Louis Hotel and Academy of Music, the old barracks, used for some time as the Palais de Justice, Chalmers (Presbyterian) church, the Hôtel de Ville, the old Government House, and the Club House. Outside the St. Louis Gate are the Convent of the Good Shepherd with its prominent spire, the Female Orphan Asylum, St. Bridget's Asylum, and the Ladies' Protestant Home. Along the beautiful stretch of the St. Louis Road are to be found many fine manor residences. Along St. John Street the principal buildings are structures for the retail trade, and the two fine churches of St. Matthew and St. Jean Baptiste, while there are many fine residences on the Ste. Foye Road, the prolongation of St. John Street. On or near this thoroughfare are Morrin College, which contains the library of the Literary and Historical Society, St. Andrew's church, the Methodist church, the Jesuits' church, the National School Building, the Hôtel Dieu, the Gray Nunnery, the Royal Victoria, St. Patrick's church, the Y. M. C. A. Building, and the Finlay Asylum. On the St. Roch side of the city there are four churches, and on the Champlain Street side there are two. The chief buildings in what is known as Lower Town are the Champlain Market-house and the custom-house.

Suburban Places of Interest. Among the places of interest outside the town are the Plains of Abraham, with its monument to Gen. Wolfe, commemorating the battle of 1759; Wolfe's Cove, where the British gained a footing on the battle-field; Prés-de-Ville, where Gen. Montgomery fell in 1775; Montmorency Falls, where Montcalm kept Wolfe at bay for months before the decisive battle was fought; Beauport and its asylum; the island of Orleans, called Île de Bacchus by Cartier; Lévis, with its three commanding forts; the graving-dock, capable of accommodating the largest vessel afloat; the Louise Embankment and its basin of safety for ships; the River St. Charles and its picturesque scenes; Lorette, with its falls and Indian church and settlement; the Chaudière Falls at the outlet of the Chaudière, a tributary of the St. Lawrence; Château Bigot, beyond the pretty village of Charlesbourg, once the residence of the Intendant Bigot; the mouth of the Lairet, where Jacques Cartier spent his first winter in Canada; and Cap Rouge.

Industries, Commerce, etc.—The chief industries are the manufacture of leather and the shipping of lumber. There

is very little ship-building. The principal factories are for boots and shoes, tobacco, and peltries. In 1893 the value of exports was \$5,193,370, and of imports \$3,555,607; 1,297 sea-going vessels entered and cleared the port, including 387 British; total tonnage, 984,399. The docks and wharfage properties extend from the mouth of the St. Charles round the river frontage for nearly three miles. The first bank was established in 1818. Five banks have a combined capital of \$6,600,000, and there are besides three savings-banks and three branch banks. The principal railway lines meeting in the place are the Intercolonial, the Quebec Central, and the Grand Trunk on the south side of the river, and the Canadian Pacific, the Lake St. John, and the Laurentides on the north side. The city has an abundant supply of water from Lake St. Charles, whose outlet is 9 miles distant. It is also lighted with electricity, the power being obtained from Montmorency Falls, 7 miles distant.

Civic Government, Taxation, etc.—The city government has at its head the mayor, chosen by the council, which consists of ten aldermen and twenty councilors elected by the various city wards. The new civic buildings, a handsome block with two wings, are situated on the site of the old College of the Jesuits, in the center of the city, opposite the Basilica. Taxation is one-fifth per cent. of the rental value of property, which for the whole city is estimated at \$1,274,968, while the estimated value of the property itself is \$17,266,782. The debt of the city is \$6,190,808. There are 6 daily newspapers published in Quebec—3 French and 3 English—and 7 weekly journals, only 2 of which are English.

History.—Quebec was founded by Champlain in 1608, but its site had been visited by Cartier in 1535. In 1663 it became the capital of the royal government established in New France. The French held possession of it till 1759. In that year the battle of the Plains of Abraham led to the Treaty of Paris in 1763, when the whole country became British, with Quebec as its first capital. The population in 1881 was 62,446; in 1891, 63,090. J. M. HARPER.

Quebracho, kê-braa'chô: an evergreen tree (*Aspidosperma quebracho*) of Brazil and the Argentine Republic, from the bark of which may be obtained six different alkaloids. The aspidospermine of commerce practically represents all six of these substances. The bark is used in cases of disordered respiration, more particularly asthma.

Quedlinburg, kved'lin-boorch: town of Prussia, province of Saxony, at the foot of the Harz Mountains, on the Bode (see map of German Empire, ref. 4-E). It was founded by Henry the Fowler in 920, and is surrounded with walls surmounted by towers, and has large manufactures of damask, linen, and woolen, besides breweries, distilleries, and sugar-refineries. It is famous for its nurseries, and exports seeds to other parts of Europe and to America. Pop. (1890) 20,761. Revised by C. C. ADAMS.

Queen Anne's Bounty: See BOUNTY.

Queen Charlotte Islands: a small group in the North Pacific Ocean, about 80 miles from the coast of British Columbia. Only Graham and Moresby are of considerable size. The islands extend about 180 miles parallel with the coast of the mainland and their greatest breadth is 60 miles. Adapted by the genial climate and fertile soil to support a considerable population, the islands have but few colonists. The coast waters abound with fish, but game is scarce in the interior. The Haida Indians living along the coasts now number only a few hundred. For best description see Dawson's *Report of Progress* (1878-79), Geological Survey of Canada. Revised by C. C. ADAMS.

Queen Charlotte Sound: See VANCOUVER ISLAND.

Queen's Counsel: See KING'S COUNSEL.

Queen's County: an inland county of Ireland in the province of Leinster. Area, 664 sq. miles. The surface is mostly flat, rising in the N. W. into the Slieve Bloom Mountains, whose summit, Ardern, is 1,734 feet high. It is drained by the Barrow and the Nore. The soil is fertile; agriculture and dairy husbandry are the principal occupations, and there is a little cotton and woolen weaving. The principal towns are Maryborough and Mt. Mellick. The county returns two members to Parliament. Pop. (1891) 64,883.

Queensland: the youngest of the Australian colonies of Great Britain, though it has surpassed all except New South Wales and Victoria in population and commercial importance. Occupying the northeast part of the continent between New South Wales and Torres Strait, it is surpassed in

size only by the colony of South Australia. Area, 668,497 sq. miles. The most important feature of its physical formation is the back-bone of hills known as the Great Dividing Range, which extends along the east coast from 50 to 200 miles inland. It forms, in large part, the water-parting between the eastern and western rivers, and though not so high as the southern Australian mountains, much of the moisture carried inland is condensed on its eastern slopes and carried back to the sea in numerous small rivers. The result is that the narrow, eastern part of the colony is better watered and more fit for agriculture than the great plains lying west of these ranges of hills. The plains are fresh and green in the spring, but most of the year they are parched for lack of water, though grazing in this region is one of the chief industries. The better settled districts are along the southern half of Eastern Queensland, where the annual rainfall is about 60 inches, while along the northeastern tropical coast the precipitation is about 120 inches a year, and on the western plains only 10 to 30 inches. Half of Queensland and four-fifths of its 2,500 miles of coast-line lie within the Torrid zone, but the climate of the large regions adapted for white colonists, although very hot, is, on account of its dryness, more salubrious than in most other countries in the same latitude. There is scarcely any fever, except in some new settlements.

Most of the flora peculiar to Australia is found in Queensland, with the addition of about 500 Indian and Malayan species. The fauna is for the most part identical with that of New South Wales. Of Australia's 700 species of birds, about 600 are found in Queensland. The agricultural possibilities are enormous, though much of the farming region suffers from alternation of droughts and floods. Maize is the principal product, though wheat and oats are also grown. Most of the grains and fruits of the U. S. thrive on the highlands, while all the best tropical fruits are grown to perfection in the low-lying coast districts. Sugar is becoming one of the great industries. The growing of sugar-cane centers chiefly in the neighborhood of 21° S. lat., though it is raised as far S. as Brisbane. Most of the work on the sugar-plantations has been done by natives of the South Sea islands, whom the Australians call Kanakas. Various abuses connected with their importation have led to legislation practically cutting off this source of labor supply and temporarily retarding the development of sugar-planting. The colony is unusually rich in valuable woods, both hard and soft, there being about 200 species that are useful. The semi-arid plains are adapted for raising cattle and sheep on a large scale, because some of their grasses have a remarkable power of enduring droughts. The Mitchell grass is most noted in this respect, and other very nutritive plants are the kangaroo and blue grasses. Of the 360 kinds of grasses found in Australia, about three-fourths thrive in Queensland. The settlements are steadily extending into the western downs since various lines of railway have made them easily accessible. All the rivers are shallow and not navigable for large vessels, but there are a number of good harbors and dredging operations are constantly improving them.

The colony has great mineral wealth, particularly in gold, silver, copper, tin, antimony, and mercury. The gold is found chiefly in quartz-veins, and only about one-fifteenth of the miners are working placer claims. Many mineral regions among the hills can not be developed until railways make them more easy of access. Some unexampled mines have been discovered, among them mountains of pure iron ore at Cloncurry, one of which is 200 feet high. Mt. Morgan, discovered in 1884, is the richest gold mine in Australia. Gold is found there under conditions not known elsewhere, being distributed throughout the mass of the mountain, which is 300 feet high, and was evidently produced in the tertiary period by a hot spring which deposited siliceous sinter, with some limonite and clayey substances, through all of which the gold was sprinkled. There is also a large production of gold in the Charters Towers district. The coal formations cover a vast territory, and Queensland promises to become the leading exporter of coal in the southern hemisphere.

The population in 1891 was 422,776, including 20,000 Chinese and about 21,000 aborigines. There are ten towns having over 5,000 population, and the growth of Brisbane, the capital, has been remarkably rapid. (See BRISBANE.) The population of the towns exceeds by very little that of the agricultural and grazing regions. There are about 140 men to every 100 women. The natives are rapidly dying out. Those living in the north are cannibals, and few of them seem able to live long under civilization. C. C. ADAMS.

Queens'town: town; in the county of Cork, Ireland; on the south side of Great island in Cork harbor; 12 miles S. E. of the city of Cork (see map of Ireland, ref. 14-F). Though poorly built on the whole, it presents a fine appearance from the sea. The principal feature is a large Roman Catholic cathedral. Queenstown is an important port of call in connection with the carriage of the mails between the U. S. and the United Kingdom. The place was known as *Cove* until 1849, when it received its present name in honor of the Queen's visit in that year. Pop. (1891) 9,123.

Quelpaert, kwel'päärt: island; about 60 miles S. of Korea, to which it belongs; is about 40 miles long and 17 miles broad (see map of China, ref. 5-L). A mountain range traverses its entire length, culminating in the center in the Auckland (Halla San) peak, 6,500 feet high. The natives follow both agriculture and fishing with much success. The chief towns are Chu Song (pop. 20,000), Chong-Hai, and Tai-Chong (pop. 5,000 each). Pop. of island about 50,000. C. C. A.

Quemada: See MEXICAN ANTIQUITIES.

Quercia, kwär'chi-äa, JACOPO, della: sculptor; b. at Quercia, in the Siennese district, Italy, in the latter part of the fourteenth century. At the age of nineteen he produced an equestrian statue of Giovanni d'Azzo Ubaldini, composed of stucco and wood, materials which had never before been so employed. After having executed some marble statues of prophets for the cathedral façade, and some wood-carving of great merit, Jacopo went to Lucca, where, in the Church of San Martino, he made the monument to Ilaria del Carreto, the wife of Paolo Guinigi. In Bologna, under the patronage of Giovanni Bentivoglio, he executed the principal door of San Petronio. When he returned to Siena the Signoria commissioned him to make a fountain to adorn the piazza. This, his principal work, led to his being called *Jacopo del Ponte*; the Signoria bestowed knighthood on him and the office of chief of the works of the cathedral. Three years later he died at Pisa at the age of sixty-four. W. J. STILMAN.

Quer'citron Bark [*quercitron* is irreg. < Lat. *quercus*, an oak + *citrus*, a tree of the lemon kind]: a valuable dyestuff obtained from the BLACK OAK (*q. v.*). The bark contains a glucoside, quercitrin ($C_{36}H_{42}O_{30} + 3H_2O$), which is decomposed by dilute acids, yielding a yellow dye, *quercetin*, and a variety of sugar known as isodulcite. Flavine is a concentrated product prepared by treating the bark with sulphuric acid. See DYE STUFFS. I. R.

Queres: See PUEBLO INDIANS.

Querétaro, kã-rã'-tiã-rõ: an interior state of Mexico, between San Luis Potosí, Hidalgo, Mexico, Michoacan, and Guanajuato; area, 3,938 sq. miles. It lies entirely in the region of the high plateau, but the surface is mountainous, especially in the northern part. The valleys are very fertile, and the higher slopes are covered with pine and oak forests; the climate is temperate and healthful. Deposits of gold, silver, lead, etc., have been worked with profit, especially during the colonial period; but most of them are now abandoned. Agriculture and stock-raising are the most important industries; the chief crops are maize, beans, and maguey on the higher lands, and sugar-cane in the warm valleys. Manufactures, especially of cotton and woolen goods, are important. Pop. (1893) estimated, 211,475, the Indian element being largely represented. H. H. S.

Querétaro: city; capital of the state of the same name; on a fine plain, surrounded by wooded hills; 5,904 feet above the sea; 152 miles by the Mexican Central Railway N. W. of Mexico city (see map of Mexico, ref. 7-G). It presents a very pleasing appearance, owing to the numerous gardens and lines of trees with which it is ornamented, and its handsome and substantial buildings. The Church of Santa Clara is noted for its exquisite wood-carvings. A fine aqueduct, dating from the eighteenth century, supplies the city with water. Querétaro is one of the most important manufacturing centers of the republic, and contains the largest mills, principally devoted to the making of cottonades. The Hercules mill employs 2,000 workmen, and is remarkable for being fortified and for maintaining a small armed force, which has more than once defended it successfully during revolutionary outbreaks. The town was founded by Chichimec Indians in the fifteenth century, and was conquered by the Spaniards 1531-51. In 1867 Maximilian made his last stand here; the city was taken after a bloody siege, and the ex-emperor was shot on a hill near it. Pop. (1892) about 36,000. HERBERT H. SMITH.

Quern [O. Eng. *cuern*; M. H. Germ. *küen*; O. N. *keern*; Goth. *quærus*, mill]; the old-fashioned hand-mill for grinding grain, in use in Asia at the present day, as well as in the Hebrides, in Ireland, and in various remote places. The quern is made of two stones, after the manner of millstones, or it is a rude mortar of wood or stone. Remains of querns belonging to prehistoric peoples have been dug up in many places in Europe.

Quesada, *kā-sā'-dā*, GONZALO NIMENEZ, de; conqueror of New Granada; b. at Granada, Spain, 1498. He was a lawyer of good family, and Pedro Fernandez de Lugo, who became governor of Santa Marta in 1535, made him his chief lieutenant. The settlement of Santa Marta had been recently founded, and its jurisdiction embraced the present northern coast of Colombia, with an undefined extension southward, including the unexplored river Magdalena. Quesada was given command of an expedition to the interior in Lugo's interests; he left Santa Marta Apr. 5, 1536, with 620 infantry, 85 cavalry, and many Indians. The route southward lay over mountains and then through vast swamps, where the Spaniards suffered terribly from famine, fevers, and hostile Indians. At Tamalameque, on the Magdalena, the survivors met vessels which Lugo had sent them; they then ascended the river to Tora, near the junction of the Sogamosa, where they arrived about Jan., 1537, and passed the rainy season. In exploring the mountains to the E. they heard of the rich kingdom of the Chibchas of Bogotá; and though the force was reduced to 166 men (including 62 horsemen), it was determined to attack this powerful nation. At Barbacoas Quesada (imitating Cortés) resigned his command, and had himself elected governor of the new conquests by the soldiers; in this way he threw off allegiance to Lugo. In the battles which ensued the Indians fled, terrified by the horses. The Spaniards occupied Bogotá, where they were besieged for a month, but gradually the neighboring tribes made peace with them. The *zipa*, or king of the Chibchas, who held out, was killed in battle; a usurping zipa who succeeded him swore allegiance to the King of Spain, but was subsequently tortured and killed. By raids and barter the Spaniards secured a large amount of gold and emeralds. The Spanish city of Santa Fé de Bogotá was founded Aug. 6, 1538. Soon after Benalcázar and FEDERMANN (*q. v.*) joined Quesada, having fought their way respectively from Peru and Venezuela. The three chiefs went to Spain together to present their claims to Charles V. Meanwhile Lugo had died, but his son claimed the conquest. Quesada offended the emperor by unseemly ostentation, and was dismissed. For many years he led a dissolute life in various countries of Europe, until he had squandered the treasure brought from Bogotá. He then renounced all claim to the governorship, and, in consideration of his services, was made marshal of New Granada and given a large *encomienda* of Indians (1549). He took some part in subsequent conquests, and is said to have died, at a great age, of leprosy. An account of the conquest which he wrote has been lost, but it was used by Piedrahita.—His brother, HERNAN PEREZ DE QUESADA, was left as governor of Bogotá in 1538, and long held the district against the agents of Lugo. In 1543 he made an expedition in search of El Dorado, was arrested and banished on his return, and perished in a shipwreck, 1545. His remains were buried in the Cathedral of Bogotá.

HERBERT H. SMITH.

Quesnay, *kā-nā'*, FRANÇOIS: one of the most noted economists of the eighteenth century; b. at Mérey, department of Seine-et-Oise, France, June 4, 1694; studied medicine at Paris, and was appointed first physician to Louis XV. D. at Versailles, Dec. 16, 1774. He is now chiefly known as the founder of the physiocratic school of political economy, and is regarded as the inventor of the term political economy. He developed his views partly in articles in the *Encyclopédie*, partly in his *Tableau économique* (1758), and other writings, which were published in a collected edition in 1768 under the title of *La Physiocratie, ou Constitution naturelle du Gouvernement le plus avantageux au Peuple*. See POLITICAL ECONOMY.

Quesnel, *kā-nel'*, PASQUIER: theologian; b. at Paris, July 14, 1634; studied theology at the Sorbonne; entered in 1657 the Congregation of the Oratory; became director of the Paris house of the order in 1662, and prepared his famous *Réflexions morales sur le Nouveau Testament*, for the use of the young men under his charge. He edited the works of Leo I. the Great (Paris, 1675, rep. in Migne's *Pat. Lat.*), and took occasion to defend the Gallican liberties. Compelled

to flee in consequence in 1685, he repaired to Brussels, where he joined Arnould, and finished the *Réflexions*, which was translated into English (London, 1719-25, 4 vols., and the part on the Gospels, n. e., New York, 1867). The book was at first considered harmless by the Roman Catholic authorities, but soon it was discovered that it really contained all the most obnoxious doctrines of the Jansenists. A hot controversy arose, and the author was denounced to the Spanish police in Brussels, and his book was condemned by the pope in the bull *Unigenitus*, 1713. He fled to Amsterdam, where he afterward lived in retirement. D. in Amsterdam, Dec. 2, 1719. He was a very prolific writer, both on moral and historical subjects. His letters were edited by Le Courayer, Paris, 1721-23, 3 vols.

Revised by S. M. JACKSON.

Quételet, *ket-lā'*, LAMBERT ADOLPHÉ JACQUES: astronomer and statistician; b. at Ghent, Feb. 22, 1796; was appointed a professor of mathematics in 1814 in his native city and in Brussels in 1819; superintended the erection of the observatory of that city in 1826, and was its director to his death Feb. 17, 1874. His writings on physical science—*Possessions de Physique* (1834), *Météorologie de la Belgique* (1864), *Sur la Physique du Globe* (1861), etc.—are valuable, but it is his statistical works—*Sur l'Homme, et le Développement de ses Facultés* (1835), *Sur la Théorie des Probabilités appliquées aux Sciences morales et politiques* (1846), *Du Système social et des Lois qui le régissent* (1848)—which have procured for him a wide reputation.

Quevedo, *kā-vā'dō*, JOSÉ HERIBERTO GARCÍA, de; poet; b. at Coro, Venezuela, in 1819; d. in Paris, June 6, 1871, in consequence of a bullet received in passing a barricade of the Commune. From the age of six he was educated in Puerto Rico, and later in France and Spain. He traveled extensively in Asia and America, but later became a Spanish citizen, and served first in the Royal Guards and then in the diplomatic corps. His poetical reputation was decidedly ephemeral. Among his *Odas á Italia* (1849), which show imitation of Filicaja and Manzoni, are bits of genuine poetic eloquence; but his long philosophical poems—*Delirium*, *La Segunda Vida*, *El Proscrito*—written in a great variety of meters, are turgid, vague, and confused to the last degree. He wrote also numerous dramatic pieces, and essayed the prose tale and the critical essay, but without permanent success. His *Obras poéticas y literarias* are collected in two volumes (Paris, 1863).

A. R. MARSH.

Quezaltenango, *kā-sā'-tā-naangō*: a town of Guatemala, 96 miles W. N. W. of Guatemala city and 35 miles N. E. from its port of Champerico, on the Pacific, on the northern slope of the Cerro Quemado volcano, 7,700 feet above the sea (see map of Central America, ref. 4-D). It is the second city in the republic in size and importance, is the center of a rich agricultural district, the metropolis of the western departments, and exports coffee and a little sugar. There are several good schools and lyceums and handsome churches. The climate is healthful, though somewhat cold and damp in winter. Quezaltenango was an Indian town before the conquest, and the Indian element still predominates. Pop. about 24,000. It is the capital of a department of the same name, which has an area of 957 sq. miles and a population of 104,800.

HERBERT H. SMITH.

Quiché Indians: See INDIANS OF CENTRAL AMERICA.

Quichua Indians: the Kechuan or Inca nation. See INDIANS OF SOUTH AMERICA.

Quicksand: a sand which yields so readily that any heavy body placed upon it gradually sinks. Quicksands occur on beaches, in bars at the mouths of rivers, in the beds of streams, and are interbedded with formations on the land. Their unstable character renders them unfit for foundations and dangerous to men and animals which attempt to walk across them. Ordinary dry sand is compacted by pressure, and though moving somewhat when pressure is first applied, quickly becomes firm. A sand that is slightly moist has the same properties; but if water is present in such quantity as not merely to fill the interstitial spaces but to hold the grains apart, friction is largely overcome and the mass yields to pressure. This condition often obtains when a current of water moves horizontally through the sand, and always when the direction is upward. As the pressure of particles upon one another is influenced also by their size, a fine sand becomes quick more readily than a coarse one, and a strong movement of water is necessary to render a gravel insecure. The principle of the quicksand is utilized in the

engineering process known as "water-jet pile-driving." A hose or other pipe is attached to a pile so as to discharge water near its lower end. The pile is then placed in position, resting upon the sand to be penetrated, and a stream of water forced through the pipe. The water loosens the sand, and, rising through it, keeps it in a quick condition so that the pile is carried downward by its own weight. The pipe is then withdrawn, and if the sand is not disturbed by a natural water movement, it soon becomes compacted and holds the pile firmly. See FOUNDATION. G. K. GILBERT.

Quicksilver: See MERCURY.

Quietism: a peculiar movement within the Roman Catholic Church, which originated from the celebrated devotional work of the Spanish priest Molinos, *Guida Spirituale* (1675). Quietism makes perfection on earth consist in uninterrupted contemplation, during which the soul remains passive or quiet, under the influence of the Spirit of God, and does not bestir itself enough even to make acts of faith, hope, and charity, to desire heaven, to hate hell, or positively to resist temptation. In opposition to the worldly tendencies of the regular orders, the Jesuits and Dominicans, and to the external character of the Roman Catholic worship, quietism presents a somewhat mystical appearance. It is a sentiment, not a doctrine. It founded no sect, though it met with much sympathy outside of the Roman Catholic Church, especially among the Pietists. In spite of its peaceable character, it awakened, nevertheless, the enmity of other parties, and was even exposed to persecution. Some of its disciples—as, for instance, Madame Bouvier de la Mothe Guyon—described their devotional feelings and exercises in a peculiar manner, which could not fail to call forth severe censure, and even caused the police to interfere. Moreover, the emphasis which the Quietists laid on the inner state of the soul made the ceremonies and rules of the Roman Catholic worship seem somewhat superfluous, and provoked the rigid churchmen. Bossuet attacked Fénelon, their most conspicuous spokesman, who immediately submitted to the decision of the pope. The movement died out in the middle of the eighteenth century. See MOLINOS, MIGUEL.

Revised by J. J. KEANE.

Quilimane, *kē-lē-maa-nā:* port of the Portuguese province of Mozambique, East Africa; in a swampy, unhealthy district, at the mouth of the Quagua river (see map of Africa, ref. 8-G). This river was used by commerce to attain the Zambesi river above the delta, before the discovery (1889) of the Chinde branch of the delta, where ocean vessels may meet river craft. The town was founded in the fifteenth century, but has never attained large importance owing to its insalubrity, difficulty of access, and Portugal's onerous restrictions on commerce. Its trade was formerly in ivory and slaves, thousands of whom were sent to Brazil. Ivory and the British interests in Nyassaland give it a trade of about \$1,000,000 a year.

Revised by C. C. ADAMS.

Quillota, *kēl-yō-tāa:* a town of the province of Valparaíso, Chili; on the river Aconcagua; a station on the railway from Valparaíso to Santiago (see map of South America, ref. 8-C). It dates from before the conquest, and was formerly celebrated for gold-washings. Copper is mined in the vicinity. Pop. about 12,000.

H. H. S.

Quills: the shafts of the large wing-feathers of birds. They were formerly the almost exclusive material from which pens were made, and there is still considerable commerce in them. Quills are obtained chiefly from geese, but also from swans, turkeys, and other birds. Crow-quills are valuable in some kinds of drawing. The so-called quills (spines) of the European porcupine have considerable commercial value. Quills are also used for making toothpicks, and for various other purposes. See FEATHERS.

Quillworts: See FERNWORTS (class *Lycopodiinae*, order *Isotaceae*).

Quilwa, *kēl'ō-ān*, or **Kilwa:** a port of German East Africa, about 170 miles S. of Zanzibar; founded by the Arabs in the tenth century; occupied by the Portuguese in the sixteenth century; surrendered in the seventeenth century to Arabs of Muscat, who settled in Zanzibar; acquired in 1888 by Germany from the Sultan of Zanzibar; chief town of the administrative district of Kilwa (see map of Africa, ref. 7-G). It has a fair harbor, and is the center of considerable trade, and was long famous as a shipping-point in the slave-trade. It is a regular port of call for German East African steamers. Pop. about 7,000. An island of the same name lies a little S.

C. C. ADAMS.

Quinault, *kē'nō'*, **PHILIPPE:** dramatist; b. in Paris, France, June 3, 1635. He studied law, but at eighteen appeared as a dramatic author. From 1653 to 1666 he produced sixteen comedies, tragi-comedies, and tragedies, which had considerable influence, though scathingly criticised by Boileau. His comedies—the best of which is *La Mère coquette* (1665)—are comedies of plot and situation; and his tragedies (for example, *La Mort de Cyrus*, 1656; *Amalasonte*, 1658; *Astrate*, 1663) are marked by excess of tender sentiment. His greatest originality was shown in the fourteen operas which he wrote for the composer Lulli, and they also had the greatest success. He was chosen to the Academy in 1670. D. Nov. 26, 1688. Editions of his works: *Théâtre* (5 vols., Paris, 1739); *Œuvres choisies* (2 vols., Paris, 1842); *Théâtre choisi*, ed. by V. Fournel (Paris, 1880). A. G. CANFIELD.

Quince [apparently a plur. form taken as singular < Mod. Eng. *quyne*, *coin*, from O. Fr. *coin* > Fr. *coing* < Lat. *Cydonium* (sc. *ma'um*, apple), Cydonian apple, quince, from Gr. *Kυδωνία*, Cydonia, a city of Crete]: a small tree (*Pyrus cydonia* or *Cydonia vulgaris*) of the Rose family; native to Western Asia, and cultivated from the earliest times. The fruit (also called quince) is usually somewhat pear-shaped, yellow when ripe, and clothed with a floccose wool. The five cells are normally many-seeded, thus differing from other fruits of the genus *Pyrus*, as the apple and pear. It has no true peduncle or stem, but the flowers expand directly from the terminal bud of small shoots of the season. As these shoots must grow before the flowers appear, the blooming-season of the quince is two or three weeks later than that of most other fruit-trees. The large fruits, therefore, always terminate the branches, and they are directly subtended by the leaves. It is this habit of bearing flowers and fruit upon the ends of the twigs which makes a quince-orchard in bloom or in crop one of the most showy of all fruit-plantations. Quinces require a rather moist loamy soil. It is customary to plant them from 12 to 16 feet apart each way, and to allow the branches to start a foot or so above the ground. The leading variety in the U. S. is the Apple or Orange, and this generally reproduces itself very closely from seed. Other popular varieties are Rea, Champion, Meech, and Missouri Mammoth. The Angers quince is grown almost wholly as a stock upon which to graft or bud the pear to make it dwarf. (See PEAR.) The quince is chiefly propagated by means of hardwood cuttings, but it is sometimes grafted upon the apple-root, the latter serving only as a temporary nurse until the quince forms roots from its own tissue. The chief quince-growing region of the U. S. is Western New York.

The Chinese quince is *Pyrus cathayensis*. The fruit is much larger than that of the common quince, and wholly unlike it. The tree is not hardy in the northern parts of the U. S., and the species is not generally esteemed. The flowering or Japanese quince (*P. japonica*) is a popular low thorny tree or bush, planted for hedges and ornament. Its fruits are occasionally used for jellies.

L. H. BAILEY.

Quincy: city (settled in 1822, incorporated as a city in 1839); capital of Adams co., Ill.; on the Mississippi river and the Burlington Route, the Quincy, Omaha and Kan. City, and the Wabash railways; 104 miles W. of Springfield, 264 miles S. of Chicago (for location, see map of Illinois, ref. 6-B). It is built on a limestone bluff, 120 feet above the river, and is laid out regularly, with N. and S. streets 3 miles long and E. and W. streets $2\frac{3}{4}$ miles long. The city is lighted with electricity, is supplied with water from the channel of the river by means of a reservoir 230 feet above tide-water, and is well drained. There are several lines of electric street-railway, a fine railway bridge across the river, and four public parks. The notable buildings include the court-house, cost \$300,000; U. S. Government building, cost \$250,000; new city-hall, cost over \$100,000; and the group, on the cottage plan, comprising the State Soldiers' and Sailors' Home. There are 33 churches, 10 public-school buildings, public-school property valued at over \$210,000, Chaddock College (Methodist Episcopal, chartered 1876), St. Francis Solanus College (Roman Catholic, opened 1860), 3 libraries (Free Public and two college) containing over 14,000 volumes, 3 national banks with combined capital of \$550,000, a State bank with capital of \$300,000, a private bank, and a monthly, 4 daily, and 10 weekly periodicals. Quincy is a manufacturing city, with excellent shipping facilities by rail and water. The census returns of 1890 showed that 374 manufacturing establishments (representing 76 industries) reported. These had a combined capital of \$6,187,845, employed 5,058 persons, paid \$2,383,571 for

wages and \$5,597,990 for materials, and had products valued at \$10,160,492. There were 16 foundries and machine-shops, 10 carriage and wagon factories, 5 agricultural implement works, and numerous cigar and tobacco factories, flour and grist mills, breweries, brick-yards, lime-works, saddle and harness factories, artificial-ice factories, and organ-works. The assessed valuations in 1893 were, real, \$4,427,555; personal, \$1,410,774—total, \$5,838,339; and the net debt in Feb., 1894, was \$1,482,200. Pop. (1880) 27,268; (1890) 31,494; (1894) estimated, 34,000.

Quincy: city (settled in 1625, set off from Braintree as a town in 1792, incorporated as a city in 1888); Norfolk co., Mass.; on the Quincy river and bay, and the N. Y., N. H. and Hart. Railroad; 8 miles S. of Boston (for location, see map of Massachusetts, ref. 5-I). The city is noted for its extensive granite-quarries and large shoe-manufactories; also as a terminus of the first railway built in the U. S. (for transporting blocks of granite from the quarries to the site of the Bunker Hill Monument). It contains 8 public-school buildings, public high-school building (completed in 1894, cost \$60,000), 2 national banks, with combined capital of \$300,000, a savings-bank with deposits of over \$1,750,000, Merry Mount and Faxon parks (besides playgrounds of more than 6 acres each in five wards of the city, secured at a cost of \$40,000), the Adams Academy (founded in 1823, opened for pupils in 1872), the Thomas Crane Public Library (founded in 1871) containing over 17,000 volumes, and a daily, a monthly, and 2 weekly periodicals. The assessed valuations in 1893 aggregated \$16,338,070, and the total debt in Mar., 1894, was \$1,103,730, including a water-debt of \$714,000. Quincy was the birthplace of John Hancock, John Adams, and John Quincy Adams. Pop. (1880) 10,570; (1890) 16,723; (1895) 20,712. C. H. PORTER.

Quincy, EDMUND: author; son of President Josiah Quincy; b. in Boston, Mass., Feb. 1, 1808; graduated at Harvard 1827; was prominent as secretary of the American and the Massachusetts anti-slavery societies; contributed to magazines; was author of *Wensley, a Story without a Moral* (1854), and of a *Life of Josiah Quincy* (1867), and editor of the *Speeches of Josiah Quincy* (1875). D. at Dedham, Mass., May 17, 1877. *The Haunted Adjutant, and other Stories* was issued in 1885. Revised by H. A. BEERS.

Quincy, JOSIAH, JR.: lawyer; b. in Boston, Mass., Feb. 23, 1744; son of Josiah Quincy (1709-84), a merchant; graduated at Harvard University in 1763, and became an eminent lawyer. He had already by his writings and speeches obtained prominence as an ardent advocate of the cause of liberty when called upon, in conjunction with John Adams, to defend the soldiers implicated in the Boston Massacre. Although successful in securing the acquittal of their clients, popular feeling ran so high that, notwithstanding their established reputation for patriotism, they incurred much odium by their connection with the defense. In 1774 he went to England, where he was active in promoting the interests of his country. D. on the return voyage, off Gloucester, Mass., Apr. 26, 1775. In 1774 he published his *Observations on the Act of Parliament, commonly called the Port Bill*. See *Memoir of the Life of Josiah Quincy, Jr., by his Son* (Boston, 1825; 3d ed. 1875).

Quincy, JOSIAH, LL. D.: statesman; son of Josiah Quincy, lawyer; b. in Boston, Mass., Feb. 4, 1772; graduated at Harvard University 1790; studied law with Judge Tudor, and was admitted to the bar in 1793; member of the State Senate in 1804, and member of Congress 1805-13, during which time he opposed the embargo law and the war with Great Britain; again State Senator 1813-21; member of State Legislature 1821-23, and Speaker of that body during his last term; appointed judge of the municipal court in 1822, but resigned the following year, having been elected mayor of Boston on the decease of the Hon. John Phillips, the first incumbent; continued in office until 1829, during which time many public improvements were carried out; was president of Harvard University from 1829 until Aug., 1845. Among his published works are *Centennial Address on the 200th Anniversary of Boston* (1830); *History of Harvard University* (2 vols., Boston, 1840); *History of the Boston Athenæum*, of which he was president 1820-30 (Boston, 1851), and *Municipal History of Boston* (Boston, 1852); *Memoir of John Quincy Adams* (Boston, 1858). *Speeches in Congress and Orations* have also been published, besides numerous *Memoirs*, including one of his father (1825). D. at Quincy, Mass., July 1, 1864. See the biography by his son, Edmund (Boston, 1867).

Quincy, QUATREMERIE, DE, S. = QUATREMERIE DE QUINCY.

Quinet, kē'nā', EDGAR: author; b. at Bourg, Ain, France, Feb. 17, 1803. He studied at Paris, Geneva, Strassburg, and Heidelberg. He was profoundly influenced by German thought, and upon his return published a translation of Herder's *Ideen zur Philosophie der Geschichte der Menschheit* (3 vols., Paris, 1827). In 1828-30 he was a member of a scientific expedition to Morea; contributed from 1831 to 1839 to the *Revue des Deux Mondes* essays principally on foreign life and thought; was made Professor of Foreign Literature at Lyons in 1839, and of the Languages and Literatures of Southern Europe at the Collège de France in 1842. His political utterances, ardently liberal and anti-clerical, led to his removal in 1846. He then traveled in Spain, took part in the revolution of 1848, was a member of the Constituent and Legislative assemblies, was banished in 1852 after the *coup d'état*, lived in Holland and Switzerland, returned at the fall of the empire, and was deputy in the National Assembly in 1870. D. at Versailles, Mar. 27, 1875. He wrote vast philosophical epics dealing with the history of humanity (*Ahasvérus*, 1833; *Napoléon*, 1836; *Prométhée*, 1838), remarkable for loftiness of conception and striking ideas, but lacking measure and sobriety; and a large number of works of eloquent prose dealing with history, politics, religion, and literature, among them *Le Christianisme et la Révolution Française* (1846); *La Révolution* (1865); *France et Allemagne* (1867). They have been collected in *Œuvres complètes* (vols. i.-x., 1857-58; vol. xi., 1870; vols. xii.-xxviii., 1877-79); to them must be added *Le Livre de l'Exilé* (1875) and *Lettres d'Exil* (4 vols., 1884-88). A. G. CANFIELD.

Quinette de Rochemont, kē-net de-rō-shā, nō-shā, ÉMILE THÉODORE, Baron: civil engineer; b. at Soissons, France, Aug. 19, 1848; educated at the Polytechnic School and at the École de Ponts et Chaussées, where he graduated 1859; attached to the council general of bridges and roads 1862; 1863-79 resident engineer of the port of Havre; engineer-in-chief of the canal from the Escaut to the Meuse 1879; engineer-in-chief of the port of Havre 1883; inspector-general of bridges and roads at the ministry of public works 1892; and professor at the École de Ponts et Chaussées since the same year. He has published *Mémoire sur le Clyde, Glasgow, Port Glasgow, et Greenock* (1869); *Note sur les phares électriques de la Hève* (1870); *Régime des courants et des marées à l'embouchure de la Seine* (1874); *Notice sur le port du Havre* (4to, 1875); numerous memoirs and notices of the port of Havre 1877 to 1889; *Note sur l'Escout maritime et le port d'Anvers* (1878); *Note sur le type d'écluse pour le Canal de l'Escout à la Meuse* (1883); *Les ports maritimes de la Hollande* (1890); *Les ports Allemands de la Baltique* (1891); *Les ports Allemands de la mer du Nord* (1892); *Les ports de la Mersey et de la Clyde* (1892). W. R. HUTTON.

Quinine, ki-neen' or kwi'nin [= Fr., from Span. *quina*, Peruvian bark, from Peruv. *kina*, bark]; the most important medicinal ingredient of cinchona or Peruvian bark. It was discovered in yellow or calisaya bark in 1820 by Pelletier and Caventou. It exists in all the official barks, but is most abundant in the calisaya. To obtain it, it is first extracted from the bark as a sulphate by means of a complex process. By treating this salt with the solution of an alkali, the quinine is precipitated, and is then washed, dried, dissolved in alcohol, and reobtained by slow evaporation. It may be amorphous, but with care it can be obtained in silky crystals. Quinine is an alkaloid with strong basic properties, and forms with acids crystallizable salts. Its formula is $C_{20}H_{24}N_2O_8$. It is without smell, but has an intensely bitter taste; is very insoluble in water, but dissolves freely in alcohol and moderately in ether. Solutions of the alkaloid or its salts, treated first with chlorine water and then ammonia, strike a brilliant green color. This test is very delicate, and distinguishes quinine from all other vegetable alkalies except quiniidia. Quinine is used in medicine principally in the form of sulphate or hydrochloride, the latter salt having the advantage of being more soluble. Quinine salts are locally irritant, and internally in small dose are stomachic; in large, powerfully disturbing to the nervous system, while also tending to cause nausea and vomit. In medicinal doses the most prominent symptoms of cinchonism are headache and deafness, with buzzing or roaring in the ears, muscular debility, and some reduction of the force and frequency of the pulse. In poisonous dose the individual may become completely blind, deaf, and paralyzed, but death is rare. Quinine salts are powerfully anti-

septic, a small percentage preventing or arresting putrefactive and fermentative processes. They also, in small percentage, arrest protoplasmic movement, as in white blood-corpuscles, bacteria, etc., and even destroy permanently the vitality of the organisms. These salts are used in medicine, especially to cure malarial affections of all kinds, over which they have a well-known and unequalled power, by preventing activity in the peculiar micro-organisms (*Hæmatozoon malarie*) of malarial disease. The five other alkaloids of cinchona bark—namely, quinine and quinicine and cinchonine, cinchonidine and cinchonine—are all more feeble than quinine in power and are rarely used, except cinchonidine. Quinicine and cinchonine are both artificial alkaloids.

Revised by H. A. HARE.

Quinisext Council [Lat. *quinque*, five, *sextus*, sixth]: the Oriental Church council which was convened in 692 A. D. to supplement the acts of the fifth and sixth œcumenical councils. It is called also the Second Trullan Council, because it was held in the domed room of the imperial palace at Constantinople, called the *Trullus*. The Greeks consider it the seventh œcumenical council, but the Latins do not recognize it. It was convened by Justinian II., and gave 102 stringent canons on clerical discipline, but allowed the marriages of priests to stand, provided they were first marriages and with virgins. See **TRULLAN COUNCILS**.

Quino'a: a woody herb (*Chenopodium quinoa*), which, with other nearly related species, is cultivated in the highlands of Spanish America for its nutritious seeds. Its leaves are used as a potherb.

Quinsy [for *quinancy*, from O. Fr. *esquinancie*, *quinancie*: Span. *esquinancia* < Lat. *cynanche* = Gr. *κυνάγχη*, a kind of sore throat]: acute suppurative tonsillitis, or inflammation of the tonsil, terminating in abscess. One attack usually leaves subacute or chronic disease of the tonsil, which predisposes the person to repeated attacks in subsequent seasons. Quinsy is most often unilateral, less frequently attacking the two tonsils successively, and rarely coincident upon both sides. It attacks adults, less often children; the two extremes of life, infancy and old age, being quite exempt from it. It occurs in persons of full habit, especially when the diet has been excessive and luxurious. The rheumatic and gouty diatheses especially predispose. The immediate or exciting cause is some exposure of the body to wet or cold. The attack is manifested by soreness of the throat, increased by swallowing and talking, rigidity of the jaw, hypersecretion of saliva, coated tongue, labored breathing, and sense of obstruction, tension, and tumefaction in the throat. With the first development of pus intense throbbing pain exists. The disturbance of the general system is variable, but in general it is remarkable how much constitutional disturbance results from limited local disease in throat-troubles of this kind. In mild cases only impaired appetite and sense of lassitude exist; in graver attacks there may be a slight or marked chill at the onset, and a succession of light chills; the temperature elevated to 102° or 104° F.; the pulse full and bounding; delirium at night, and by day the face expressive of great fatigue, suffering, and alarm. Internal examination discloses the tonsil symmetrically enlarged, extending to the median line of the throat and obstructing it. Palpation by the finger may detect the softness and fluctuation of pus. In from five to eight days the suppurated tonsil bursts, all the symptoms vanish, and recovery is speedy. In its formative or first stage, quinsy may sometimes be aborted by scarification, by ice in the mouth, cold gargles or spray, and astringent gargles or applications, as of alum or tannin, and by administration of saline cathartics and arterial sedatives or quinine. When developed, the inhalation of steam, warm anodyne gargles, soothing poultices or fomentations, anodynes to secure rest, tonics and diet to sustain the strength, and early evacuation of pus with the knife, are the essentials of treatment. Sudden death may occur when the abscess opens spontaneously during sleep and the pus enters the air-passages, or from hæmorrhage when the internal carotid artery is involved by the suppuration.

Revised by W. PEPPER.

Quintain [Fr. *quintaine*; Ital. *quintana*, *chintana* < Lat. *quinta'na*, a street in the Roman camp between the fifth (*quintus*) and sixth maniples, where probably was set a post for use as a target]: an object, often in the form of a man, designed to be tilted at with a lance. It was sometimes placed at the end of a crosspiece so balanced upon a pivot that if the rider were not very quick a bag of sand at the other end of the crosspiece would strike him in the back.

Quintal [viâ Fr. and Span. from Arab. *qinfâr*, a weight of 100 lb., probably from Lat. *centenarius*, consisting of a hundred, from *centum*, hundred]: a hundred weight, chiefly used in weighing fish.

Quintana, kēen-taa'na, MANUEL JOSÉ: author; b. in Madrid, Spain, Apr. 11, 1772. He studied at the University of Salamanca, and became a lawyer at Madrid. His first literary works, a tragedy and a volume of poetry, were intended to rouse the national spirit against the French, who were then invading the Peninsula: they were very popular. During part of the "war of liberation" Quintana was secretary of the Cortes and the regency; after the restoration his liberal principles led to his mild imprisonment in the castle of Pamplona. In 1833 he was made preceptor to the infant queen, Isabella, and in 1835 he became a senator. His principal work, and one of the modern Spanish prose classics, is *Vidas de Españoles célebres* (1807-34; many later editions). It includes biographies of the Cid, Gonzalo Fernandez de Córdoba, Balboa, Pizarro, Las Casas, etc., and is characterized by clearness and simplicity of style, with much original research. D. in Madrid, Mar. 11, 1857. H. H. SMITH.

Quintard, CHARLES TODD, M. D., D. D., LL. D.: bishop; b. at Stamford, Conn., Dec. 22, 1824; graduated in medicine at the University of New York 1847; became a physician to the New York City Dispensary 1847; Professor of Physiology and Pathological Anatomy in the Memphis Medical College 1851; contributed to medical periodicals; took orders in the Protestant Episcopal Church 1855; was successively rector of churches at Memphis and Nashville; was a chaplain in the Confederate army, and was chosen Bishop of Tennessee 1865. Bishop Quintard is the second founder of the University of the South at Sewanee, Tenn., after its destruction during the civil war. He obtained large endowments for this institution in England, and until 1893 was vice-chancellor and trustee. Revised by W. S. PERRY.

Quintilian (Lat. *Marcus Fabius Quintilianus*): author; b. at Calagurris, Spain, about 35 A. D.; educated at Rome, and gained there the highest reputation as a teacher of eloquence; received a regular salary from the treasury fund established by Vespasian, and was loaded with the highest civil honors and titles by Domitian. D. probably about 96. About 95 he published his *Institutio Oratoria*, a work in twelve books on the art of oratory, which, besides its great historical interest (bk. x.), may still be read for practical purposes. There are English translations by Guthrie (1756), Patsall (1774), and Watson (1856). The best critical editions are by Halm (2 vols., Leipzig, 1868) and Meister (2 vols., Prague, 1886-87). The lexicon to Quintilian by Bonnel (Leipzig, 1834), forming the sixth volume of Spalding's edition, is valuable. Separate editions of book i. are by Fierville (Paris, 1890), of book x. by Bonnel-Meister (Berlin, 1882), Krüger (Leipzig, 1888), and Petersen (Oxford, 1891). The two collections of *Declamationes*, 19 longer and 145 shorter, ascribed to Quintilian, are probably spurious. A complete edition is by Gronovius (Leyden, 1665) and Burmann (Leyden, 1720). Of the 145 shorter by C. Ritter (Leipzig, 1884). See Schanz, *Gesch. der Röm. Lit.* (Munich, 1892, 2d part, p. 442).

Revised by M. WARREN.

Quintus Curtius Rufus: the author of an historical work in ten books on Alexander the Great, *Historiæ Alexandri Magni Macedonis*, which was much read and much admired during the Middle Ages. Of the author nothing definite is known. He may have been a rhetor mentioned in an *Index* of Suetonius. Of the work, which was composed under the Emperor Claudius, the first two books have been lost, and some of the others considerably damaged. The narrative is very pleasing, but by no means accurate, and is full of fables. The best editions are by E. Hedicke (Berlin, 1867), Th. Vogel (Leipzig, 1881; and with notes, 1885), S. Dosson (with French notes, Paris, 1887). See also Dosson, *Étude sur Quinte Curce, sa vie et son œuvre* (Paris, 1887).

Revised by M. WARREN.

Quintus Smyrnaeus, or Calaber: Greek epic poet, who composed *Posthomerica* (τὰ μετ' Ὀμήρου), in fourteen books. The name *Smyrnaeus* comes from his own statement (12, 310) that he had lived at Smyrna, *Calaber* from the fact that his poems were discovered in Calabria by Cardinal Bessarion in 1450 A. D. His versification points to an earlier period than that of NONNUS (q. v.). The poem covers too much ground and lacks unity. It produces the effect of a mosaic for which Homer, Hesiod, Sophocles, Euripides, Apollonius, Lycophron, and probably even Vergil and Ovid have been laid

under contribution. The style is simple, the descriptions do not lack epic detail, similes abound, and the work is further commended by purity of tone, but there is no true life in it, and no one comes back to Quintus except to investigate his sources. There is an edition by Köchly (Leipzig, 1850), another by the same in the Teubner Library, and a critical one by Zimmermann (Leipzig, 1891). B. L. GILDERSTEEVE.

Quirinal [from Lat. *Collis Quirinalis*, the Quirinal Hill; *collis*, hill + *Quirinalis*, pertaining to *Quirinus*, a name of the deified Romulus, deriv. of *Cures*. See **QUIRITES**]; one of the seven hills of Rome, lying N. and a little E. of the Forum. Like the Palatine it was originally the seat of a separate community (as Mommsen has conclusively shown, *Roman History*, vol. i., p. 82) with religious and political institutions of its own. Aside from the ancient temple of *Quirinus*, restored by Julius Caesar and Augustus, the most important buildings on the Quirinal, of which remains still survive, were the baths of Constantine and the baths of Diocletian. See Ch. Hülsen, *Zur Topographie des Quirinals*, *Rheinisches Museum*, vol. xlv., (1891), pp. 379-424. On the baths, see Middleton, *Remains of Ancient Rome*, vol. ii., pp. 177-186. G. L. HENDERICKSON.

Quirites [= Lat., plur. of *Quiris*, probably meaning a citizen of Cures (q. v.)]: the citizens of ancient Rome, synonymous with *populus Romanus*, or even added to it, as *populus Romanus Quiritium*. The singular *quiris* is very rare, and the plural form is only used in certain set formulas—e. g. *Quirites* as a form of address, *jus Quiritium* (full Roman citizenship), and the example given above. G. L. H.

Qui-tam Actions: See **INFORMER**.

Quit-claim: a word often employed in deeds in which the grantor or seller undertakes no responsibility in regard to the validity of his own assumed right to the property in question, but merely conveys to the grantee or buyer his own interest, whether valid or the reverse.

Quitman, JOHN ANTHONY, LL. D.: lawyer and soldier; b. at Rhinebeck, N. Y., Sept. 1, 1799; received a liberal education; became a lawyer, and was professor at the Mount Airy College, Pa., 1819; practiced law at Chillicothe, O., 1820-23; removed to Natchez, Miss., where he became a successful planter and rose to distinction in his profession and in the politics of the State; was chancellor of the superior court 1828-31 and 1832-34; member of the State Legislature 1828-32; president of the Senate in 1835 and Governor *pro tem.*; judge of the high court of errors and appeals 1839; distinguished in the Texan struggle for independence, he was, on the outbreak of the war with Mexico, appointed brigadier-general of volunteers; promoted to be major-general Apr., 1847; was distinguished at Monterey, Chapultepec, and assault and capture of the city of Mexico; Congress presented him with a sword for his services at Monterey, and Gen. Scott appointed him governor of the city of Mexico. Returning home at the close of the war, he was elected Governor of Mississippi in 1850, and from 1855 to 1858 was a member of Congress and chairman of the committee on military affairs. D. at Natchez, July 17, 1858. See his *Life and Correspondence* (2 vols., 1860), by F. H. Claiborne.

Quito, kee'tō: a city; capital of Ecuador; on the Andine plateau, 9,250 feet above the sea; a few miles S. of the equator, and 165 miles N. N. E. of Guayaquil (see map of South America, ref. 3-B). The plain or valley of Quito is an elevated basin nearly surrounded by some of the highest peaks of the Andes. The city itself is built on the lower spurs of the Pichincha volcano, and Cayambé, Antisana, Cotacachi, Cotopaxi, Sinchalagua, Corazon, and Iliniza are in plain sight, their snow-clad peaks forming a panorama of almost unequalled grandeur. The ground occupied by the city is very uneven and is traversed by deep ravines spanned by arches; the streets are narrow, indifferently paved, and so steep that carriages can not be used. Owing to the danger from earthquakes, most of the houses are built with only one story, but many of them are substantial, and the older ones recall the early colonial period. The public buildings are generally of stone; the cathedral, government and archbishop's palace, and city-hall are grouped about the Plaza Mayor, a handsome square and public garden. There are many churches and convents, a public (formerly the Jesuits') library, hospitals, observatory, and several educational institutions, including the ancient university, which

is essentially a theological seminary. Many of the ecclesiastical buildings are adorned with paintings by native artists, and the city has a wide reputation as an art center. In population and commerce it is surpassed by Guayaquil; it has been impoverished by frequent revolutions. No railway connects it with the outer world, and there is only one good carriage-road out of the city—that to Guaranda. The bulk of the population consists of small tradesmen and artisans and Indian laborers and servants. The climate is spring-like, very equable, and salubrious. The natural drainage keeps the city healthful, though sanitary rules are neglected. Quito is probably the oldest existing city in America, having been the capital of the ancient Quito chiefs. It was taken by the Inca Tupac Yupanqui about 1470, was thereafter a favorite residence of the Incas, and when their empire was divided in 1525, became the capital of the northern portion. The Spanish general Benalcazar took it and founded the modern city in 1534. During the colonial period it was the capital of the presidency of Quito (now Ecuador). The most destructive earthquakes were in 1797 and 1859. Pop. about 35,000. HERBERT H. SMITH.

Quittor: See **FARRIERY**.

Quoits, kwoits or koits [M. Eng. *coite*, from O. Fr. *coitier*, push, harass < Lat. *coactare*, force, freq. of *cogere*, compel]: a game of strength and skill, in which the player strives to pitch a flattened ring of steel (called a quoit) in such a way as to land it as near as may be to a peg or hob of iron stuck upright in the ground, or, if possible, to make it ring the hob. This game differs from the discus-play of the ancients, in which the player threw a disk of metal or stone as far as he could, the longest thrower winning the prize.

Quoratean Indians [*Quoratean* is an adaptation of Quoratem, or Kworatem, the native name of Salmon river, California, as well as of a small band formerly residing at its mouth]: a linguistic stock of Indians, whose geographic limits are somewhat indeterminate. The main area occupied by the tribes includes both banks of the lower Klamath, from a range of hills a little above Happy Camp to the junction of the Trinity, and Salmon river from its mouth to its sources. On the N., Quoratean tribes extended to the Athapascan territory near the Oregon line.

The tribal divisions are the Ehnek, Karok, and Pehtsik. The Ehnek are well formed and compact, and in stature are but slightly inferior to the whites. The women are better-looking, fairer, and of livelier disposition than any on the coast, and not a few have married among the settlers. The social organization is exceedingly democratic, the authority of their village chiefs being only nominal. In time of war they had a single chief, and instead of taking scalps, decapitated their captives. The Ehnek have many dances, among which is one performed in the fall, for the spirits of the earth and forest, and another immediately before the salmon-catch in spring. The term Karok means *up the river*, and is applied to the Indians who reside on the middle Klamath, in contradistinction to those living near the mouth. In 1889 the Indians of this stock numbered about 600. See **INDIANS OF NORTH AMERICA**, and Stephen Powers, *Tribes of California (Contributions to North American Ethnology*, iii., Washington, 1877). F. W. HODGE.

Quorum: See **PARLIAMENTARY LAW (Adoption of Motions)**.

Quotidian: See **FEVER** and **CHILL**.

Quo Warranto, Writ of, or (as often abbreviated) **Quo Warranto** [Law Lat., by what authority; Lat. *quo*, by what + *warranto*, abl. of Mediæv. Lat. *warrantum*, warrant, authority]: a very ancient common-law writ, in the nature of a writ of right, for the crown against a person or corporation claiming or usurping any office, franchise, or liberty, to inquire by what authority the claim was supported, or to determine the right. The writ also lay in case of non-user or long neglect, and in case of misuse or abuse. The respondent was commanded to appear and show by what right he exercised the office, franchise, or liberty, not having a grant of it, or having forfeited it for non-user or abuse. The proceeding of *quo warranto* was long, and the judgment in it conclusive even against the crown. In England it was superseded at an early day by the proceeding called an information in the nature of a *quo warranto* (see **INFORMATION**), and it is little used in the U. S. F. SHERMAN ALLEN.

R



: the eighteenth letter of the English alphabet.

Form.—It is the Latin R or *ꝛ* derived from the Greek *Ῥ*, a form of the letter *Ρ* (rho), particularly common in the alphabets of Eubœa, Boeotia, Phocis, Locris, Thessaly, and the Peloponnesus. The added dependent stroke was preserved in

the Latin alphabet as a convenient means of distinguishing the letter from the form of *pi* (*P* instead of *ꝑ*) generally adopted there. The Phœnician form of the letter was *q*.

Name.—The Semitic name *rēsh*, head (side view), was changed in Greek to *ῥō* (*ῥω*). In Latin the letter received the phonetic name *er*, which appears in O. French as *erre*, Provenç. *erre*, *erro*. Adopted into M. Eng., this yielded in Mod. Eng. the present name *ar*; cf. *ferme* > *farm*, *persone* > *parson*, *persil* > *parsley*, *gerner* > *garner*, etc.

Sound.—In the standard English of Great Britain and in that of the southern and northeastern part of the U. S., *r* stands for a consonant only when it immediately precedes a vowel as in *ride*, *dry*, *try*. This consonant sound is a spirant, either voiced or voiceless, produced between the tip of the tongue and the forward palate or the ridge between palate and gums. Before the back-vowels the tongue-tip is turned back toward the palate, as in *raw*, *roar*, *roul*; otherwise it turns toward the ridge of the gums, as in *rid*, *red*. It is often voiceless after voiceless consonants; contrast *try* and *dry*. After vowels it denotes, in the language of the localities mentioned above, the sound of the obscure vowel *ə*, or is entirely silent. Thus it is pronounced as *ə* in *care*, *floor*, *dire*, *our*; it is silent or results in lengthening the preceding vowel in *far*, *sir*, *fern*.

Source.—In Teutonic words it generally represents either (1) Teutonic and Indo-European *r*; as *red* < O. Eng. *rēad* : Goth. *ráups* : Germ. *roth*, cf. Gr. *ῥυθρός* : Lat. *rubër* : Sanskr. *rudhīrā*, or (2) Teutonic *z* < Indo-European *s*; as *ear* < O. Eng. *ēare* : Goth. *áusō* : Germ. *ohr*, cf. Lith. *ausis*; *sear* < O. Eng. *sēar*, cf. Lith. *sausas*, dry, Gr. *αἶψα*, to dry up.

Symbolism.—R = rood, rod, king (*rex*), queen (*regina*), take (*recipe*); Rh. = rhodium. See ABBREVIATIONS.

BENJ. IDE WHEELER.

Ra (Egypt. *Rā*): the Egyptian "sun-god," "father of gods and men," in whom in particular the solar worship of the Egyptians was centered. Heliopolis contained his principal sanctuary and was the center of his cult, which was very ancient. He was regarded as the offspring of the celestial ocean, and was believed to have appeared first at HERACLEOPOLIS (*q. v.*), where he gained a victory over the "children of the rebels" and assumed divine rule over the world. So long as he was young his kingdom was strong, but with advancing age his subjects became rebellious. With the aid of Hathor he revenged himself upon mankind and almost utterly destroyed them. Such are the main features of the myth of Ra. (See Brugsch, *Die neue Weltordnung nach Vernichtung des sündigen Menschengeschlechtes*, Berlin, 1881.) *Rā* is represented as hawk-headed, with the sun-disk and the uræus on his head, the sun-disk being his emblem. *Rā* himself was the sun at midday; the rising sun was Ra-Harmachis, "Horus on the horizon"; and the setting sun was Ra-Tum (Ātum, the closer), as an aged man. During the night he was regarded as in conflict with the serpent Apepi, but from the contest he emerged each morning in victory. The *Adoration of Ra* was one of the chief and best-known poems of the Book of the Dead. The worship of *Rā* as Āten, the sun-disk (see KHUNATEN), was the nearest approach to monotheism which Egypt ever saw. Joined with Amen, as Amen-Rā, he became the principal national god after the expulsion of the Hyksos, and joined with Mont, as Mont-Rā or Menthu-Rā, he was the god of war. *Rā* was also conceived of as joined with various other gods of the Egyptian pantheon. CHARLES R. GILLET.

Raab: town of Hungary; at the influx of the Raab into the Little Danube, a branch of the Danube; 67 miles W. N. W. of Budapest (see map of Austria-Hungary, ref. 5-F). It was formerly fortified, and has a fine old cathedral. Its

manufactures of tobacco and cutlery and its transit trade are extensive. Pop. (1890) 23,956.

Raabe, *raa be*, WILHELM (pseudonym *Jakob Corvinus*): novelist; b. at Eschershausen, Brunswick, Sept. 8, 1831; studied philosophy at Berlin and devoted himself entirely to literary pursuits. He is distinguished as a humorist among the German novelists of the nineteenth century. His principal works are *Die Chronik der Sperlingsgasse* (1857); *Leute aus dem Walde* (1863); *Der Hungerpastor* (1864); *Wunnigel* (1879); *Horacker* (1876); *Das Horn von Wanza* (1881); and *Der Lar* (1889). J. G.

Raba'nus Magnen'tius Mau'rus (spelled also *Iirabanus* and *Rhabanus*): archbishop; descended from an ancient Roman family, and pronounced by Kurtz "the most learned man of his age"; b. at Mentz about 776; studied in the monastery at Fulda, and afterward in Tours under Alcuin; teacher at Fulda from about 805 till 814 and again from 817, and made abbot there in 822; Archbishop of Mentz 847. D. at Winkel, Feb. 4, 856. The name of Maurus was given to him by his teacher, Alcuin, in remembrance of St. Maur, the disciple of St. Benedict. He opposed the doctrine of transubstantiation, first distinctly set forth by Paschasius Radbert in 831 (expanded in 844). His works fill six volumes (107-112) of Migne's *Patrologia*. See Bach's *Rabanus Maurus, der Schöpfer des deutschen Schulwesens* (1835); Kunstmann's *Rabanus Magnentius Maurus* (1841); and Spengler's *Leben des Rabanus Maurus* (1856).

Revised by M. WARREN.

Rabat': strongly fortified town of Morocco, Northern Africa; at the mouth of the Wadi-el-Bureg on the Atlantic; formerly a port of considerable importance, but less accessible now on account of a sand-bank in front of the river mouth (see map of Africa, ref. 1-B). Most European trade has therefore sought safer ports, though one or two steamers a month call to leave tea, sugar, cloths, candles, and small wares, and take away olive oil, beans, wool, skins, and bones. The fine and brilliantly colored carpets, woolen cloths, mats, leather goods, and potteries for which Rabat is famous are not extensively exported, but are widely distributed in Morocco. Pop. 25,000, one-sixth Jews, besides about 100 Europeans. Zelâ, across the river (pop. 10,000), has its own local government, its people following the same industries as those of Rabat. C. C. ADAMS.

Rab'ba: ancient capital of the native state of Nupé; on the middle Niger river, West Africa. It was destroyed by the Fulahs early in the nineteenth century when they were spreading the tenets of Mohammedanism. Though no longer the capital, it is a large town in a well-cultivated region, and has a considerable trade with Sokoto and other places in the Sudan. It was once one of the most important slave-markets in West Africa. Revised by C. C. ADAMS.

Rabbah: same as AMMAN (*q. v.*).

Rabbi [= Lat. = Gr. *πάββι*, from Heb. *rabî*, my master, deriv. of *rab*, master, lord, teacher; cf. Arab. *rabb*]: a title of honor anciently employed by the Jews to designate those learned in the law, in which sense it is frequently found in the Gospels. It was also used by disciples of other teachers, for it was applied to John the Baptist (John iii. 26) and to Jesus himself (e. g. Matt. xxvi. 25, 49; Mark x. 31; John i. 38). Luke employs the term *didaskale*—i. e. teacher—but this is only the Greek translation of *rabbi*. The term *rab* is applied by Oriental Jews in a manner similar to the use of the English "esquire."

Rabbinical Literature: a name wrongly given to the whole of the literature produced by the Jews, but one which may fitly describe that portion of it which is the result of the literary activity of the *rabbi* in his position as religious and judicial leader of the community. Its subject-matter is civil and ecclesiastical law, both the legislative and executive power in the Jewish community being in post-Talmudic times, the period treated of, in the hands of the rabbis.

The continuity of oral tradition had not been disturbed by the completion of the Mishnah and the TALMUD (*q. v.*).

The latter became the basis for all further discussions in the schools, and was modified and developed as occasion required. The literature which resulted from these discussions took on the form of commentaries, glosses, compendia, and practical decisions. Of the two redactions of the Talmud, it was the Babylonian which soon acquired absolute authority, almost to the exclusion of the Palestinian. It was in the schools of Babylon (Sora and Pumpaditha) that the first attempts were made to bring order into the chaos of the Talmud. The most noted of the Gaōnim ("Highnesses," 800-1037) as Talmudic scholars were Sherira (980), who wrote an encyclical to the Jews of Kairowān in which he detailed the history of the formation of the Talmud; hisson, Hai (969-1038), to whom a commentary on the Mishnah is ascribed; and Samuel ben Hofni (960-1034). Even before their death Jewish scholarship had sought a new home in Spain and North Africa. The Jews in Spain lived in greater freedom and busied themselves more with poetry and philosophy. Talmudic science had been transported there from the East by Moses ben Chanoch (960), and was kept alive by his son Chanoch and by Joseph ibn Abitur; but rabbinical science found its first real home across the Pyrenees—in Provence, in France, and then in Germany. The influence of Solomon ben Isaac (Rashi 1040-1105) of Troyes was supreme in France, and as a result of his commentaries there arose a school of Tosafists ("adders"), which, in contradistinction to the Spanish compilers and epitomizers, developed the careful criticism of the text and its application to the needs of actual life. Zunz has put together nearly 200 names of Tosafists, some of whom carried their methods into England.

In Spain the controversy evoked by MAIMONIDES (*q. v.*) in favor of philosophy against the exclusive study of the Talmud produced two men who deserve notice: Moses ben Nachman (Ramban, Nachmanides, 1263) of Gerona, who wrote a commentary, and who may be called the Spanish Tosafist, and Solomon ben Adret (1300) in Barcelona, the author of novellæ to many Talmudic treatises. In Italy this period produced three scholars whose fame reached beyond their own country: Nathan ben Yehiël (d. 1106) of Rome, the author of an excellent Talmudic dictionary; Isaiah ben Mali (1250) of Trani, who because of his rational and critical spirit is ranked even above the Tosafists of France and Germany; and Joseph Kolon (Maharik, d. 1800). In Germany the importance of the study of the Talmud was emphasized by the meeting of the rabbinical councils of Mayence in 1233 and 1245. Meir ben Baruch (d. 1293) of Rothenburg, called the German Tosafist, may justly be considered the head and front of the new school.

It was in the middle of the sixteenth century that the Jews began to wander into Poland, where the Talmud reached its culminating point as the supreme religious and legal authority. Being there largely excluded from all other employments, the Jews found their only consolation in the schoolhouse (Yeshibhah), where they studied and restudied their ancient lore. This study developed into a mere exercise of ingenuity, into pure casuistry similar to the casuistry of the Christian and Mohammedan scholastics. * This casuistry is called Pilpul (vpepper), and the new matter thus evolved Chiddūshim (novellæ). A fair description of the method employed will be found in the *Autobiography* of Solomon Maimon (Boston, 1888, chap. vi.). Its origin is ascribed to Jacob Pollak (d. 1541) and to Solomon Shechina (1557) of Lublin. In Poland and Russia it still exists; but with a wider and more secular education it is gradually making way for a critical and intelligent study of the Talmud.

The numerous compendia which were written for the purpose of making the decisions scattered up and down the Talmud available for the practical office of the rabbi and the rabbinical decisions deserve a special mention. Very shortly after the completion of the Talmud a digest was attempted by Hai Gaōn (969-1038), who tried to put the whole material into memorial verses. Simon of Kahira arranged all the decisions upon the basis of 613 commandments supposed to be contained in the Pentateuch. Similar compilations were made by other writers. More important were the *Halachōth* of Isaac ben Jacob (Alfasi), and more scientific the *Mishnêh Thorah* of Maimonides. This last codification by Maimon was, however, too scientific for actual use, and presupposed a too intimate acquaintance with the material. To remedy this other compendia were made by Moses ben Jacob of Coucy in his *Sēfer hammitzwōth*; Solomon ben Adret in his *Torath habbayyāth*, and others; and finally by Joseph Caro (1556) of Safed, in his *Shulchān Arīch*.

The rabbinical decisions are in the form of questions and answers (*She'elōth Utheshibhōth*). Such questions upon religious and juristic matters were sent to prominent Talmudic scholars all over Europe, Asia, and North Africa, but the authority of the teacher as such was not final. Apart from their intrinsic value, these decisions contain a large amount of material for the history of the social life of the Jews during the whole of the post-Talmudic period. They exist by the hundred thousands.

Among numerous works giving information on this subject, see Renan and Neubauer, *Rabbins Français in Histoire littéraire de la France*, vol. xxvii.; A. Geiger, *Nachgelassene Schriften* (Berlin, 1875, vol. ii.); M. Gûdemann, *Geschichte des Erziehungswesens und der Cultur der abendländischen Juden* (Vienna, 1873-84, 3 vols.); Joel Müller, *Briefe und Responsen der vorgerühmten Jüd. Lit. Abt. von 1886*; *Die Responsen der Spanischen Lehrer des jehudeischen Jahrhunderts* (Berlin, 1889); and those given in bibliography of article JEWISH LITERATURE (*q. v.*). RICHARD GOETHELI.

Rabbit [M. Eng. *rabet*; cf. dial. Fr. *rabotte*, Old Dutch *robbe*, and Gaelic *rabaid*, rabbit]: the English name for many species of the family LEPIDOTÆ (*q. v.*), but more especially applicable to *Lepus cuniculus*. This species is found generally distributed throughout Europe (except in its more northern portions), as well as the contiguous portions of Asia and Northern Africa, and is also naturalized in Australia, where it is a serious pest, and elsewhere. It lives in communities, burrows in the ground, and brings forth its young blind and naked. It is very prolific, beginning to breed at the age of about six months, and having several litters in the course of a year, and in each litter some four to eight young ones. In the U. S. the name rabbit is also generally given to all species, the best known of which is the common small rabbit of the Eastern and Middle States (*Lepus sylvaticus*); this species, as well as the other species of the family (*Lepus cuniculus* excepted), agrees with the hare in making forms, instead of burrowing, and in bringing forth its young provided with hair and able to see.

Revised by F. A. LUCAS.

Rabelais, râb'be-lâ', FRANÇOIS: author; b. at Chinon, Indre-et-Loire, France, toward the end of the fifteenth century (1495?). Being the youngest son he was destined for the Church. He studied first at the abbey of Seuilé, then at the monastery of La Baumette, near Angers. About 1509 he entered the Franciscan monastery at Fontenay-le-Comte. There he passed his novitiate and was made priest in 1519. His intellectual curiosity was enormous, and he devoted himself to reading and study, attaining to an almost encyclopædic knowledge of the science of that time, becoming well read in Latin, Greek, law, mathematics, and astronomy. His passion for learning was directly opposed to the spirit of his order, and his devotion to books and relations with scholars made his brother monks distrust him. His cell was searched, his books seized, and he himself sought safety in flight. The intervention of influential friends, especially of Geoffroy d'Estinac, Bishop of Maillezais, and Guillaume Budé, saved him from further consequences. Clement VII. authorized him, in 1524, to leave the Franciscan order for the Dominicans and enter the abbey of Maillezais; but he soon abandoned the monastic life, assuming with the consent of his superiors the garb of lay preacher, and began a kind of free, roving existence to which his great curiosity for knowing the world predisposed him, adding continually to his vast information. The story of this vagabondage is obscure. He took a course of medicine at Montpellier and was teaching there in 1530; from 1532 to 1534 he was at Lyons practicing medicine, editing the first of a series of almanacs, engaged in various works of scholarship, and beginning his great *Pantagruel*. In 1534 he went to Rome with Jean du Bellay, Bishop of Paris, who was there made cardinal, and returned with him to Paris in 1535. In 1539 he entered the abbey of Saint-Maur as canon, but with the privilege of freely practicing medicine. From 1540 to 1542 he was again in Italy with Guillaume du Bellay, as his physician, and wrote in Latin the history of his wars, now lost. In 1547 he was at Metz, in 1549 again in Rome with Cardinal du Bellay. In 1550 he was in Paris, and was made curate of Meudon, but surrendered this living, with that of Saint-Christophe-du-Jambert, previously given him, in 1552. D. probably in 1553. His main fame is due to his *Gargantua* and *Pantagruel*. The first *Gargantua* was but a new edition, with a few original additions by Rabelais, of an older popular romance. Its success provoked an original continuation,

Pantagruel. This too was very successful, and to bring the story of *Gargantua* to its level he rewrote it in 1535, and in this form it is now the first book of the complete work. In 1546 appeared with the royal privilege a third book of *Pantagruel*, generally considered the best; and in 1552 a fourth book appeared, also with the royal privilege, which did not prevent its being condemned by the Sorbonne. In 1562-64 a fifth book appeared, of which certainly not all, probably not much, is by Rabelais. The work recounts the marvelous lives and deeds of the giants Gargantua and Pantagruel; but it is the actual life of the time which it really pictures, with all its ferment of ideas, its struggle between mediævalism and the Renaissance, its mixture of fragments of the decomposing Middle Ages, and of elements of a new order. The spirit of these pictures is that of exuberant and jovial satire. They breathe a disrespect for the traditional authorities and conventional forms, and are especially keen against the ideas and practices of the Church. They are saturated with the sense of intense delight in life, the physical and sensuous existence of the human animal in all its manifold exhibitions, and it is rendered with such frankness and absence of reticence that throughout the work coarseness and obscenity are frequent and prodigious. Good recent editions are by Desmarests and Rathery (2 vols., Paris, 1857-58); Marty-Laveaux (4 vols., Paris, 1868-81); Jannet (2 vols., Paris, 1858-72). Cf. E. Gebhart, *Rabelais, la Renaissance et la Réforme* (Paris, 1877); P. Stapfer, *Rabelais* (Paris, 1889). The English translation by Sir Thomas Urquhart (1653), continued by Motteux (1693-94), and often reprinted, is a famous piece of translation. A. G. CANFIELD.

Rabener, raab'-ner, GOTTLIEB WILHELM: poet; b. at Wachau, near Leipzig, Germany, Sept. 17, 1714; studied law at Leipzig, and entered the civil service of Saxony; d. at Dresden, Mar. 22, 1771. He gained his reputation chiefly as a satirist, and, like his friend Gellert, he represents the perfection as well as the mediocrity of German literature previous to the classical era. Though his satires seem very tame they were widely read and admired by the middle class of his contemporaries. See P. Richter, *Rabener und Liskow* (1884). J. G.

Rabenhorst, GOTTLIEB LUDWIG: botanist; b. at Treuenbrietzen, Brandenburg, Prussia, Mar. 22, 1806; educated in Universities of Berlin and Jena, resided in Luckau and Dresden from 1831 to 1875, devoting himself after 1840 entirely to botanical studies. His most important publications are *Flora Lusatica* (1839-40); *Deutschlands Kryptogamen Flora* (1844-53); *Kryptogamen Flora von Sachsen* (1863-70); *Flora Europæa Algarum* (1864-68). He was editor of *Hedwigia* (1852-71); published exsiccata as follows: *Algen Sachsens* (1,000 species, 1848-61); *Hepaticæ Europææ* (with Gottsche, 660 species, 1856-78); *Bryotheca Europæa* (1,450 species, 1858-75); *Lichenes Europæi Exsiccati* (900 species, 1855-79); *Cladonia Europæa* (380 species, 1860-63); *Algae Europææ Exsiccata* (1,600 species, 1861-79); *Fungi Europæi Exsiccati* (2,600 species, 1861-79). D. at Meissen, Apr. 24, 1881. CHARLES E. BESSEY.

Rabies: an extremely fatal infectious disease of many animals. In man it is generally called HYDROPHOBIA (*q. v.*).

Rabshākeh [from the Assyrian *Rab-shākē*, chief of the officers]: a high officer in the Assyrian army, next in rank to the *tartan*, or field-marshal. At times he seems also to have been employed as interpreter and ambassador. It is he who carries on the negotiations with the officers of King Hezekiah of Judah (702 B. C.) before the walls of Jerusalem, during the campaign of Sennacherib. A similar officer is sent by Tiglath-Pileser II. on a mission to Tyre (734 B. C.). See Schrader, *Keilinschriften und das Alte Testament* (2d ed. Giessen, 1883, p. 319); Fried. Delitzsch, *The Hebrew Language* (London, 1883, p. 13); Thiele, *Babylonisch-Assyrische Geschichte* (Gotha, 1856, p. 497).

RICHARD GOTTHEIL.

Rabulas (or, more correctly, **Rabbula**): Bishop of Edessa and the predecessor of Ibas. He is said to have governed his diocese with great authority, and succeeded in suppressing the various heretical sects which arose before the Nestorian controversy. D. at Edessa, Aug. 8, 435. Of his writings, some hymns and letters, the rules he drew up for the monks, and a sermon he delivered in Constantinople are still extant. They were edited by Overbeck (*Ephraemi Syri et Rabulæ Edessini Opera*, Oxford, 1865), and translated into German by Beckell in the *Kempten Bibliothek* of Church Fathers (1874).

Racahout, räkä'-hōüt, or **Racahout des Arabes**: a starchy food prepared in Barbary from the acorns of *Quercus ilex* and *Q. ballota*, oaks of that region. It is flavored with herbs, and is sometimes prescribed for invalids. The racahout of confectioners is a compound of starch with chocolate, vanilla, etc., sold as a sweetmeat, or for making a beverage.

Racalmu'to: town of Sicily, province of Girgenti; on the left bank of an affluent of the Platani; about 15 miles N. E. of the town of Girgenti (see map of Italy, ref. 10-F). The neighboring country is very rich in grain, vines, olives, and fruits, and abounds in sulphur, saltpeter, and gypsum. Pop. 13,133.

Racan, räkä'kaän', HONORAT DE BUEIL, Marquis de: author; b. at La Roche Racan, Touraine, France, in 1589. In 1605 he became page at the court of Henry IV., and a few years later served a short time in the army, taking part in the siege of La Rochelle. He then withdrew to his estate and devoted himself to letters. D. in 1670. He stood under the influence of Malherbe, but was too indolent and negligent to reach his polish of language and style. His chief work is a pastoral drama, *Les Bergeries* (1618). He wrote also odes, sonnets, epigrams, and a paraphrase of the Psalms. He was one of the first members of the Academy. His *Œuvres complètes* were edited by de Latour (2 vols., Paris, 1857). A. G. CANFIELD.

Raconnigi, räkä-kō-nee'jée: town of Northern Italy, province of Cuneo; on the right bank of the Maira; about 19 miles by rail S. of Turin (see map of Italy, ref. 3-B). It is a walled town, and the three old castles of Migliabrana, of Carpanetto, and of Bonavalle are in its remote neighborhood, but it is now chiefly known for the royal castle and park in its immediate vicinity. This castle was originally a fortress, was converted into something like a villa by E. Filiberto in 1681, and has been improved by successive princes until it is one of the most sumptuous of the Italian royal palaces. Pop. 7,875.

Raccoon, **Racoon**, or more often **Coon** [from Amer. Ind. *arrathkune*, whence Fr. *raton*, raccoon (in form adapted to *raton*, augment. of *rat*, rat): the common name for a small carnivorous mammal, *Procyon lotor*, the best-known member of the family *Procyonide*, a group nearly related to the bears. The raccoon is about 2 feet long, without the tail; the body is stout, tail rather short and bushy; feet plantigrade, furnished with rather slender toes. The fore feet are well fitted for grasping, although none of the digits are opposable, and the animal climbs well. The general color is



The crab-eating raccoon.

gray, the tail is bushy with black and white rings, and there is a conspicuous black patch on either cheek, which includes the eye and is surmounted by a whitish mark. The raccoon dwells in hollow trees, and is nocturnal and omnivorous; though aquatic animals (fish, mollusks, and crawfish) form a large portion of its food. It is readily tamed, and is an amusing but mischievous pet, although like all carnivores subject to sudden outbreaks of temper. It has the peculiar habit of washing its food, whence the specific name of *lotor* (washer) and the German name, *Waschbär* (wash-bear). It is found throughout the greater part of the U. S., and a closely related species, *Procyon cancrivora*, the crab-eating raccoon or agonara, larger with shorter fur and more powerful dentition, is found in the northern parts of South America.

F. A. LUCAS.

Raccoon Nation: See IROQUOIAN INDIANS.

Race, Cape: See CAPE RACE.

Racemic Acid [*rac-ee* is from Lat. *rac-e-mus*, bunch of grapes or fruit], also called **Paratartaric Acid** and **Uvic Acid** (C₄H₆O₆); an acid formed with tartaric acid in grape-juice, and identical with it in composition, though differing from it in its action on polarized light and in some other characters. It was discovered by Kestner in wines of certain vintages. It may also be formed artificially. Racemic acid itself has no action on polarized light, but by certain treatment may be separated into two isomeric constituents, one of which is ordinary dextro-rotatory tartaric acid, and the other is levo-rotatory, the two being called *dextro-tartaric* and *levo-tartaric* acid. Pasteur found certain relations between the modifications of the crystals of the two acids and the action on polarized light, which have attracted much attention on account of a theory that has been proposed to account for them. See **Stereochemistry**.

Revised by IRA RIMSEN.

Rachel [from Heb. *Rāchēl*, liter., ewe]: a native of Northern Mesopotamia, younger daughter of Laban, favorite wife of Jacob, and mother of Joseph and Benjamin. Her tomb, about 4 miles from Jerusalem on the road to Bethlehem, though of modern construction, undoubtedly marks the site of her burial, described in Gen. xxxv. 19, 20.

Rachel, *raā'shel*, properly **ÉLISA RACHEL FÉLIX**: actress; b. at Mumpf, Switzerland, Feb. 28, 1820, daughter of a wandering Hebrew peddler. In Lyons, Paris, and other cities she, with her sister Sophia, afterward called Sarah, sang at the *cafés* and on the boulevards. Choron, teacher of singing at the Royal Institution, attracted by their voices, took them from the streets and gave them free instruction. In 1833 they were admitted to the Conservatoire, where Élisabeth developed more dramatic talent than musical. In 1837 she made an unsuccessful *début* at the Gymnase, but in 1838 astonished and captivated Paris by her performance, at the Théâtre Français, of Camille in *Les Horaces*. Her fame and fortune were made. The classic tragedies of Racine, Corneille, and Voltaire were revived; her intensity, originality, naturalness, the singular expressiveness of her face, the skill of her declamation, made a new era in dramatic art. She played, also, with great power Jeanne d'Arc, Marie Stuart, Adrienne Lecouvreur (the play by that name was written for her by Legouvé and Scribe), and other characters. In 1855, in company with her brother, Raphael Félix, and her sisters, Sarah, Lia, and Dinah, she went to the U. S., but after she had played in a few cities failing health compelled her to desist. She returned to France, and died at Cannet, near Cannes, Jan. 3, 1858. See Janin, *Rachel et la Tragédie* (1858), and the *Life* by Mrs. Kennard (1885). Rachel was slender, graceful, not beautiful, and had a pale complexion, expressive features, brilliant eyes, and singularly fascinating presence. —**RAPHAËL FÉLIX** became in 1868 director of the Théâtre Porte Saint-Martin; **SARAH** (d. 1877) was connected with the Gymnase, the Français, and the Odéon; **LIA**, devoted to high tragedy, distinguished herself most at the Porte Saint-Martin; **REBECCA** died in 1854, having been five years at the Comédie Française.

Revised by B. B. VALLENTINE.

Racine: city (settled in 1836, incorporated in 1848); capital of Racine co., Wis.; on Lake Michigan, at the mouth of Root river, and the Chicago, Milwaukee and St. Paul and the Northwestern railways; 25 miles S. by E. of Milwaukee, 62 miles N. of Chicago (for location, see map of Wisconsin, ref. 7-F). It has one of the best harbors on Lake Michigan, is connected with the principal lake ports by steamboat and propeller lines, and has considerable shipping of its own. The city is laid out regularly on a plateau 40 feet above the level of the lake and 690 feet above that of the sea, is lighted with gas and electricity, and has a new system of water-works, which provides an abundant supply of water from the lake. There are 3 national banks with combined capital of \$625,000, a State bank with capital of \$100,000, and 2 daily, 5 weekly, a semi-monthly, and 2 monthly periodicals. The educational institutions include Racine College (Protestant Episcopal, chartered in 1852), St. Catharine's Academy (Roman Catholic, opened in 1866), the McMurphy Home School (Protestant Episcopal, opened in 1877), and Racine Academy (non-sectarian), and the benevolent institutions, St. Luke's Hospital and the Taylor Orphan Asylum. There are four libraries, High School, Racine College, Y. M. C. A., and McMurphy's Home School, which contain over 14,000 volumes. The census returns of 1890 showed that 190 manufacturing establishments reported. These had a combined capital of \$11,533,207, employed 4,872 persons, paid \$2,418,498 for wages and \$4,340,-

308 for materials, and had products valued at \$8,462,359. The principal industries were the manufacture of agricultural implements, which had 11 establishments, a capital of \$5,573,207, and products valued at \$1,979,613; of carriages and wagons, which had 5 establishments, a capital of \$2,347,932, and products valued at \$1,902,536; and of leather, trunks and valises, and malt liquors. Pop. (1880) 16,031; (1890) 21,014; (1895) 24,889.

Racine, *RAH-see*, **JEAN BAPTISTE**: b. at La Ferté-Milon, Aisne, France, Dec. 22, 1639. He studied first at the College of Beauvais, then at Port-Royal, where he underwent the influence of its severe moral and religious ideas, and under such masters as Nicole, Lancelot, and Hamon became an eager and proficient student of the classic literatures, especially that of Greece; finally at the Collège d'Harcourt, at Paris, where he was fascinated by the gayety and elegance of social life. He remained at Paris after his studies were finished, mixing with men of letters and giving himself freely to the pleasures and dissipation of the capital. His first literary venture, *Les Nymphes de la Seine*, an ode on the marriage of Louis XIV. (1660), brought him some praise and a royal gift of 100 louis. His habits gave concern to his family, and he was sent to an uncle, vicar at Uzès, in Languedoc, to study theology and qualify himself to receive a benefice. The efforts of his uncle to secure a benefice for him met with repeated failure, and he lost patience and in 1662 was again in Paris, where he offended his friends of Port-Royal still further by the manner of his life, and yielded fully to his inclinations for the theater, which they were then condemning. In his first tragedies, *La Thèbaïde* (1664) and *Alexandre* (1665), his original genius is less conspicuous than the influence of Rotrou, Corneille, and Quinault. In his next play, *Andromaque* (1667), he achieved a new and original type of tragedy, which finds the constant motive of conduct in the passion of love taken at a moment of crisis, and seeks the dramatic interest entirely in the conduct of its characters under the play of this motive. This type is the perfection of French classic tragedy, and reappears in the six plays that followed: *Britannicus* (1669); *Bérénice* (1670); *Bajazet* (1672); *Mithridate* (1673); *Iphigénie* (1674); and *Phèdre* (1677). In all he follows the working of violent passion, especially in his heroines, with great psychological penetration. To these plays, to which an excellent comedy, *Les Plaideurs* (1668), must be added, he gave a rare perfection of form by an exquisite polish of language and an unequalled harmony of versification. The intrigues of jealous rivals, culminating in the apparent failure of *Phèdre*, powerfully seconded by a recoil in his moral attitude toward the ideas of Port-Royal, led Racine to abandon the theater. This recoil amounted to a conversion, and he even thought of becoming a Carthusian monk. In the same year he was married, and, with Boileau, was appointed royal historiographer. At the prayer of Madame de Maintenon he wrote for her schoolgirls of St.-Cyr two biblical tragedies with chorus, *Esther* (1688) and the masterpiece *Athalie* (1691), which keep the qualities of his earlier works, except that passions of another order are substituted for that of love. After this he wrote only letters, epigrams, some religious verse, and a short *Histoire de Port-Royal*. D. Apr. 21, 1699. He had entered the Academy in 1673. The best edition of his works is that of P. Mesnard in the *Collection des Grands Écrivains de la France* (8 vols. and 2 albums, Paris, 1865-73). See P. Robert, *La Poétique de Racine* (Paris, 1890); P. Stapfer, *Racine et Victor Hugo* (Paris, 1887); F. Brunetière, *Les Époques du théâtre français* (Paris, 1892).

A. G. CANFIELD.

Racine, **LOUIS**: author; son of Jean Baptiste Racine; b. in Paris, Nov. 2, 1692. His education was directed by Boileau and Rollin, and he grew up with the religious sentiments of Port-Royal. He wrote memoirs on his father's life, and religious and didactic poems which possess grace and elegance, but lack spirit and interest. The most important are *La Grâce* (1720), in four cantos, and *La Religion* (1742), in six cantos. D. in Paris, Jan. 29, 1763. A. G. C.

Racing: See HORSE-RACING.

Rack: a kind of liquor. See **ARRACK**.

Rack: a certain gait of a horse. See **GAITS**.

Rack [M. Eng. *racke*; cf. Dutch *rek*, *rek-bank*; Germ. *reck*, *reck-bank*, rack; *recken*, stretch + *bank*, bench]: an engine of judicial torture formerly much employed in Europe to compel accused persons to plead guilty and to ob-

tain satisfactory testimony from recusant witnesses. It was introduced into England in 1447 by the Duke of Exeter as constable of the Tower of London. In 1628 it was pronounced illegal by the courts. The victim was stretched upon a platform of wood; cords were attached to his limbs, and then strained by pulleys until the sufferer yielded or had his joints dislocated.

Rackarock : See EXPLOSIVES (*The Chlorates*).

Rackets, or **Raquets** [from O. Fr. *rachette* > Fr. *raquette*, from Span. *raqueta*, racket, battledore, palm of the hand (tennis being originally played with the palm of the hand), perhaps from Arab. *rāḥat*, palm of the hand]: a game originally similar to tennis, now played with ball and racket-bat in a closed court, about 60 feet long and 30 wide. The front wall has two lines marked on it, the first (play-line) 2 feet from the floor and the second (service-line) 8 feet. The half of the floor-space farthest from the front wall is marked off into two courts by a line midway between the side walls. One player stands in each court. The first serves the ball so that it may rebound from the front wall above the service-line and strike in the opposite court, the second returns it above the play-line, and so on. The server is allowed one "fault"; i. e. if on his first attempt the ball strikes between the two lines, or rebounds to a part of the floor not his opponent's court, and the second player declines to return it, he may serve again. If the second player fails to return the ball properly the first scores one; if the server fails, his "hand is out" and his opponent serves. The one who first scores fifteen wins.

Radbertus, PASCHASIUS: one of the most prominent ecclesiastical writers of the Carolingian age; b. toward the close of the eighth century; entered the monastery of Corbie, in Picardy, in 814. The favorite pupil of Abbot Adalbard, a relative of Charlemagne, Radbertus became teacher in the cloistral school, and in 844 he was elected abbot, but, being unable to maintain discipline in the monastery, he resigned in 851. A complete and critical edition of his extant works was published by Sirmond (Paris, 1618) and reprinted in Migne, *Patrol. Latin.* By far the most interesting is his *De Corpore et Sanguine Domini*, in which he exposed the doctrine of the Roman Catholic Church on the Eucharist. This book became famous because of the controversies it gave rise to in the following century, when Hrabanus Maurus, Ratramnus, Scotus Erigena, and others opposed certain of its tenets, but their opposition was based on a misunderstanding of the text. See Wetzer and Welte, *Kirchenlexikon*, and Ebert, *Geschichte der Literatur des Mittelalters*, vol. ii., p. 230. The best text of this little work is in Martène and Durand, *Amplissima Collectio* (vol. ix., Paris, 1723).

Revised by J. J. KEANE.

Radeliffe, ANN (*Ward*): novelist; b. in London, England, July 9, 1764; married in 1786 William Radeliffe, subsequently editor of *The English Chronicle*; published several romances notable for their wild and fantastic plots, of which *The Mysteries of Udolpho* (1794) is the only one remembered. Others once popular were *The Sicilian Romance* (1790), *The Romance of the Forest* (1791), and *The Italian* (1797). D. in London, Feb. 7, 1823. Her writings had considerable influence upon the literature of the time, and even Byron was among her imitators. A *Memoir* by Talfourd appeared in 1826, introducing the posthumous romance *Gaston de Blondville*, and a collection of her poems was issued in 1834.

Revised by H. A. BEERS.

Radeliffe, CHARLES BLAND, M. D., F. R. C. P.: physician; b. at Brigg, Lincolnshire, England, June 2, 1822; M. B. London University, in 1845 and M. D. in 1851; became physician to the Westminster Hospital in 1857 and to the National Hospital for the Paralyzed and Epileptic in 1863; was lecturer on botany in the medical school of Westminster Hospital 1850-54, and lectured on materia medica 1854-60; was Gulstonian lecturer in 1860 and Croonian lecturer in 1873 of the Royal College of Physicians. He was joint editor of Rankin's *Abstract of the Medical Sciences* from 1852-64. Among his published works are *Proteus*, or *the Law of Nature* (London, 1850); *The Philosophy of Vital Motion* (London, 1851); *Epilepsy and other Affections of the Nervous System* (London, 1854); *Dynamics of Nerve and Muscle* (London, 1871); and articles in *Reynolds's System of Medicine*. D. June 18, 1889. S. T. ARMSTRONG.

Radeliffe College : See HARVARD UNIVERSITY.

Radetzky, řáa-det'skěe, JOHANN JOSEPH WENZEL ANTON FRANZ KARL, Count: soldier; b. at Trzebnitz, Bohemia,

Nov. 2, 1766; entered the Austrian army in 1784; fought with distinction at Aspern and Wagram in 1809, and at Kulm and Leipzig in 1815; was made commander-in-chief of the Austrian troops in Italy in 1831, and field-marshal in 1836; put down the revolution in Milan and Venice in 1848, though then over eighty years old; won the victories at Custoza and Novara over the Piedmontese, and governed the Austrian possessions in Italy to Feb. 28, 1857, when he resigned. D. at Milan, Jan. 5, 1858. See Radetzky's *Denkwürdigkeiten in Mittheilungen des kaiserlichen Kriegsraths* (1887), and Kunz, *Die Feldzüge des Feldmarschalls Radetzky in Oberitalien* (1890).

Radiata [from Lat. *radia'tus*, having spokes or rays, perf. partic. of *radia're*, furnish with spokes or rays, deriv. of *ra'dius*, spoke]: one of the four great groups or branches into which Cuvier divided the animal kingdom, and which included those forms in which the parts radiated from a central axis like the spokes from the hub of a wheel. It included, as limited by him, the Coelenterates, Ctenophores, Gephyrea, Polyzoa, Protozoa, and Parasitic Worms of later zoologists. It was soon found that some of these forms had other affinities, and the clear definition by Leuckart of the *Coelenterata* and *Echinodermata* gave the death-blow to the ill-assorted group, which disappeared from European works about the middle of the nineteenth century, but lingered in the U. S. for twenty years more. J. S. KINGSLEY.

Radiation : See HEAT and CLIMATE.

Radical Axis : a line related to two circles and determined by the condition that the tangents from any point upon it to the circles are equal in length. If the circles intersect it is their common chord. S. N.

Radicals [from Lat. *radica'lis*, deriv. of *ra'dix*, root, origin, foundation], in chemistry sometimes called **Radices** : a term applied to a group of elements that can pass unchanged through a series of compounds by chemical reactions. Thus in the salts formed by ammonia with acids the presence of the hypothetical radical *ammonium*, NH₄, is assumed. So, too, in all cyanogen compounds the group CN is assumed. Among the compounds of carbon such groups are very common, so much so that Liebig proposed the name chemistry of the compound radicals for organic chemistry. Thus ALCOHOL (*q. v.*) is a compound of the group or radical ethyl, C₂H₅, with the group or radical hydroxyl, OH. Or alcohol is the hydrate of this radical; ether is the oxide, (C₂H₅)₂O; chloroethane the chloride, C₂H₅Cl, etc. Some of these organic radicals are called *residues* or *rests*. Thus ethyl, C₂H₅, is the *residue* or *rest* of ethane, C₂H₆. It is that which is left after one atom of hydrogen has been removed. The theory of radicals played an extremely important part in the development of the science of chemistry. I. R.

Radiograph : See X-RAYS.

Radiola'ria [Mod. Lat., from Lat. *radius*, a ray]: a subclass of Rhizopodous Protozoa which occur in the sea, at times extremely abundant. They have the body divided into two portions, inner and outer, by a perforated membrane. In the inner portion is the nucleus, while the outer contains no nuclei, but gives rise to numerous radiating filaments of protoplasm (*pseudopodia*). There is in addition, frequently, a skeleton, either horny or siliceous, and often of extreme beauty. The central protoplasm alone is concerned in reproduction, and in it are found flagellate spores which in turn develop into *Actinophrys*-like embryos. (See HELIOZOA.) Haeckel, in his great monograph of the Radiolaria collected by the Challenger expedition, recognizes 739 genera and 4,318 species of these pelagic organisms. Many forms are interesting from the fact that they contain "yellow cells" which are known to be unicellular algae living symbiotically with the Radiolarians. See SYMBIOSIS. J. S. KINGSLEY.

Radiom'eter [from Lat. *ra'dius*, ray, *radia're*, radiate + Gr. *μέτρον*, measure]: in physics, any instrument for the detection and measurement of radiant heat. One of the earliest forms was the differential thermometer of Leslie, which consisted of two glass bulbs, the necks of which were joined. The air contained within these bulbs is separated by means of a column of liquid. In order to prevent liquid from collecting in the bulbs the tube which joins the two is generally bent twice at right angles, and the instrument is mounted so that the bulbs are uppermost. (See Fig. 1.) One of these bulbs being subjected to the radiant heat while the other was protected, the expansion of the atmosphere in the heated bulb served to drive the liquid column along the tube,

bringing it to rest in some position other than that which the liquid would occupy when the temperatures of the two bulbs were the same. By means of this simple device Leslie discovered many of the important facts concerning radiant energy.

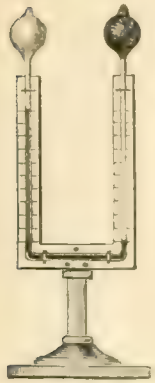


Fig. 1.

The Thermopile (*q. v.*) which in the hands of Melloni yielded such remarkable results, is also to be classified as a radiometer. It is, indeed, with the possible exception of the Bolometer (*q. v.*), the most important instrument for the study of radiation. Whether the thermopile, which enables us to measure radiant energy by means of the electromotive force which is generated by the difference of temperature between its junctions, or the bolometer, an instrument which indicates temperature through the variation in the electrical resistance of a wire or strip of metal which is exposed to the rays, the intensity of which it is desired to measure, is the more sensitive is as yet an open question. The

bolometer has, however, one very great advantage over the thermopile in that its mass may be reduced to an exceedingly small quantity. Possessing small mass, it is susceptible to very rapid fluctuations of temperature, and is capable of following sudden changes much more accurately than can be done by means of the ordinary form of thermopile.

Many other forms of radiometer have been described, for some of which a degree of delicacy surpassing that attainable with either of the instruments just mentioned is claimed. The best known of these are the thermo-galvanometer of d'Arsonval, the tasimeter of Edison, and the selenium cell. The thermo-galvanometer, which, under the name of the radio-micrometer, has been developed and utilized

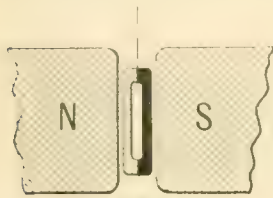


Fig. 2.

by Boys, consists of a very small light thermo-couple of bismuth and antimony closed upon itself so as to form a complete circuit. (See Fig. 2.) The same is suspended in a strong magnetic field by means of a quartz-fiber. When one of the bismuth-antimony junctions is exposed to radiation differences of potential arise, and

since the circuit is of low resistance a considerable current flows. In consequence of this current the suspended thermo-element tends to turn in the field, and the movement is noted by means of a very small light mirror and a telescope and scale.

The tasimeter depends for its action upon the change of contact resistance of carbon with change of pressure. A vulcanite strip is so placed that one end of it rests upon a microphone button. Vulcanite possesses a large coefficient of expansion. When subjected to radiation its elongation is sufficient to materially compress the carbon button, reducing the resistance of the same and thereby increasing the flow of the current through a galvanometer in circuit with the latter. Neither of these forms has been found to be so serviceable as the bolometer or the thermopile, although an almost incredible sensitiveness has been claimed for both.

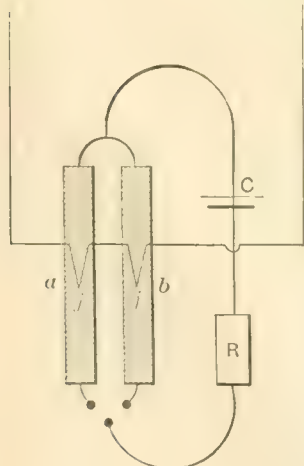


Fig. 3.

A method for the measurement of radiant heat was described by Knut Ångström in 1893 (see *Physical Review*, vol. i., p.

365), which, although not of exceeding sensitiveness, affords a very accurate means of comparing radiant intensities. Ångström's instrument takes advantage of the principles of

both bolometer and thermopile. It consists of two similar strips of metal (*a* and *b*, Fig. 3), one of which is exposed to radiation, while the other is shielded. These strips are in contact with the opposite junctions of a thermo-element, *j*, which is placed in circuit with a sensitive galvanometer. By means of the heating action of an electric current generated in the battery, *C*, the temperature of the protected strip is brought into equilibrium with that of the exposed strip, a condition which is indicated by the reduction of the galvanometer deflection to zero.

A very sensitive radiometer is that which is based upon the remarkable changes in the conductivity of selenium when this substance is exposed to light. The selenium radiometer has been found a very unsatisfactory instrument, however, on account of the uncertainty of its action. Its sensitiveness to radiation depends upon instability of molecular structure. Like all other changes which consist in the breaking down of molecular arrangement, this is of great irregularity, and beyond accurate control.

The instrument with which the name radiometer is most generally connected is, in the strict sense of the word, not a radiometer at all. The apparatus in question is Crookes's radiometer (Fig. 4). It consists of a set of four mica-veins mounted at the ends of arms and revolving upon a needle-point. The arrangement is inclosed in a glass bulb from which the air has been exhausted by means of the mercury-pump. Crookes found that when the atmosphere reached a certain degree of attenuation these mica-veins began to revolve under the action of light. The phenomenon attracted great attention and many investigations concerning it were made. The result of these studies has been to show that the instrument is entirely unfitted for use as a measurer of radiant energy. The phenomena which the instrument presents are in themselves, however, of great interest.

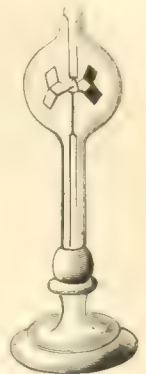


Fig. 4.

For a description of Crookes's radiometer, see Crookes, *Quarterly Journal of Science* (1876); Schuster, *Proc. Royal Society* (1876); Stoney, *Phil. Mag.* (1876). E. L. NICHOLS.

Radish [from O. Fr. *radis*, radish, Lat. *ra'dix*, root, whence O. H. Germ. *rātih* (> Mod. Germ. *rettich*) and O. Eng. *rēdic*, radish]: the *Raphanus sativus*, a cruciferous plant, a native of Asia, cultivated for its root, and used as a table relish. The root is stimulant, diuretic, and antiscorbutic. The seeds of some varieties yield an oil almost identical with rape and colza oil.

Radius [Lat. *ra'dius*, spoke, ray]: the outer bone of the forearm, on the same side with the thumb. It is parallel with the ulna, which is larger than the radius, and enters much more closely into the formation of the elbow-joint, while the radius forms the joint with wrist-bones. Thus the hand of man acquires its susceptibility of rotation.

Radnorshire: a county of South Wales, adjoining two English counties—Shropshire on the N. and Hereford on the E. Area, 432 sq. miles. The surface is irregular and mountainous, reaching an altitude of 2,163 feet in Radnor Forest; more than half of the soil is bog and moorland. Of the latter, however, the larger part has been reclaimed, and is under cultivation. The valleys afford rich pasturage for large herds of cattle. Barley, oats, and potatoes are grown; cattle and sheep are reared. Principal towns, Presteign and New Radnor. Radnorshire returns one member to Parliament. Pop. (1891) 21,791.

Radowitz, *raa'dō-wits*, JOSEPH MARIA, von: soldier and statesman; b. at Blankenburg, Brunswick, Germany, Feb. 6, 1797; received his military education at Paris and Cassel; fought in the campaigns of 1813 and 1815; taught mathematics at the military school of Cassel; removed in 1823 to Prussia, and held high military and diplomatic positions, and for a short time in 1850 was Minister of Foreign Affairs. He was a member of the Frankfort Parliament in 1848, and on its dissolution was the chief agent in bringing about the union of the three kingdoms, an attempt to found a united German state under the leadership of Prussia. D. in Berlin, Dec. 25, 1853. His *Gespräche aus der Zeit der Frankfurter Versammlung* (Stuttgart, i., 1846; ii., 1851) and *Gesammelte Schriften* (5 vols., Berlin, 1852-53) derive their principal interest from the friendship and community of ideas between the author and Frederick William IV.

Rădulescu, IOAN ELIADE: See HÉLIADÉ, JEAN.

Rae, JOHN, M. D., LL. D.: Arctic explorer; b. in the Orkney islands (1813); studied medicine at Edinburgh; entered the service of the Hudson Bay Company as a surgeon 1833; for ten years lived at Moose Factory; made a boat journey (1846) along Hudson Bay to Repulse Bay; surveyed (1847) 700 miles of new coast-line, connecting surveys of Ross in Boothia with those of Parry at Fury and Hecla Strait. The only book he published was an account of this expedition, *Narrative of an Expedition to the Shores of the Arctic Sea* (1850). He took part in the expedition (1848) down the Mackenzie river in search of Sir John Franklin, and explored the whole coast of the Arctic Sea between the Mackenzie and the Coppermine rivers. He explored and mapped 700 miles of coast (1851), the south shores of Wollaston Land and Victoria Land. He proved the insular character of King William Land (1853), elicited from the Eskimos the first information obtained of Sir John Franklin's fate, and secured many relics of that party. For this discovery he received the admiralty grant of \$50,000. He was a gold-medalist of the Royal Geographical Society, and attributed his success in Arctic travel to his ability to live in Eskimo fashion. D. in England, July, 1893. Revised by C. C. ADAMS.

Raff, JOSEPH JOACHIM: composer; b. at Lachen, Switzerland, May 27, 1822; owing to poverty was able to study music only at intervals; supported himself by teaching till he was twenty-four years of age, and then on the advice of Mendelssohn joined his class; but the death of Mendelssohn occurring soon after altered his plans. He had many struggles, and encountered much opposition, but force of character, persistency, and real musical talent enabled him to overcome them and to gain an eminent place in the ranks of composers. He was director of the conservatory at Frankfort-on-the-Main from 1877 till his death June 25, 1882. His works include eleven symphonies, including *Im Walde*, one of the best of modern works, an oratorio, *Das Weltgericht*, several operas and cantatas, very many sonatas for piano, for violin, and other instruments, much chamber music, songs, and many other pieces. His numbered works run up to Opus 216. He was a vigorous writer as well as composer, and contributed many articles to the German papers advocating the Wagner school. D. E. HERVEY.

Raffles, Sir THOMAS STAMFORD: administrator and ethnologist; b. at sea off Point Morant, Jamaica, July 5, 1781; son of a sea-captain in the West India trade; obtained at the age of fifteen an assistant-clerkship in the East India House. In 1805 he was appointed assistant secretary to the government of Pulo Penang (Prince of Wales island), and in 1807 he was made principal secretary. He soon became a leading authority upon the ethnology of the Indian Archipelago. He was secretary to the Governor-General of India, Lord Minto, during the expedition against Java 1811; was made lieutenant-governor of the newly acquired colony, and administered that important island and its dependencies with great judgment for five years. Returning to England on account of ill health, he was knighted in 1817, and published his *History of Java* (2 vols., 1817). Java having been restored to the Dutch, Raffles was in 1818 made lieutenant-governor of the settlement at Fort Marlborough, Bencoolen, on the coast of Sumatra. While in Sumatra he emancipated the slaves, formed the new British settlement of Singapore (1819), endowed there a college for the study of Malay and Chinese literature, and published *Malayan Miscellanies* (2 vols., Bencoolen, 1820-22). He returned to England in 1824, and founded the Zoological Society of London, of which he was the first president. D. in London, July 5, 1826. See the *Memoir* by his widow (1830).

Rafflesia [Mod. Lat., named for its discoverer, Sir T. Stamford Raffles (1781-1826)]: a genus of plants of the family *Rafflesiaceae*, natives of Sumatra and Java, and parasitic upon stems and roots of *Cissus*. They are greatly degraded, and are nearly stemless, rootless, and leafless, being little more than mere flowers, with a few scales for leaves; the seeds are rudimentary, and the embryo small and few-celled. The plant has a fungus-like, fleshy appearance, and a strong odor of carrion. *R. arnoldi* is considered the largest flower in the world. It is 3 feet in diameter, and has been known to weigh 15 lb. It is worshipped by the Javanese. *R. patma* has strong styptic power. *R. horsfieldii* is but 3 inches across. Revised by CHARLES E. BESSEY.

Rafinesque, CONSTANTINE SAMUEL: naturalist; b. of French-German parents at Galata, Constantinople, in 1784.

His mother's name being Schmaltz, he took for a time the name Rafinesque-Schmaltz. He was sent to the U. S. in 1802, landing at Philadelphia; he soon developed a fondness for natural history; made many excursions for collecting botanical specimens; went to Leghorn 1805, and thence to Sicily, where he resided ten years, and published (in Italian) several scientific works; sailed for New York 1815; lost by shipwreck on the coast of Long Island all his effects, including valuable books, manuscripts, and collections; was for some years Professor of Botany in Transylvania University, Lexington, Ky.; traveled and lectured in other States; settled finally at Philadelphia; wrote many monographs in various branches of natural history, especially *Ichthyologia Ohioensis* (Lexington, 1820); published *Annals of Kentucky* (1824), *The American Florist* (1832), *Atlantic Journal and Friend of Knowledge* (8 numbers, 1832-33), *The American Nations* (2 vols., 1836), *Medical Flora of the United States* (2 vols., 1828-30), *A Life of Travel and Researches* (1836), and other works. D. in Philadelphia, Sept. 18, 1842. The *Writings of S. C. Rafinesque on Recent and Fossil Conchology* was edited by W. G. Binney and G. W. Tryon, Jr. (Philadelphia, 1864). See *An Eccentric Naturalist in Science Sketches* by Jordan. Rafinesque was a man of large learning, quick insight, and great energy, but all his work is vitiated by an insatiate desire for novelties and a lack of recognition of the value of exact statement.

Revised by D. S. JORDAN.

Rafn, CARL CHRISTIAN: scholar; b. at Brahesborg, island of Fünen, Denmark, Jan. 16, 1795; studied at the University of Copenhagen; was appointed librarian of the university in 1821; and founded in 1825 the Society of Northern Antiquities. D. in Copenhagen, Oct. 20, 1864. Besides a number of critical editions, like *Krakkumál* (1826), *Fornaldar Sögur* (3 vols., 1829), *Färeyinga Saga* (1832), and parts of *Fornmanna Sögur* (12 vols., 1828, seq.), and minor essays, he wrote *Antiquitates Americane* (1837), *Grönlands historiske Mindesmærker* (3 vols., 1838-45), and *Antiquités russes et orientales* (3 vols., 1850-54). In his *Antiquitates Americane* he gave the first popular account of the Norse discovery of America.

Revised by D. K. DODGE.

Raglan, FITZROY JAMES HENRY SOMERSET, BARON: son of the fifth Duke of Beaufort; soldier; b. in England, Sept. 30, 1788; educated at Westminster School; entered the army 1804; accompanied the Duke of Wellington in the Spanish Peninsula as a member of his staff, rising to the position of aide-de-camp and military secretary 1807; was wounded at Busaco 1810; distinguished himself at Badajoz 1812; was wounded in the battle of Waterloo; was knighted and made colonel; was secretary of embassy at Paris 1816-19; entered Parliament as a Conservative 1818 and 1826; was appointed master-general of the ordnance Sept., 1852; was made Baron Raglan Oct., 1852; commanded the British expedition to the Crimea, with the rank of general, Mar., 1854; defeated the Russians at the battle of the Alma Sept. 20; fought the battles of Balaklava, Oct. 25, and Inkermann, Nov. 5, and was made field-marshal Nov., 1854. The criticisms which were made on his command, on account of the sufferings of the troops, and the fearful repulse he suffered on June 18 weighed upon his mind, and he died in the camp before Sebastopol on June 28, 1855. His military papers formed a part of the material for Kinglake's *History of the Crimean War*.

Ragnarok [Icel. *ragna rökr* (translated into Germ. as *götterdämmerung*), the twilight of the gods]: in Scandinavian mythology, the final dissolution of the cosmic world, when gods and giants and men destroy each other in an internecine feud. Depravity and strife in the world proclaim the approach of the great event, which is preceded by a fall of snow from the four corners of the world, cold, piercing winds, tempestuous weather, the absence of summer, and convulsions of nature. Kindred slay each other for mere gain. The Fenris-wolf is freed from his chains, and the Midgard-serpent gains land. The heavens are rent in twain, and the sons of Muspel come riding through the opening in brilliant array to the battle-field called Vigrid. Thither repair also the Fenris-wolf, the Midgard-serpent, and all the forces of evil. The gods, who assemble without delay, arm themselves with speed, and sally forth to the battle-field, led by Odin. Odin is swallowed by the Fenris-wolf, and the wolf is killed by Vidar. Thor kills the serpent, but falls suffocated by its venom. Finally the earth, consumed by fire, sinks beneath the sea. After Ragnarok there is a new green earth, and there comes a new golden age in

which all will be good and happy. Then comes the Mighty One, he who is from everlasting to everlasting, and establishes peace and good will among gods and men. See SCANDINAVIAN MYTHOLOGY. RASMUS B. ANDERSON.

Raguet, ra-gā', CONDY, LL. D.: merchant and lawyer; b. in Philadelphia, Pa., Jan. 28, 1784; was educated at the University of Pennsylvania, and studied law; engaged in commercial pursuits; went to St. Domingo as supercargo of a vessel 1804; returned there 1805; published two small books giving an account of the state of that island and a history of the massacre of the planters; went into business on his own account 1806; accumulated a fortune; took an active part in several useful corporations and mercantile associations, and in taking measures for the defense of the city against an expected attack by a British fleet 1812; served in both branches of the Legislature; became in 1822 consul at Rio de Janeiro, Brazil; negotiated a commercial treaty with that country, to which, in 1825, he was appointed the first *chargé d'affaires*; returned in 1827, and wrote much in periodicals, especially in *The Portfolio*, in favor of free trade. D. in Philadelphia, Mar. 22, 1842. Author of *Principles of Free Trade* (1835); *On Currency and Banking* (1839); and other works; editor of *Free Trade Advocate* (2 vols., 1829); *Examiner* (2 vols., 1834-35); and *Financial Register* (2 vols., 1837-39).

Ragusa: town of Austria, in Dalmatia, on the Adriatic; picturesquely built in terraces along the side of Monte Sergio (see map of Austria-Hungary, ref. 10-F). It was the capital of a mediæval aristocratic republic, and during centuries the chief city on the eastern Adriatic. It rivaled Venice in activity and wealth and Florence in literary life, being commonly called the Slavic Venice. Its land-trade also was enormous; frequent caravans brought raw materials for export and manufacture, and took manufactured goods away. In 1364 it made a treaty of alliance with Murad I., the first concluded between a Christian state and the Ottomans; in 1421 it obtained from the Holy See special privileges or a sort of monopoly of trade with the Mussulmans; after 1453 it paid a small tribute to the Ottomans, but was always favored and protected by them; was twice almost destroyed by earthquake—in 1634 and 1667, when 5,000 persons perished. Napoleon suppressed the republic in 1808. In 1815 it was ceded to Austria; it had then 44,000 inhabitants. The doges' palace, library, and hospital are fine buildings. Grass grows in the principal streets, and the city is in full decay. Of its two harbors, Porto Cassonne is used only by fishing-boats, but Gravosa, 2 miles N., is the finest port on the Dalmatian coast, accommodating the largest men-of-war. Pop. (1891) 7,143. Seven miles S. are the ruins of Ragusa Vecchia, the ancient Epidaurus, destroyed by the Slavs in the seventh century. E. A. GROSVENOR.

Ragusa: town of Southeastern Sicily; in the province of Syracuse (see map of Italy, ref. 10-F). It is of very ancient origin; it sided with Syracuse against the Romans, and was by them made a colony. In 844 it was sacked by the Saracens. It has suffered greatly from earthquakes, being almost destroyed in 1693. In the city and immediate vicinity are remains of mediæval buildings, ancient tombs, and cisterns and caves in the rocks. Count Cabrero (d. 1423), who claimed the Sicilian crown, is buried here. The city consists of two distinct parts, each having its own municipal organization—Ragusa Superiore, pop. 24,183, and Ragusa Inferiore, pop. 6,260. E. A. GROSVENOR.

Rahbek, KNUD LYNE: poet and critic; b. in Copenhagen, Denmark, 1760. After studying theology and law he devoted himself to literature. In 1785 he published a volume of *Prosaiske Forsøg* (Prose Attempts). In 1788 he delivered the first course of lectures on æsthetics ever given in Denmark, and in 1790 was appointed to the new chair of æsthetics at the University of Copenhagen. Besides *Minerva*, he edited alone *Den Danske Tilskuer* (The Danish Spectator, 1791-1808), the more general character of whose articles gave it an even greater influence than the earlier periodical. In Aug., 1798, he married Karen Margrete Heger, famous in Danish social and literary history as Kamma Rahbek. Besides editing a vast number of works of earlier and contemporary writers, among the former Holberg, he published *Dansk Læsebog* (Danish Reader, 1799), the first of its kind; *Ludwig Holberg som Lystspilddigter* (Ludwig Holberg as Writer of Comedies, 1815-17); and many dramas and occasional poems, several of the latter of which still retain their popularity. Though only a second-rate writer and thinker, Rahbek exercised a greater influence upon his time

than many of his more gifted contemporaries. For this he was in no slight degree indebted to his wife, whose wit and culture attracted to their home, Bakkehus, all that was best in the intellectual life of the capital. D. Apr. 1, 1830. D. K. DODGE.

Rahway: city; Union co., N. J.; on the Rahway river, and the Penn. Railroad; 19 miles S. W. of New York (for location, see map of New Jersey, ref. 3-D). Direct water-communication with New York is afforded by the river, which is here navigable for vessels of light draught. The city is tastefully laid out, and contains the residences of many people doing business in New York. There are 10 churches, a public high school, 4 grammar schools, a public library with over 10,000 volumes, a Y. M. C. A. building containing baths, gymnasium, bowling alley, and reading, social, and recreation rooms, a State bank with capital of \$50,000, a savings-bank, and 2 weekly newspapers. The industries comprise a large printing and bookbinding house, printing-press manufactory, railway-signal works, woolen-mills, and carriage, hub, and spoke factories. Pop. (1880) 6,455; (1890) 7,105; (1895) 7,945.

Rai'æ [Mod. Lat., from Lat. *ra'ja*, ray, skate]: according to some authors an order, and to others a sub-order, of the class of elasmobranchiates, including the rays, torpedoes, and related types. The pectoral fins are much developed, produced from the anterior margins forward, and are connected with the rostral cartilages, thereby constituting an integral part of the form, and are not abruptly differentiated from the body, as in the sharks and all true fishes; the branchial openings are in two converging rows of five each on the inferior surface of the body; spiracles are well developed behind the eyes. In other respects the order essentially agrees with the *Squali*, and the two form a common super-order or sub-class—the *Plagiostomi*. The form varies considerably in the several members of the order; on the one hand, the sawfishes have an outline much like that of the sharks, and with a long caudal portion; and on the other hand, the eagle-rays and certain sting-rays have a disk extremely wide—much wider than long—and the caudal portion is reduced to a whip-like appendage. Revised by F. A. LUCAS.

Rai'idæ: a family of the order *Raie*, including the common skates or rays. In all these the disk is broad and sub-rhomboid, and the tail slender, but fleshy, and rather longer than the disk; the skin covered with radiated spines or asperities; the head well defined, and with a pointed snout; the internal region furnished with a broad velum; the mouth transverse; the teeth small, generally varying according to the sex; the dorsals two in number, small and situated on the terminal half of the tail; the caudal reduced to a narrow seam. The female is oviparous, laying eggs provided with parchment-like cases furnished at each angle with a filamentous extension; these cases are known popularly as sailor's-purses, and are often found on the seashore. Between thirty and forty species are known. Some inhabit all seas, but they are more numerous in the northern than the southern hemisphere. Five species are found along the east coast of the U. S. (*Raia erinacea*, *R. ocellata*, *R. radiata*, *R. eglanteria*, and *R. levis*), and several others on the west coast, *R. binoculata* being the most common. Revised by D. S. JORDAN.

Raikes, ROBERT: originator of Sunday-schools; b. at Gloucester, England, Sept. 14, 1735; succeeded his father as editor and publisher of the *Gloucester Journal*; founded a system of Sunday-schools for poor children in 1781, and witnessed its extension to most of the towns of England. D. Apr. 5, 1811. See the *Lives*, by Gregory (London, 1877) and Eastman (London, 1880), and SUNDAY-SCHOOLS.

Rail [from O. Fr. *rcale* (> Fr. *râle*), deriv. of *raller*, have a rattling in the throat]: a popular name for any member of the *Rallidæ*, a family of marsh-haunting birds, having stout legs, long slender toes, weak wings, a compressed body, and, usually, a rather long bill. Rails are widely distributed throughout the world, and range in size from little larger than a sparrow to about 15 inches in length, or, if the COURLAN (*q. v.*) be counted a rail, 2 feet. They fly poorly, but run among the reeds with ease. They nest on the ground, and lay a number of cream or buff colored eggs with brown markings; the young run about as soon as hatched. Rails feed on all manner of small aquatic animals, such as snails and worms, and, to some extent, also on seeds. The common rail of Europe is *Rallus aquaticus*; the common species of the U. S. are the Virginia rail (*Ral-*

lus virginianus) and the sora, or ortolan (*Porzana carolina*). Both are found over the greater part of temperate North America, and are especially abundant during the fall migrations in the marshes and rice-fields of the Southern Atlantic States. F. A. LUCAS.

Railways, or Railroads: roads with parallel lines of rails, upon which the (usually flanged) wheels of vehicles may run. The term *railways* is exclusively used in Great Britain, and is gaining ground in the U. S. Some writers confine the meaning of the term "railway" to the superstructure upon which the carriages run, the "railroad" being regarded as the formation of earthworks or other material upon which the "railway" itself rests. This distinction, however, is more fanciful than real, and the terms may properly be used synonymously.

General History.—The precise date of the first use of railways can not be ascertained. The plan of facilitating the draught of carriages by forming a hard continuous surface for the wheels to run upon is old and simple, and the successive adaptations of flagstones, pieces of timber, and finally strips of iron fastened to the top of the timbers, are the several improvements it has undergone. The use of iron was found to reduce the friction very sensibly, and to increase more than fourfold the amount which the horses could draw from the mines, where such tracks were mostly in use; a ledge or flange on the inner, or in some cases the outer, edge of the plate of iron forming the rail enabled the ordinary wagon to keep on the rails without difficulty. This kind of track was long in use, and was known as a tramway. The next improvement, growing out of the necessity for increased strength in the rails, was the introduction of the edge-rail, formed by setting up a bar of cast or rolled iron in the form of a T. This required special supports called "chairs," spiked to the timber-rails or to cross-supports of timber called "ties," or at intervals to stone blocks. In this rail the flange, which in the tramway was necessary to prevent the wheels from leaving the track, was removed, and in lieu of it a flange was cast on the inner edge of the wheel-tires. Railways constructed upon this principle were in operation in the principal collieries in Great Britain and Germany toward the close of the eighteenth century, used for the transportation of coal or ores from the pit to the port of shipment, sometimes by the force of gravity; and where the acclivity had sufficient steepness the loaded wagons in descending drew up the empty wagons by means of an endless rope passing around a pulley at the summit of the incline; in others, horse or steam power was used.

From the date of the application of the edge-rail—about the year 1790—in lieu of the timber-rail, with its strip of flat iron permitting but a limited speed, the additional strength thereby conferred on the railway proper naturally led those interested to seek a means of propulsion more effective than horse-power, and so the progress and extension of railways became intimately connected with the improvements in the locomotive engine.

The advantages of the low-pressure condensing steam-engine, as demonstrated by James Watt, led to the neglect of the high-pressure principle, although the high-pressure engine, from its comparative lightness, dispensing with the cumbersome apparatus necessary for condensation, is alone applicable to locomotive purposes on land.

Richard Trevithick in 1802 was the first person to take out a patent for a high-pressure engine adapted to motion on roads; his engine was first tried on common roads, but subsequently applied to colliery railways. Improvements made by him were the subject of a patent in 1804, and as early as this steam was used as a means of propulsion on some of these roads, but the speed was not greater than that of horses, owing to the imperfect construction of the boilers of the engines; and on grades as low as 18 feet per mile they required to be assisted by auxiliary power of some sort. The progress of improvement in the engine used for roads was much retarded for many years by an imaginary difficulty which it would seem a single experiment would have sufficed to remove. This was in the opinion that the friction, or the adhesion of the driving-wheels of an engine to the rails, did not offer sufficient resistance to slipping to allow of the power of the engine being applied to the axles so as to produce locomotion. As late as 1811 Blinkinsop obtained a patent for the application of a rack-rail, laid on one side of the railway, into which a cog-wheel on the axles of the driving-wheels worked. Other patents are on record as late as 1815, seeking to overcome this fictitious difficulty—

some by means of chains extending the whole length of the road between the rails, and others by means of jointed levers worked by steam. It was at about this date that the discovery was made that the adhesion of the wheels of the engine to the rails furnished a sufficient fulcrum for the action of the propelling power, thus dispensing with all the cumbersome contrivances of racks and chains.

In 1814 George Stephenson built an engine for the Killingworth colliery. The boiler was a flue-boiler, and as it did not make steam enough for a speed of more than 3 miles per hour, it would have been condemned as useless had not Stephenson applied the steam-blast to it, which increased its speed to full 6 miles per hour. It is in the accounts of the day that this application was accidental; the noise of the escape steam was complained of as a nuisance, and to avoid it Stephenson turned the escape-pipe into the chimney, thus creating a draught.

Notwithstanding the efforts made by Stephenson to bring his engines into general use, the opinions of some able engineers of that day were that they did not possess the advantages which the inventor had anticipated. Their use was extending, however, in the neighborhood of the collieries for the transport of coal from the mines, although still supplemented on some of the inclines by horse-power, and on others by rope and stationary engines.

The Stockton and Darlington Railway, 37 miles in length, intended originally for the transport of coal alone, was opened in 1825. It had been the intention to operate it with horses, but Stephenson soon succeeded in introducing the use of locomotives. Engines and tenders weighing 12 tons drew loads of 92 tons upon that road, which has an average grade of 21 feet per mile, some places being level and others having a grade of 53 feet per mile; on the steeper grades 37 tons were taken up at a speed of 4 miles per hour, 6 miles per hour being the speed on other parts of the road; but a speed of from 7 to 8 miles per hour was attained under favorable circumstances. Increased commerce between Manchester and Liverpool, much hampered by the excessive tolls and uncertain movements on the canal between these points, led to chartering the Liverpool and Manchester Railway in 1828, its main object being the transport of merchandise between the two places, but by horse-power. The engineer, George Stephenson, however, advocated the use of steam exclusively. The directors of the road were induced to offer a reward for a locomotive engine which should be able to take three times its own weight on a level road at a speed of 10 miles per hour. In Oct., 1829, the Rocket, an engine built by Robert Stephenson, Jr., a nephew of George Stephenson, more than performed all the stipulated requirements; weighing but $7\frac{1}{2}$ tons, it drew 44 tons at the rate of 14 miles an hour. The effect of this announcement was electrical, and was felt in every civilized country in the impulse given to railway construction.

The first railway built in the U. S. was from the granite-quarries of Quincy, Mass., to tide-water, length 5 miles; begun in 1826 and completed in 1827, it was built to supply the granite for the Bunker Hill Monument, and made of wooden rails laid on granite sills, with a strap-rail of rolled iron. The second road was begun in Jan., 1827, and completed in May of the same year, extending from the coal-mines to the Lehigh river at Mauch Chunk, Pa.—a distance of 9 miles. The loaded cars passed down the inclined planes by gravity, and the empty cars were drawn up by mules. The rails were of timber covered with a strap of iron. In 1828 the Delaware and Hudson Canal Company constructed a railway from its coal-mines to Honesdale, the termination of the canal, to transport the anthracite coal to tide-water. The Baltimore and Ohio and the South Carolina railroads were begun, the latter in 1830. By the close of the year 1830 the following railways had advanced in construction as shown below:

NAME.	Projected, miles.	Completed, miles.
Quincy	5	5
Mauch Chunk	9	9
Delaware and Hudson Canal Company	16	16
Baltimore and Ohio	250	60
Mohawk and Hudson	16	12
South Carolina R. R. (Charleston and Augusta)	135	20
Camden and Amboy	50	constructing.
Ithaca and Owego	29	"
Lexington and Ohio	75	"

All these roads, with a single exception to be noted subsequently, were built for and operated by horse-power. The

first number of *The Railroad Journal* (from which the above list is taken) contains also a list of the railway companies then petitioning the Legislature of the State of New York for charters, the aggregate capital reaching the sum of \$43,000,000; this prior to 1831. The roads mentioned in the table, it will be observed, were chartered before the experiment of the Rocket at Liverpool had indicated the most advisable power for operating railways.

In Jan., 1828, Horatio Allen, of the Delaware and Hudson Canal Company, went to England, charged with the duty of procuring the iron rails for that company's road, and also, at his discretion, to order three locomotive engines. He accordingly ordered one engine from the works of Foster, Rastrick & Co., of Stourbridge, and two engines from the works of R. Stephenson at Newcastle. These orders were given in the early summer of 1828, and the engines were received in New York in the following winter (1828-29). The burning of anthracite coal in the furnaces of engines was the point to be demonstrated by the Delaware and Hudson Canal Company, whose extensive mines were waiting a demand on the part of the public, the total consumption of anthracite coal having reached but about 80,000 tons yearly. In the spring of 1829 one of these three engines was ordered to be sent by river and canal to Honesdale, Pa., the initial point of the company's railway. The accident which sent the Stourbridge engine rather than either of the other two has not been accounted for. The other two engines were precise counterparts, and identical in boiler, engine, plan, and appurtenances with the Rocket, by the same maker, which subsequently startled the world by its performances at Liverpool. The Stourbridge Lion, as the engine was named, was put upon the track—built of hemlock timbers and strap-rails, with timber trestles 35 feet in height, and curves of 720 feet radius—and Mr. Allen ran the engine himself for some 6 miles at good speed amid the cheers of the incredulous spectators. No load was attached, as it was feared that it would prove too severe for the road, but it was the first trip ever made on a railway by a locomotive engine in America. It is true it was a foreign-built engine, but its plan had been selected by an American engineer many months before there existed any acknowledged standard by which such machines were to be judged; and there are few bolder achievements of the civil engineer on record than this trip for the first time with an engine between 8 and 9 tons weight at full speed upon such a road. The experiment was successful in exhibiting the value of anthracite coal as a fuel for steam purposes.

Horatio Allen had been appointed chief engineer of the South Carolina Railroad (not then constructed) at the date of his experimental trip with the Stourbridge Lion; and, entering upon his duties a short time subsequently, he reported his views as to the power which he considered it advisable to adopt for its operation in a paper dated Sept., 1829, strenuously urging, for reasons stated at length, the employment of steam as the locomotive power. This report, submitted to the board of directors and unanimously adopted and placed on record Jan. 14, 1830, was the first act by a corporate body, either in the U. S. or elsewhere, adopting the locomotive engine as the tractive power on a railway for general passenger- and freight-transport. Accordingly, in pursuance of that resolution, in Mar., 1830, E. L. Miller, on the part of the South Carolina Railroad Company, contracted with the West Point Foundry Company for a locomotive engine. This was the first locomotive engine built for railway service in the U. S., and was first put upon the road Nov. 2, 1830.

A second locomotive was also built at the West Point Foundry works for the same railway company, and from designs of the chief engineer. In 1830 trials of a small steam-engine built by Peter Cooper were made by the Baltimore and Ohio Railroad, which, however, continued to be operated by horse-power till 1832. The engine was placed on a platform-car.

The improvements made in the locomotive engine became so numerous that it is difficult to determine the precise value of their respective claims. Their effect upon the extension of railways was most marked, and projects and charters were multiplied, not unfrequently much in advance of the wants of the locality. The flat rail—or strap-rail, as it was called—was soon abandoned; the New Orleans and Lake Pontchartrain Railroad was the first to adopt the T-rail (1830-31), Gen. J. G. Swift being the engineer.

Between the years 1828 and 1833 the present system of railway communication in the U. S. may be said to have been begun by the commencement of the Baltimore and

Ohio, the Baltimore and Susquehanna, the Camden and Ansbury, the New Castle and Frenchtown, the Hudson and Mohawk, the Charleston and Augusta, the Boston and Providence, the Boston and Lowell, and other roads. If we except the Baltimore and Ohio, it will be seen that there was little foresight of a future great connecting system; and it may be said that in general the great lines of communication with the Mississippi valley and the States W. of it are made up of parts originally having little reference to each other. Indeed, the roads in the U. S. have been gradually called into existence to supply a need which they themselves have created, and which did not in the beginning exist. The Baltimore and Ohio and (at a later date) the Pennsylvania roads, connecting the Ohio with Baltimore and Philadelphia, the Mobile and Ohio, connecting that river with the Gulf, may be called the first through lines. The necessity of connecting the newly developed Pacific States with the older body gave rise to the most extended system of reconnaissance and survey through a vast expanse of mountain-chain and desert for the determination of practicable routes, and finally to the rapid construction of the most remarkable through line of railway in the world. The Union Pacific Railway (completed 1869) was built, many parts of it, at the unprecedented rate of a mile a day, but even this is regarded as slow, and the reports of the Canadian Pacific Railway (completed 1885) for the year 1883 show a progress for the entire working season, from Apr. 18 to Nov. 21, of 2.4 miles of completed track laid for every working day.

Following the history of railways to the present day, it will be in order to consider briefly some of the principles to be considered in their construction. The principles of the construction of the accessory works of a railway, such as embankments, bridges, tunnels, etc., differ in no essential save dimensions from those required for first-class turnpike-roads; but the location of the *curves*, or horizontal deviations from a right line; the *grades*, by which we understand the rise or fall in the direction of the length of the road; and the *gauge*, or width between the rails of the track, are the elements which determine the capacity or classification of a railway as a means of transport, and are matters requiring careful study.

Curves.—The amount of resistance to locomotion occasioned by curves in a road is partly due to the effect of centrifugal force, causing the flange of the outer wheel of the cars to press against the rail; partly to the dragging of the wheels, which, being necessarily fixed on the axle, are obliged to perform an equal number of revolutions whether on the inner and shorter, or outer and longer rail of the track; and partly to the axles being *fixed* parallel. In practice, curves of a mile radius offer but little impediment to rapid motion. The necessities of the locality very frequently call for curves of much less radius than this, and the expense of maintenance of both road and machinery is thereby much enhanced unless the curves be traversed at a reduced speed.

It is customary to reduce the rate of inclination on the portions of such parts of the road as are curved at the rate of .05 feet per 100 for every degree of curvature, as also to raise the outer rail of the track a height proportioned to the speed of the trains. It has also been customary to make the tread of the wheels a conic surface, that in traversing a curve the wheels on the outer rail may run on a longer diameter and so cover a greater length of the track than those on the inner rail, and thus assist the movement around the curve; but this method has been found to produce much oscillation and concussion on the straight portions of the track, and has in a great measure been discontinued—at least to the extent originally thought necessary—although a coning of the wheels to the extent of $\frac{1}{8}$ inch is occasionally practiced. The action of the edge of the rail upon the wheel tends to wear the base of the cone into a groove, as it were, and what at first was thought a notable device for facilitating the movement of the vehicles around a curve is found in practice to be of no value, and in the U. S. the tread of the wheels is now made cylindrical. In European practice the coning of the wheels is still followed to a considerable extent, and the rails are inclined inward at an angle of from 1 in 20 to 1 in 24 in order to allow the rail-head to fit the wheel.

The velocity of the train being an element in the calculation for the super-elevation of the outer rail of the track, what would be suitable for one speed of train would be unsuitable for another; hence a compromise has to be made,

and the average speed of passenger-trains is usually taken from which to calculate this super-elevation:

Theoretically, if v = speed of train in feet per second,
 r = radius of curve, in feet,
 g = gauge of track, in inches,

then $g \times \frac{v^2}{32 \cdot 2r}$ = elevation in inches to be given to the outer rail of the track. In practice it is customary to disregard the speed and elevate the rail $\frac{1}{4}$ inch per degree of curvature for ordinary-gauge tracks. When the term "degree of curvature" is mentioned in speaking of curves, it is to be understood as the number of degrees subtended by a 100-foot chord. Thus a $\frac{1}{4}$ curve is one of about 2 miles radius; a 1° curve is of about a mile radius; a 2° is of about a half-mile radius, or, more accurately—

Radius, feet.	Curvature, degrees.	Radius, feet.	Curvature, degrees.
22,918.....	$\frac{1}{4}$	2,292.....	$2\frac{1}{4}$
11,459.....	$\frac{1}{2}$	1,910.....	3
7,639.....	$\frac{3}{4}$	1,433.....	4
5,730.....	1	1,146.....	5
3,820.....	$1\frac{1}{4}$	955.....	6
2,865.....	$1\frac{1}{2}$		

Hence the super-elevation to be given to the outer rail would be, in inches, for a 1° curve, $\frac{1}{4}$; for a 2° , $\frac{1}{2}$; for a 3° , $\frac{3}{4}$; for a 4° , 1 ; for a 5° , $1\frac{1}{4}$ inches, and so on, which according to Trautwine is sufficient for speeds as high as 40 miles per hour. The modern refinement of the introduction of transition-curves, by which the point of tangency is virtually thrown back a considerable distance on the tangent, and the curve thus eased on its approach to the latter, gives the opportunity for availing earlier of the super-elevation of the outer rail. This results in a smoother motion when the cars take the curve, very perceptible in comparison with the older methods of change of direction.

Grades.—The additional resistance to motion occasioned by the various grades or inclinations in a road is susceptible of precise calculation, and is a constant quantity for the same inclination, let the state of the road or the machinery be what it may. It is as the sine of the angle of inclination; or, virtually, it is that fraction of the weight which is represented by dividing the height of a given inclination by its length. For instance, in a rise of 22 feet per mile it would be represented by $\frac{22}{5280} = .004$, which is 8 lb. for a ton of 2,000 lb., or $\frac{1}{250}$ th of the weight. The relative capacity of roads for traffic is therefore limited by their grades—that is to say, since only a certain number of trains can pass over the road yearly, that if the grades are such as to limit the load of the engine to a certain amount, the yearly tonnage, which is the total number of trains multiplied by the load of each, is limited in the same proportion. The capacity of railways is a subject of but little popular appreciation, but one of great importance in projecting new lines of roads.

The principle which obtains in calculating the effect of grades on the movement and weight of trains is briefly illustrated as follows: If a locomotive engine be prevented from advancing on the track, and at the same time the proportions of the machinery be such that upon the application of the power to the wheels the latter will revolve by slipping on the rails (as is usually the case), the engine is said to work up to its adhesion, and the latter becomes the limit of its tractive force. This adhesion varies, in different states of the rail-surface, from one-third to one-tenth of the weight on the driving-wheels, and may be taken ordinarily at one-sixth of the insisting weight. If, then, we know the amount of this and of the resistance to motion occasioned by the friction at the axles of the wheels of the engine and train, as also of the rolling of their surfaces on the rails, we may calculate the weight which the engine will draw on a level under the assumed condition of the rails and the machinery. Thus if it be found that 8 lb. per ton of the weight of the engine and train represents the resistance to motion on a level occasioned by all impediments to motion of whatever kind, disregarding the speed, then by dividing the adhesion expressed in pounds by 8 we obtain the gross weight in tons which the engine will draw upon a level; but where the train ascends a grade there will be, in addition to the resistance of friction on the level, the resistance arising from the gravity of the engine and its load, or its tendency if unresisted to move down the slope, explained above.

The resistance of gravity is the same on a given plane at all speeds, but is overcome twice as fast at 20 miles per hour as at 10 miles, and hence is said to vary with the speed. Friction varies with the load of the train and slightly with

the velocity; concussion or resistance of the curves varies both with the weight and speed of the train. Atmospheric resistance varies with the speed and bulk of the train, but its value is not well established and has been estimated as dependent upon the area of the frontage of the train rather than its bulk. If we disregard for the present the various resistances in detail occasioned by curves, concussions, and that of the atmosphere, and consider them as included in a single factor per ton of train, the formula expressing the power of an engine on different grades is very simple and sufficiently accurate for relative comparison. Let E represent the weight on the driving-wheels of an engine in pounds; and let R represent the rise in feet per mile of a given grade; then the gross load, including engine and tender, in tons of 2,000 lb., which the engine will take up that grade

will be represented by $\frac{2E}{3787R + 8}$, the adhesion being one-fifth

of the weight of the engine on the drivers. The following table shows the gross load, in tons of 2,000 lb., which, by the above formula, an ordinary freight-engine weighing 66,000 lb., 40,000 lb. on the driving-wheels, may be estimated to move on different grades in a good condition of the rails:

ON A LEVEL.	20 feet per mile.	30 feet.	40 feet.	50 feet.	60 feet.	80 feet.	100 feet.	150 feet.	200 feet.	250 feet.
1,000...	513.8	413.2	345.6	290.3	260.4	208.9	174.4	123.4	95.5	78.0

The most simple formula for the resistance of a train—for purposes of general comparison sufficiently accurate—is that of D. K. Clark, which is, where R is the resistance in pounds per ton (2,240 lb.) of engine, tender, and train, and V the velocity in miles per hour,

$$171 + 8 = R.$$

The following table shows the resistance in pounds per ton (2,240 lb.) for different velocities, according to Clark's formula:

At 10 miles per hour.....	8.6 lb.	At 40 miles per hour.....	17.3 lb.
At 12 " " " " " " " "	8.8 lb.	At 50 " " " " " " " "	22.6 lb.
At 15 " " " " " " " "	9.3 lb.	At 60 " " " " " " " "	29.0 lb.
At 20 " " " " " " " "	10.3 lb.	At 80 " " " " " " " "	45.4 lb.
At 25 " " " " " " " "	11.7 lb.	At 100 " " " " " " " "	66.4 lb.
At 30 " " " " " " " "	13.3 lb.		

The resistance to motion as affected by the grade alone is had by multiplying the load by the rise in feet and dividing the product by the length also in feet. The following table shows by inspection the resistance in pounds on different grades, of loads varying from 1 to 500 tons:

GRADE IN FEET PER MILE.	1 ton.	50 tons.	75 tons.	100 tons.	250 tons.	500 tons.
10	4	212	318	424	1,061	2,121
20	8	424	636	848	2,121	4,242
30	13	636	955	1,273	3,182	6,363
40	17	848	1,273	1,697	4,242	8,484
50	21	1,061	1,591	2,121	5,303	10,606
60	25	1,273	1,909	2,545	6,364	12,727
70	30	1,485	2,227	2,970	7,424	14,848
80	34	1,697	2,545	3,394	8,485	16,969
100	42	2,121	3,182	4,242	10,606	21,212

The tractive or drawing power of an engine, called its *traction*, is directly as the diameter of the steam-cylinders, the steam-pressure, and the stroke of a piston, and inversely as the diameter of the driving-wheels; therefore we increase the tractive power of an engine by increasing either the diameter of cylinders, the steam-pressure per square inch, or the stroke, or by decreasing the diameter of the driving-wheels. The formula expressing this is as follows:

If d = diameter of a cylinder, in inches,
 p = mean effective pressure of steam per square inch on the piston,
 s = length of stroke, in inches,
 D = diameter of the driving-wheels in inches,
 then $\frac{d^2 ps}{D} = \text{tractive power.}$

This is upon the supposition that the adhesion of the wheels to the rails, taken at one-sixth of the weight in pounds upon the drivers, is in excess of the tractive power as above determined, the adhesions varying from as high as one-fourth to less than one-tenth of the weight on the driver. Thus the tractive power, with an effective pressure of steam on the piston of 80 lb., the stroke being 23 inches,

and the diameter of the cylinder being 16 inches, and diameter of wheel 60 inches, would be

$$16 \times 16 \times 80 \times 22 = 7509.8 \text{ lb.}$$

60

Therefore, if the weight of the engine on the driving-wheels is in excess of six times this, or 45058.8, the engine would be said to work up to its adhesion, and locomotion would ensue.

Inclined Planes.—Before the locomotive had been perfected, and before even the question of locomotives as stationary-engine power had been settled, it is not surprising that recourse was had to inclined planes (which were in fact the first form the railway assumed) for overcoming abrupt changes of level. Hence we find several examples, as that on the Mohawk and Hudson (Albany and Schenectady) road. The Columbia road (Philadelphia to the Susquehanna) had one at each end. The Alleghany Portage road, connecting two sections of the Pennsylvania Canal, had a number. The South Carolina road (Charleston to Augusta) had one near the latter place, and the Baltimore and Ohio had one at Parr's Ridge, Md. On the Liverpool and Manchester road there were two, on the railway near Liège, Belgium, was one, and others existed elsewhere in Europe; but the necessity of admitting much higher grades than had been supposed admissible and of overcoming them by locomotive power was speedily felt. The Baltimore and Ohio road was constructed to admit grades of 116 feet, and even heavier grades, though inadvisable, are yet to be found. All of the inclined planes above enumerated are now operated by the more modern locomotive engine. The grade of 116 feet per mile on the Baltimore and Ohio road is operated by two engines each 62 tons weight, which take a load of 600 tons, exclusive of the weight of engine and tender, up this incline at the rate of 15 miles per hour. For temporary purposes the engines have taken loads of 40 tons, exclusive of their own weight, up grades of over 500 feet to the mile. See INCLINED PLANE and MOUNTAIN-RAILWAYS.

Gauge.—It is not known what, if any, principle governed the determination in the first instance of the gauge between the rails of 4 ft. 8½ in. It was adopted in the roads from the collieries in the north of England, and believed to have arisen from the colliery-wagons in use on common roads having an outside width of axle of 5 feet; for as the tram-roads had the flange on the outer edge of the rail these ordinary wagons could be used on them, and when the tramway was replaced by an edge-rail the same width of track was continued, but, measured from the inner edge of the rail, resulted in the 4 ft. 8½-inch gauge. Another reason, given by an authority, is that the tramways were 5 feet wide including the rails, and as the later edge-rails were 1½ inches wide they practically determined the gauge at 4 ft. 8½ in. as soon as they were introduced. Be this as it may, Mr. Stephenson, engaged in these collieries, was selected to build the Liverpool and Manchester road, and seeing no reason to change the gauge with which he was familiar, it was adopted there. When once established on a line of road looking to future extension, it was apparent that unless some special advantage called for a change there was a manifest propriety in continuing its use; accordingly, the success of the Liverpool and Manchester road led to the general adoption of this gauge. As the weight of traffic increased, and a corresponding increase of power was called for in the locomotive engine, the impression prevailed that this could be best arrived at by increasing the space within which the machinery was placed, and an increase in the width of track on many roads was the consequence. In 1846 the inconvenience resulting from this lack of uniformity in the width of the railways in England led to the matter being brought before Parliament, and an inquiry was instituted as to the respective merits of the various proposed widths of tracks. The commotion which followed, known as the "battle of the gauges," led to experiments, investigations, and reports by a committee of Parliament, and every effort possible was made to arrive at a just conclusion in the premises, and the subject was exhaustively considered. The result was, that while Parliament declined to enact a law compelling all roads to adopt the narrow gauge, yet the evidence went to show that although for main-trunk lines of great traffic a wider gauge than the prevailing one of 4 ft. 8½ in. would probably prove advantageous, yet the advantages were not then so apparent as were the disadvantages resulting from a lack of uniformity with the prevailing gauge of the king-

dom; and the public mind settled generally to this belief. In the U. S. there were five different widths of track—from 4 ft. 8½ in. to 6 feet—and the advantages of uniformity of track again forcing itself upon the attention of railway proprietors resulted in the triumph of the 4 ft. 8½ in.; and for the same reasons as formerly, not its mechanical superiority to any other, but the expediency of its adoption in view of the extent of roads in operation of that width of gauge.

As before remarked, the grades, curves, and gauge of a railway are the elements of its capacity for transport. The relative effects of the first two are measurably well understood, but the precise value of the latter still remains a mooted question among engineers, although the general adoption of the standard gauge of 4 ft. 8½ in. in the U. S. has rendered such investigation of little practical interest.

Drainage.—The expense of the maintenance on any line will, other things being equal, vary very nearly in the proportion in which its drainage is good or otherwise. Water lying or running on the surface soaks and softens the road-bed, washes away the earth, and chokes the ditches. When saturated with water the road-bed loses its firmness, and the bottom sinks and deranges the tracks, thus adding to the shocks of the train and to the wear and tear of both the machinery and the track. The surface-drainage of the slopes of excavations is equally important, to prevent the velocity of running water from tearing up the soil and choking the ditches, which should be kept open and of a sufficient depth to drain the bottom of the ballast.

The cross-ties, upon which the rails rest, are generally of oak, chestnut, or other hard and durable wood, from 6 to 8 inches in depth, from 8 to 10 wide, and 8 feet in length, and are laid usually upon the road-bed at intervals of about 2 feet between centers. The ballast, or material upon which the ties rest, should be broken stone or gravel mixed with coarse sand free from loam or clay, and should extend to a depth of at least 18 inches below the bottom of the ties, and the space between the latter should be filled in nearly to the level of the bottom of the rail. The effect of this, besides securing the cross-ties and rails in their places, permits by its porosity the thorough drainage of the track, resists sinking of the ties, and enables them to be readily packed up, while it gives a proper amount of elasticity to the track, more conducive to durability than the plasticity of earth or the rigidity of rock, and secures them against the heaving action of the frost.

Rails and Cross-ties.—The early forms of strap-rails soon gave way to cast-iron bars about 6 feet long, called fish-bellied rails, and these in turn were replaced by wrought-iron forms. The first steel rails were rolled in England in 1857, and the introduction of the Bessemer process (patented in 1856) produced a marked influence in cheapening the cost of construction of railways.

In Great Britain and on the continent of Europe it has been customary to make the rail double-headed, and when worn on one edge to reverse it, and thus double its duration; but this method, besides rendering an expensive cast-iron chair necessary, with its complication of fastenings (this item alone being estimated in Great Britain as amounting to over 1,000,000 tons), is of doubtful expediency, as the effect of the chair is in many cases to indent the lower face of the rail, which is subsequently liable to fracture. This has led to the use of the "bull-head" non-reversible rail, the lower head being only large enough to secure the rail in the chair. The system universally pursued in the U. S. of dispensing entirely with a chair, and making the base of the rail some five inches in width, resting on the timber cross-ties without other support, and secured to the latter by brad-headed spikes, is gradually gaining ground elsewhere as the most simple and efficient method of securing the rail.

For some years the use of steel cross-ties has been gaining ground, and is now advocated as conferring the requisite elasticity of track with economy of maintenance; and, what is very remarkable, as it is well known that rails subjected to the rolling traffic of the road do not deteriorate by rust, while a rail lying unused by the roadside is soon destroyed by rust, so it is found that the metal sleeper, or cross-tie of rolled iron or steel, while in use under the rails, does not suffer loss by rust to any appreciable extent, and does not require renewal from this cause. The extent of metal track in the world up to 1892 is shown in the following table (from official sources); it is scarcely to be regarded as experimental in countries where from scarcity of timber, climatic, or other considerations, the use of metal for the

support of the rails became almost a matter of necessity. This table also gives the miles of railway up to 1892 :

COUNTRY.	Metal track, miles.	Total track, miles.	Per cent. of metal track.
Europe.....	10,400	135,000	7.70
Africa.....	1,350	5,300	25.09
Australasia.....	200	10,740	1.86
Asia.....	9,800	21,425	45.74
South America.....	3,850	21,000	18.33
Central America.....			
West Indies.....			
Mexico.....			
U. S.....	20	171,000	.....
Canada.....	.....	14,635	.....
Totals.....	25,600	379,100	6.75

The average number of ties obtained from one acre of forest is 100, so that for new track with 2,640 ties per mile about 26½ acres of forest must be cleared to supply ties for each mile of track. The annual consumption of timber for railway purposes in the U. S. is about 365,000,000 cubic feet for ties, and 60,000,000 cubic feet for bridge and trestle construction of sawed material; so that the annual consumption of 500,000,000 cubic feet of wood in the shape of forest-grown (round) timber for railway purposes may be taken as a reasonable figure.

The first rails of rolled iron were not above 3 feet in length, while steel rails have been rolled over 80 feet in length. Common rails are rolled in lengths of about 30 feet, and the joints are secured by fish-plates—plain plates of rolled iron placed under the head of the rail, and secured to both rails by bolts—or by angle-plates, having the general sectional form of the rail and its flange, and secured in the same way by bolts. The joint being considered the weakest point of the track, every effort was made to stiffen it by clustering the ties near it, and making the joint-tie broader and heavier than elsewhere. Against this it was urged that the joint became stiffer than the remainder of the rail and to that extent objectionable, and the joint was then suspended by resting the angle-bar at each end on a tie, and dispensing with the support afforded by a tie immediately under the joint, thus giving elasticity to the joint. Each method has its advocates, and innumerable patents claiming to make a perfect joint have been issued. The rails are secured to the angle-plates by bolts passing through holes made oblong to permit the expansion and contraction of the rail occasioned by change of temperature. In the climate of the U. S. it is estimated that this variation in the length of a 30-foot rail will amount to ⅞ of an inch. At or near the center of each rail the spikes are passed through nicks in the flange of the rail, instead of outside the flange as elsewhere, thus fastening each rail near the center of its length to the

down grade by the action of the driving-wheels of the engines. The thorough draining and ballasting the track, it will be perceived, is relied upon to render the above precautionary measures of any service. Constant increase in the weight of rails has been going on for some years. Steel rails 6 inches high and of the same width of flange, and weighing 120 lb. to the yard, are now proposed, and 100-lb. rails are not uncommon. The main tracks of all the chief railways of the U. S. are of steel.

Electric Railways.—With the exception of variations in the width of gauge and weight of rail, and the details of the rolling stock, the railways of the U. S. present great uniformity of plan. To this statement an exception must be made in the case of the roads operated by electricity; for although the consideration of the motive power to be used on railways is in a measure foreign to the purpose of this article, yet the use of electricity has rendered some changes in the construction of the rail track essential, and still greater changes may be anticipated in the future.

The electrically operated railways have thus far been confined to the streets of cities and towns, and, as with other municipal roads, neither its construction nor its operation is embodied in the tabular statements herewith appended. See ELECTRIC RAILWAYS.

Statistics.—Nearly one-half of the railway mileage of the U. S. has been constructed since 1880. This great increase has been largely in the Southern and Western States. But this has been eclipsed by the increase in the magnitude of operations. The gross earnings of 1893 were \$1,208,641,498, of which \$808,494,668 were from freight, \$311,978,347 from passengers, and \$88,168,488 from miscellaneous sources. The net earnings were \$358,648,918.

In addition to the cost of construction of new roads, a large amount of fresh capital is yearly expended on old lines; so that for many years past there has been expended upon railways over \$1,000,000 for every working day in the year. Should much of the cost of new lines be lost to shareholders, the republic is undoubtedly the richer to a very large extent, possibly approximating the expenditure, from the incidental advantages growing out of opening new and extensive tracts of rich lands for settlement, and bringing within reach of markets products which would otherwise have had no commercial value. These railways during 1893 transported 757,464,480 tons of freight, an equivalent of 90,552,087,290 tons moved one mile, at an average charge of 0.89 cents per ton per mile; and passengers 628,965,973, equivalent to 15,246,711,952 persons carried one mile, at a charge of 2.05 cents per passenger per mile, the number of passengers carried equaling nearly nine times the entire population of the U. S. This is exclusive of elevated-railway travel in the cities. The value of the freight carried, at \$25 per ton, would equal nearly \$19,000,000,000.

COMPARATIVE STATEMENTS RELATIVE TO THE RAILWAYS IN THE U. S., GREAT BRITAIN, CANADA, AND THE BRITISH COLONIES, 1892.

SUBJECTS CONSIDERED.	United States.*	United Kingdom.	Canada.	Queensland.	New South Wales.	Victoria.	South Australia.	New Zealand.	India.	Natal.
Area, square miles.....	2,967,617	121,115	3,510,500	668,224	309,175	87,884	903,425	104,235	1,378,044	19,000
Population.....	62,622,250	38,000,000	5,000,000	393,938	1,145,400	1,137,272	328,000	623,000	234,490,000	481,362
Population per square mile.....	21.1	314	1.4	0.6	4	13	0.36	6	170	25
Population per mile of railway.....	367	1,900	370	179	536	412	197	338	13,790	1,600
Miles of railway.....	170,601	20,073	13,256	2,195	2,182	2,763	1,666	1,842	16,996	268
Gauge.....	4 ft. 8½ in.	4 ft. 8½ in.	4 ft. 8½ in.	3 ft. 5 in.	4 ft. 8½ in.	5 ft. 3 in.	3 ft. 6 in. { 5 ft. 3 in. {	3 ft. 6 in.	{ 5 ft. 6 in. { { 3 ft. 3½ in. }	.....
Cost per mile.....	\$59,820	\$223,530	\$59,250	\$34,400	\$72,795	\$65,765	\$34,330	\$38,760	\$62,820	.....
Gross receipts per train-mile 1890-91.....	Cts. 135.60	Cts. 117.22	Cts. 112.30	Cts. 115.66	Cts. 169.76	Cts. 129.26	Cts. 155.88	Cts. 186.00	Cts. 186.00	Cts. 186.00
Operating expenses per train-mile 1890-91.....	93.43	63.64	86.80	82.18	104.52	90.54	78.60	116.18	93.00	.....
Net revenue per train-mile.....	42.17	53.58	25.50	33.48	65.24	38.76	77.28	69.82	93.00	.....
Percentage of operating expenses to earnings.....	68.90	54.30	77.29	71.05	61.57	70.05	50.42	62.46	50.00	60.00

* Exclusive of Alaska.

ties, and confining the action of contraction or expansion to each individual rail. This is the method relied upon also for preventing what is called the "creeping" of the rails

The following table, condensed from Poor's *Manual of Railroads* and other sources, exhibits the mileage of the railways of the world :

COUNTRY.	1840.	1850.	1860.	1870.	1875.	1880.	1885.	1890.	1893.
Germany and Luxemburg.....	219	3,635	7,021	11,715	17,519	21,200	23,535	25,608	27,100
Great Britain.....	1,331	6,635	10,410	15,310	16,650	17,935	19,169	20,073	20,325
France.....	205	1,865	5,860	11,010	13,420	16,100	19,300	20,743	21,788
Russia.....	14	310	989	7,005	12,180	14,600	15,939	18,059	19,651
Austria-Hungary.....	89	942	2,780	5,962	10,413	11,610	13,957	15,877	17,609
Italy.....	13	378	1,369	3,830	4,770	5,460	6,610	8,164	8,742
Spain.....	.....	16	1,187	3,210	3,680	4,630	5,654	6,108	6,708

RAILWAY MILEAGE OF THE WORLD.—CONTINUED.

COUNTRY.	1840.	1850.	1860.	1870.	1875.	1880.	1885.	1890.	1893.
Sweden			416	1,305	2,540	4,400	5,277	5,983	6,225
Norway									
Belgium	186	552	1,071	1,790	2,175	2,550	2,758	2,793	2,810
Switzerland		15	653	882	1,275	1,635	1,777	1,972	2,082
Holland		110	196	885	975	1,115	1,542	1,839	1,900
Roumania				152	767	860	1,100	1,590	1,598
Turkey			41	174	954	867	964	961	984
Denmark			69	473	985		1,214	1,214	1,289
Portugal			85	443	643	778	950	1,284	1,440
Greece						8	210	452	568
Serbia							247	500	337
Malta									
Total Europe	2,117	14,458	32,117	64,153	88,752	104,733	120,299	133,006	141,083
British empire in India			840	4,771	6,517	9,147	11,993	16,095	18,042
Ceylon				73	91	135	178	191	200
Java and Dutch possessions				93	162	255	586	809	850
Asia Minor				145	219	244	347	392	474
Japan					41	75	250	1,437	1,877
Russia in Asia								890	890
Malay states								73	118
Siam									190
China and Cochin China								137	180
Persia								6	11
Total Asia			840	5,085	7,030	9,856	13,354	20,031	23,363
United States	2,816	9,015	30,600	52,856	74,050	93,526	125,379	161,397	177,753
Canada and Newfoundland			1,880	2,670	4,430	6,886	10,773	13,435	15,394
Mexico				215	399	654	3,662	4,648	6,900
Costa Rica						74	170	180	231
Nicaragua							93	99	99
Guatemala						80	99	99	118
Honduras						56	34	37	37
San Salvador							38	53	62
Cuba						860	900	1,000	1,000
Jamaica						41	93	64	89
Trinidad							54	54	54
Colombia			48	64	64	75	140	218	218
Venezuela				19	21	70	162	183	287
British Guiana						21	21	23	23
Brazil			133	504	1,030	2,170	4,379	5,582	6,651
Argentine Republic			25	612	1,168	1,530	4,150	5,798	8,023
Uruguay				61	189	298	271	707	974
Paraguay				44	44		45	152	157
Chile			119	452	794	1,370	1,421	1,700	1,735
Peru			46	247	965	1,150	996	1,625	882
Bolivia					81			300	500
Ecuador				18	18	32	40	50	63
Barbados								24	24
San Domingo									71
Porto Rico						7		12	12
Hawaii							32	56	56
Total America	2,816	9,015	32,851	57,762	83,223	108,795	152,896	197,497	221,350
Egypt			296	646	950	927	900	1,123	1,225
Cape Colony				69	148	903	1,599	1,785	2,252
Algeria and Tunis				164	373	875	1,533	2,170	2,216
Natal				5	5	99	174	259	399
Mauritius				66	66	66	92	92	92
Rouman						8	8	78	78
Senegal								164	246
South African Republic									300
Orange Free State								130	
Total Africa			296	950	1,542	2,878	4,306	5,791	7,398
New South Wales			124	335	435	855	1,734	2,182	2,351
Victoria			176	275	617	1,195	1,743	2,341	2,903
Queensland				265	265	635	1,434	2,064	2,353
South Australia			47	133	250	678	1,063	1,756	1,810
West Australia					38	71	76	500	651
Tasmania				43	149	171	257	374	475
New Zealand				44	542	1,253	1,654	1,912	2,036
Total Australasia			347	1,035	2,296	4,858	7,961	11,129	12,579
Total world	4,933	23,473	66,481	128,985	182,443	231,120	298,816	367,455	405,583

Since the opening of the Liverpool and Manchester Railway (1825) there have been built about 400,000 miles of railway, at an estimated cost of \$40,000,000,000. The railway may therefore justly claim to be one of the most signal instruments—perhaps the most signal instrument—of civilization yet developed.

J. W. ADAMS.

RAILWAY EQUIPMENT: The track, shops, stations, and rolling stock of railways. The total railway mileage of the world has 74 per cent. of standard gauge (4 ft. 8½ in. in the clear between the heads of the rails), 12 per cent. of broader gauges, and 14 per cent. of narrower gauges.

Track.—The visible portion of the road-bed, consisting of rails and cross-ties, constitutes the track, which usually rests on a foundation of broken stone or gravel. About 90,000,000 of timber cross-ties are annually used on the railways of the U. S. Preserving wooden ties is commonly practiced in Europe, and to some extent in the U. S. The principal processes are as follows: Kyanizing (corrosive sublimate),

burnettizing (chloride of zinc), Boucherie (sulphate of copper), Wellhouse (chloride of zinc and tannin), and vulcanizing (heating under pressure). Metal tie-plates are often used under T-rails to protect the wood. Metal ties are used very little in the U. S., but extensively in other countries.

The two forms of rails in most general use are shown in Fig. 1. The flange or T-rail was invented in 1830 by Col. Robert L. Stevens, of the U. S., for the Camden and Amboy Railroad. In Europe it is called the Vignoles rail, having been reinvented in England in 1836 by C. H. Vignoles. It is used exclusively in the U. S. and largely in other countries, and is fastened to the cross-ties by bolts, screws, or spikes. The bull-head rails used in Europe are secured by wooden or iron wedges or "keys" to cast-iron chairs fastened to the ties. Modern track is laid with steel rails, which resist strains and shocks far better than iron rails and have greater endurance, and in 1891 the railways of the U. S. had 82 per cent. of their mileage laid with rolled steel

rails, and the balance with iron. The first steel rails were laid at Derby, England, in 1857. Rails for main track weigh 70 to 90 or even 100 lb. per yard, and are usually 30 feet long. The average life of good steel rails is about 150,-



FIG. 1.—Rails: a, T-rail; b, bull-head rail.

000,000 to 200,000,000 tons of traffic. For rail-joints short splice-plates or fish-plates were used in 1831 on the Camden and Amboy Railroad, and in 1847 the fish-plate joint was invented in England by W. Bridges Adams. The angle-bar now generally used is a development of the fish-plate, and is 20 to 48 inches long, with four or six bolts. Since 1890 there has been a growing tendency to use a "bridge-plate" under the rail ends to prevent the deflection which (and not the space between the ends) causes the shocks to car-wheels. The most approved form of switch is the split switch (Fig. 2), in which the switch-rails are planed to a taper, so that

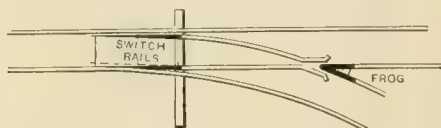


FIG. 2.—Split switch (set for straight line).

the ends will fit closely against the main or stock rails. This type was used in England before 1830. In the stub-switch (Fig. 3), still used in the U. S., the switch-rails are shifted

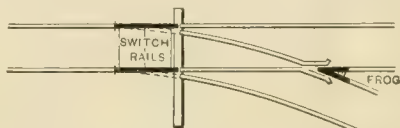


FIG. 3.—Stub-switch (set for straight line).

into line with those of one or other of the diverging tracks. The frog is placed at the intersection of the rails, and allows wheels to pass on either track.

Maintenance of Way.—Traffic causes wear and disturbance of the track; and climate and weather tend to rot the ties, shift the ballast, fill up the ditches, etc. The expense of maintenance is many times greater in the U. S. than in Europe, where, as a general thing, the roads are completed before being opened for use. Maintenance includes the periodical renewals of rails, ties, etc., and also the daily work of repairs and general attention to details. The work is of great importance to the safety and economy of traffic. A railway is divided into "sections" of 4 to 7 miles in length for single track, or 3 to 5 miles for double track, each section having a foreman and gang of 4 to 6 men, and the section is gone over daily from end to end to see that it is in good and safe condition.

Signals and Interlocking.—About 1841 the semaphore signal was introduced in railway service by C. H. Gregory in England, and it is almost universally used, although disks, etc., are used to some extent. It consists essentially of a post carrying a pivoted arm. When horizontal the arm indicates "track blocked" or "stop." When lowered to a vertical or inclined position it indicates "track clear" or "go on." Colored glasses attached to the arm move in front of a fixed lamp for the night-signals. Signals are of two classes: 1, those dividing the railway into sections or "blocks"; 2, those indicating the position of switches, draw-bridges, etc. With block-signals a "distant signal" indicates the position of the "home-signal," but if the former is at "stop" a train may pass it, being prepared to stop at the home-signal if the latter has not in the meantime been lowered. A home-signal at "stop" must never be passed if the "absolute block" system is used, but with the inferior "permissive block" the train may pass after a certain interval, proceeding with caution. Block-signals are operated by

wires, compressed air, etc., from towers placed at distances apart varying with the amount of the traffic. There is telegraph (and sometimes telephone) communication between the towers, and in the lock-and-block system invented in England in 1874 the apparatus of each tower is electrically interlocked with those of other towers, so that the signalman can not move the signals or switches until certain electrical operations have been performed by the other signalmen to release or unlock the levers for the movement he has notified them that he wishes to make. Automatic signals, worked electrically from track-connections by the trains, are used to a greater extent in the U. S. than in any other country, but are inferior to the lock-and-block system. The Westinghouse and Hall automatic systems are those most used. By a combination of the manual and automatic systems the

signal is set at "stop" by the train, but must then be lowered by the signalman, who can not do so, however, until the train has passed the next signal. In 1843 the apparatus of a junction in England was so interlocked that conflicting signals could not be given. In 1856 John Saxby, of England, applied his invention of interlocking combined with the concentration of the operating levers, and in 1874 Mr. Stevens, of England, invented the interlocking by tappets, which is now generally used. In an interlocking plant the operating levers are connected to a series of bars or rods having notches and projections which engage with each other, and are so arranged that when switches and signals are set for a particular train movement no levers can be moved for any conflicting signal or switch. The first interlocking plant in the U. S. was used in 1874 by the New York Central Railroad, and in 1875 the Pennsylvania Railroad imported a Saxby machine from England. Such machines are now in extensive use at terminals, junctions, and track crossings. By Dec. 31, 1892, the railways in Great Britain had 97 per cent. of their switch and signal plant interlocked.

Water and Coal Stations.—The engine-tenders are generally supplied with water from a wooden or iron tank (one or more according to the number of engines) supported upon a stone, iron, or timber tower about 12 feet high. A hinged pipe at the base of the tank leads the water to the tender-manhole. A water-crane or column is an upright pipe beside the track with a swinging horizontal pipe to reach across to the tender-manhole, the water being taken from an underground pipe. It is very important to use good water. A plan for filling the tender-tank while the engine is running, invented by John Ramsbottom, of England, in 1861, is extensively used in Great Britain and the U. S. An iron track-tank about 18 inches wide, 6 inches deep, and 1,200 to 1,500 feet long is laid between the rails. In the tender-tank is an upright pipe, extended downward through the bottom and fitted with a movable curved end or "scoop." When running over the track-tank the scoop is lowered into it, and the motion forces the water up the pipe into the tender. Coal is loaded by shoveling, by cars or buckets, or from a coal-tipple, which is a structure fitted with rows of coal-bins at an elevation above the track. When an engine is under or alongside the tipple, gates are opened allowing the contents of the bins to flow down a chute into the tender. Coal is generally used for fuel, sometimes in the form of anthracite dust. Oil-fuel and bricks of pulverized coal mixed with tar or other cementing material are considerably used in Europe.

Stations and Shops.—The size of a station and the passenger accommodation and freight facilities provided depend upon the importance of the town and the traffic. Large stations generally have a train-shed covering the tracks and platforms, and at important terminals handsome buildings are frequently erected, containing the station and railway company's offices, hotel accommodations, etc. Union stations are for the use of two or more railways. At terminals and important stations extensive yards and side-tracks are required, and freight-sheds, warehouses, grain-elevators, stockyards, etc., must be provided according to the nature and extent of the traffic. In Europe hydraulic power is largely used for handling cars and freight at terminals. Some railways build locomotives and cars, and have therefore extensive works. Repair-shops for locomotive- and car-work, however, are required at different points on all roads. Engine-sheds in Europe are usually rectangular, but in the U. S. they are usually "roundhouses" of circular, annular, or segmental plan, with tracks radiating from a central turntable. Among the extra equipment required at terminal

and divisional points are the following, not all, however, being established at any but very important places: Repair-shops, engine- and car-sheds, storerooms for engine-supplies, sand-house (sand for engines), ice-house (ice for water-coolers, dining-cars, and refrigerator-cars), oil-house (for lamp-supply), gas or electric plant for car-lighting (where either system is used), coal- and water-supply, offices, rooms for employees, storerooms for parlor and sleeping-car supplies; side-tracks for storing, cleaning, inspecting, and repairing cars; turn-table or transfer-table, ash-pit, etc. The greatest terminal yards in the world are those at Buffalo, N. Y., which have about 100 miles of main track and 400 miles of side-track.

TRAIN-SHEDS OF PASSENGER STATIONS.

CITY.	RAILWAY.	N. of apts.	Width.	Length.	Height.	N. of tracks.
Jersey City, U. S.	Pennsylvania Railroad	1	256 ft.	652 ft. 6 in.	86 ft.	12
Philadelphia, "	"	1	304 ft.	598 ft.	100 ft. 4 in.	16
"	Philadelphia and Reading Railroad.	1	266 ft.	596 ft. 8 in.	88 ft.	13
New York, "	New York Central Railroad	1	200 ft.	650 ft.	96 ft.	12
"	" (annex) ..	1	98 ft. 3 in.	650 ft.	22 ft. 6 in.	5
St. Louis, "	Union Station	5	601 ft.	700 ft.	75 ft.	30
London, England	Midland Railway	1	243 ft.	600 ft.	100 ft.	10
Paris, France	Western Railway	1	243 ft.	600 ft.	100 ft.	30
Cologne, Germany	State Railways	3 1/2	209 ft. 8 in. / 44 ft.	836 ft.	78 ft. 7 in.	..

* Broad Street.

† St. Pancras.

‡ St. Lazare.

Locomotives.—British practice in the design and construction of locomotives is still mainly followed by all countries except the U. S. and Canada. North American practice employs bar-frames, outside cylinders, trucks, equalized springs, eight-wheel-tenders, and large cabs fitted with seats. European practice employs plate-frames (invariably), inside cylinders, rigid axles and unequalized springs (generally), and four or six wheel tenders, while the men have to stand up in cabs affording little shelter. North American engines are equally well adapted for light and rough track, and the best and heaviest track, and many features of American practice are widely adopted in Europe, while locomotives are extensively exported from the U. S. The truck, or "bogie," was invented by John B. Jervis, of the U. S., in 1831, and first used on an engine ordered by him from the Stephenson works in England. The North American "eight-wheel" type of engine (having four coupled driving-wheels and a four-wheel leading truck) was patented in 1836 by H. R. Campbell, of Philadelphia, and is extensively used in Europe as well as in the U. S. British express-engines have often but one pair of driving-wheels, 7 feet to 8 feet diameter, and have never more than two pairs, while in the U. S. they have never less than two pairs, and often three pairs for the heavy express-trains characteristic of North American railways. Freight-engines in Europe have generally six wheels, all coupled, while in the U. S. they have from eight to twelve wheels, with six to ten wheels coupled. In 1891 there were in the U. S. 32,139 locomotives, of which 8,901 were passenger, 16,696 freight, 4,321 switching, and 2,221 unclassified and leased. Of this total, 23,094 were fitted with train-brakes. In the compound locomotive the expanded steam from the high-pressure cylinder flows to a larger low-pressure cylinder, where it expands further before escaping to the atmosphere. This gets more work out of the steam, and effects an economy of 10 to 20 per cent. in fuel, the best results being obtained at moderate speeds. The invention dates from 1834, but the first practical engines were built in 1875 to the designs of A. Mallet, of France. Engines on the Mallet system have two cylinders, and can be run at will as simple engines by admitting steam direct to both cylinders. In the Worsdell (England) and von Borries (Germany) two-cylinder engines, live steam is only admitted to the low-pressure cylinder at starting, and is then shut off by an automatic intercepting valve. Four-cylinder compounds may be arranged with one pair of cylinders to each of two driving-axles (generally European), or with two cylinders on each side acting together in the same way as the usual single cylinder. Engines with two, three, and four cylinders are in service throughout the world, and in 1892 there were about 2,500 compound locomotives in use, of which over 500 were in the U. S., where they were more extensively used than in any other country. These U. S. engines are of various designs, but all with two or four cylinders, giving them extra power in starting, and on heavy grades, and are generally arranged to be run as simple engines at will. They are of all types and are used in every class of service. See LOCOMOTIVE.

Cars.—The first passenger-cars resembled stage-coach bodies on four-wheel platforms, but as early as 1831 the American style of long car with trucks, or "bogies," end doors, central aisle, and seats all facing the same way, was introduced. In Europe the cars are generally short and light, divided into compartments having side doors, the passengers sitting face to face and knee to knee, but within recent years improvements have been made in introducing larger cars on trucks, and also parlor, dining, and sleeping cars. The smaller cars have four or six wheels, and are 26 to 34 feet long, while the larger ones on trucks are from 42 to 56 feet long. American cars are 50 to 80 feet long, wider and higher than European cars, and generally of stronger

and heavier construction. The vestibule connections, or in-closed-end platforms, were used on mail-cars about 1852, and were first used on passenger-cars in 1886. They make a train practically one long articulated car, and afford increased safety in case of accident. Dining, sleeping, and parlor cars are run on most important trains, and are very luxuriously and elaborately finished and equipped. The first sleeping-car in the U. S. was run on the Cumberland Valley Railroad (Pennsylvania) in 1836-37. In 1856-57 Thomas L. Woodruff built a sleeping-car, and he was followed by Webster Wagner. In 1859 George M. Pullman began making improvements, and in 1864 he built for the Chicago and Alton Railroad the first real Pullman sleeping-car. European freight-cars are generally 12 to 18 feet long, with four wheels, weigh 11,200 to 18,000 lb., and carry 18,000 to 23,000 lb. Larger cars are used to some extent for coal, ore, etc. In the U. S. freight-cars are 30 to 36 feet long, with two four-wheel trucks, weigh 20,000 to 30,000 lb., and carry 40,000 to 60,000 lb. Refrigerator-cars for carrying meat, fruit, etc., have the sides, roof, and floor insulated by air-spaces, felt packing, etc., and are fitted with ice-chambers. Iron and steel are being largely used in freight-car construction, especially for the frames. The number of cars in the U. S. in 1891 was as follows:

CLASS OF SERVICE.	Total.	With train-brakes.	With automatic coupler.
Passenger.....	27,949	27,246	26,662
Freight.....	947,300	108,132	107,795
Company's.....	35,185	2,438	1,067
Fast freight.....	51,787	4,777	8,597
Total owned.....	1,062,221	142,593	144,141
Total leased.....	153,390	22,645	23,202
Grand total ..	1,215,611	165,238	167,343

Brakes.—In the U. S. hand-brakes have been almost entirely superseded on passenger-cars, and to a considerable extent on freight-cars, by continuous power brakes applied by the engineman to all the wheels of a train simultaneously. Power-brakes have been operated by air-pressure, vacuum, steam, hydraulic power, weights, springs, and electricity, but the two former are most generally used, and so applied as to act automatically in case of rupture of the hose connecting the train-pipes of the cars. The Westinghouse air-brake was first patented in 1869, and is universally used in the U. S. and largely in other countries. The vacuum-brake, dating from 1871, is used in many foreign countries, and is efficient, but is slower in action than the Westinghouse, and therefore not so well adapted for long, heavy, or fast trains. The Eames vacuum-brake is used on elevated railways in New York and Brooklyn, and air- and vacuum-brakes have been applied to horse-, cable-, and electric-cars. In 1887 George Westinghouse perfected his quick-acting freight-train brake, which will stop a fifty-car train at 30 miles an hour in 320 to 350 feet. Passenger-trains at 40 to 60 miles an hour may be stopped in 600 feet for the

former and 900 to 1,000 feet for the latter speed. In Feb., 1893, the U. S. Congress passed a law compelling the use of power-brakes and automatic couplers on freight-cars. Brakes are generally applied to the driving- and tender-wheels of American locomotives, and sometimes also to the engine-truck wheels. With the Westinghouse brake the engine has an air-pump, main reservoir, and engineman's valve; and each car has a smaller reservoir, triple valve, and a horizontal brake-cylinder having two pistons connected by a spiral spring. A pressure of 70 to 80 lb. is maintained in the reservoir and train-pipe, the brake-cylinder being empty and the brakes off. When the pressure in the train-pipe is reduced (purposely or by a broken hose connection), the greater pressure in each car-reservoir moves the triple valve, opening a passage by which the air rushes to the brake-cylinder and forces the pistons apart, thus applying the brake-shoes forcibly to the wheels by means of a system of rods and levers. To release the brakes, air is admitted by the engineman's valve from the main reservoir to the train-pipe, moving the triple valves back, recharging the car-reservoirs, and opening an escape for the air from the cylinders, the pistons being then drawn back by the spring. With the vacuum-brake there is a steam-ejector and a brake-cylinder on the engine, and a vertical brake-cylinder and ball-valve on each car. A vacuum is maintained in the train-pipe and cylinders by the ejector, the piston then being at the bottom of the cylinder and the brake off. When air is admitted (purposely or by a ruptured hose), its rush moves the ball-valve, thus closing the pipe to the top of the cylinder, and the air-pressure therefore passes to the bottom, forcing the piston up and applying the brakes. When air is again drawn from the pipes and cylinders by the ejector, the ball-valve returns to its position, allowing the air to escape, and the brakes then come off by their own weight and that of the descending piston.

Car-couplers (Fig. 4).—The common form of coupling used in the U. S. is the "link and pin," consisting of a link with its ends resting in the hollow ends of the draw-bars of the two cars, and held in place by a vertical pin through each draw-bar. Coupling and uncoupling by hand is dangerous work, and in the year ending June 30, 1892, about 378 men were killed and 10,319 injured in it. Passenger-cars are generally fitted with the automatic coupler invented by Ezra Miller in 1863, and have also spring buffers, safety-platforms, and safety-chains. The Janney automatic coupler for passenger and freight cars was adopted by the Master Car-builders' Association in 1887. Each coupler has a vertical claw-shaped end with a movable knuckle, and when

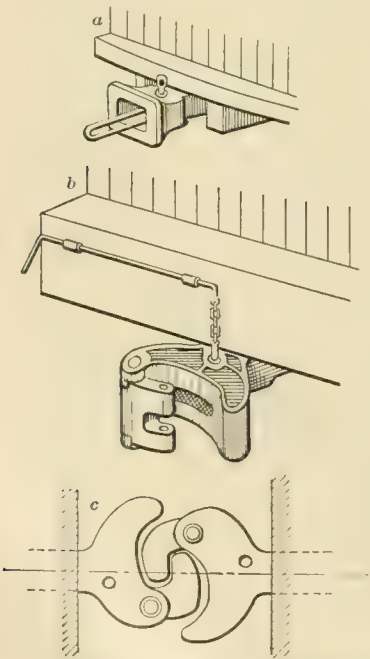


FIG. 4. Car-couplers: a, link-coupler; b, Janney automatic coupler; c, top view of automatic couplers when coupled.

pushed together the knuckles interlock, and can not be pulled apart unless a vertical locking-pin is withdrawn, which can be done by a handle at the side of the car. The Miller hook-coupler is uncoupled by shifting the hooked drawheads sideways by a lever on the car-platform. In Feb., 1893, the U. S. Congress passed a law that by Jan., 1898, all freight-cars must be equipped with automatic couplers. In Europe passenger-cars generally have hooked drawbars connected by chains which are drawn tight by a screw, bringing into contact the long spring buffers at the ends of the cars. Freight-cars have either a similar coupling or a loose chain.

Car-lighting and heating.—Mineral-oil lamps are most used in the U. S., oil of 300° F. fire-test being the safest. In Europe vegetable oils are used, owing to the high price of kerosene, but they are inferior to the latter, and the cars are in general poorly lighted. Compressed oil-gas is extensively used in the U. S. and many other countries. The oil is distilled and vaporized in retorts, and the gas is forced into storage-tanks by compressor-pumps. It is then piped to the car-reservoirs, which usually hold 212 cubic feet at 150 lb. pressure, or enough for twelve lamps for sixteen hours. Gasoline-gas is used to a limited extent in the U. S. Electricity has been extensively experimented with, and is in use, but is expensive. It may be operated by storage-batteries, by a dynamo driven from a car-axle (with storage-batteries for use when the train stops), or by a separate engine and dynamo in one car. The ordinary stove has caused many fires in trains by being upset, especially in train-accidents, and in the U. S. its use is prohibited in some States. Improved stoves, with hot-water pipes, are used considerably, but the most approved system is that of leading steam from the engine through pipes in the cars, and it is very extensively used. In Europe stoves and steam and hot-water heating are used to a limited extent; but in Great Britain the primitive and inefficient plan of portable foot-warmers filled with hot water is the most common. The ventilation of American cars, especially sleeping-cars, is generally very poor, but in Europe fans and mechanical ventilators are largely used to draw out the foul air.

E. E. RUSSELL TRATMAN. A. M. WELLINGTON.

RAILWAY OPERATION: the conduct of the business of a railway, together with the methods and results of economic management. In all countries the government exercises the right to grant or refuse permission for the construction and operation of railways. The government may build and operate railways, as in France, Belgium, Germany, Australia, and South Africa, private lines being also generally permitted in the European countries. It may build and own the railways, but contract with private companies for their operation, as in France and Italy. It may own the railways, but allow private companies to construct and operate them, as to some extent in India. It may permit private companies to build, own, and operate railways, itself exercising a greater or lesser degree of control, as in the U. S., Great Britain, Canada, and many other countries. Railway companies claim that railways are purely private enterprises, but the courts in most countries have recognized them as being public highways, differing only in degree from roads or canals, the fact of a railway having its own equipment and using its collected tolls or rates for its exclusive use, not affecting the principle. The government assistance by land-grants, bonds, etc., is made in recognition of the railway as an improved highway. Abuses of railway management in the U. S. led to the "granger" movement in 1871, through which the granger or farmer element of the Northwestern States secured the passage of laws adverse to the railway companies, limiting rates and prohibiting discrimination. The resulting litigation led to an investigation by Congress, and in 1887 the Interstate Commerce Act was passed to regulate rates, prevent discrimination, etc., through the Interstate Commerce Commission. The principal executive head of a railway is the general manager, next to whom come the general superintendent (traffic), the chief engineer (civil engineering), and the superintendent of motive power (locomotives and cars), with their staffs of assistants. These attend to the handling of the business which is obtained through the general passenger agent and the general freight agent. In 1891 there were in the U. S. 784,285 railway employees (one man in 82, or over 1 per cent. of the entire population), exclusive of baggage-men and car-ports.

Traffic and Rates.—The relative importance of the passenger- and freight-traffic varies in different countries. Thus in Great Britain the proportion of freight to passenger earnings is about as 5 to 4, while in the U. S. it is about as 20 to 7. The following table, for 1890, gives the data from which this proportion is computed:

KIND OF EARNINGS, ETC.	United States.	United Kingdom.
Passenger earnings.....	\$1,368,320,000	\$171,640,000
Freight earnings.....	3,701,875,000	216,100,000
Miscellaneous earnings.....	360,000,000	17,000,000
Total earnings.....	5,430,195,000	404,740,000
Average rate per passenger....	2 18 cts. per mile.	2 33 cts. per mile.
Average journey per passenger	24 18 miles.	7 20 miles.

There has been since about 1870 a steady reduction in rates in the U. S., due to the increasing competition, and in order to enable the railways to make a profit on their business the cost of transportation has had to be correspondingly reduced. This has been by (1) consolidation of railways and consequent lessening of expenses; (2) increase of locomotive power and mileage of each engine; (3) increase of capacity of freight-cars and decrease of proportion of dead load of trains; (4) improvements to track, terminals, etc. Passenger traffic does not show a similar reduction, owing largely to the increased weight of cars without increase in capacity. The following table may be instanced:

NEW YORK CENTRAL RAILROAD.		1875.	1891.
Rate per passenger-mile	cents	2.14	1.96
Expenses per passenger-mile	"	1.46	1.49
Rate per ton-mile	"	1.25	0.74
Expenses per ton-mile	"	0.90	0.57

Until about 1875 the railways made rates at their pleasure, making high rates on lines without competition to compensate for low rates on lines having competition, and discriminating between towns and individuals by special rates. This led to the enactment of the interstate commerce law (see INTERSTATE COMMERCE), which among other things prohibited pooling and discrimination. A pool is a combination of railways engaged in competitive traffic to maintain rates by suspending competition. The famous "long and short haul" clause forbids the practice of giving lower rates between certain widely separated points than are given to intermediate points, which are of course nearer together. Cheaper articles and the necessities of life must be carried at lower rates than expensive articles and luxuries, for the reason that the rates are necessarily based upon (1) cost of transportation (which varies with distance); (2) terminal charges (which are fixed rates); (3) market value of the freight. The reduction of passenger- or freight-rates does not necessarily mean a reduction of earnings, as the reduced rates may encourage additional traffic. The only correct basis of estimating the cost of railway service is the cost per passenger-mile and per ton-mile (or of hauling one passenger or one ton a mile), since it makes practically all the difference in cost of service whether they are hauled 1 mile or 100 miles. The car-mile may be used instead of the ton-mile. The zone-tariff system introduced in Hungary in 1890 divides the country into a series of belts or zones, with a uniform rate for each. Thus a person may travel a short or a long distance within any one zone for the same fare, but if his journey extends beyond its limits he must pay the rates for the two zones. It has caused a great reduction in rates and increase in traffic.

Train-dispatching.—This is the system of directing traffic most used in the U. S., by which the dispatcher at the principal station sends telegraphic orders to the agents or operators at the several stations. The operator writes out the order and hands a copy to the engineman or conductor of the specified train. The operator at the next stopping-place is notified to expect the train, and receives orders for its next movement. The principle is simple, but with heavy traffic, late trains, extra trains, etc., the operation is very intricate, and accidents are constantly occurring through carelessness, natural mistakes, or misunderstanding of orders. For the block system, see above (*Signals and Interlocking*); also the article BLOCK SYSTEM.

Loads and Speed of Trains.—Many of the long-distance express-trains in the U. S. are of very great weight, owing to the number of sleeping-cars, and such trains, with nine to twelve cars, weigh from 700,000 lb. to 950,000 lb. Short-distance expresses of four to six cars weigh from 280,000 lb. to 600,000 lb. Both light and heavy trains attain speeds of 45 to 60 miles per hour. In Great Britain the heavy trains of ten to fifteen cars weigh from 300,000 to 537,000 lb., while the lighter trains of about five cars weigh 168,000 lb. In other countries the train-loads resemble those of British trains, both in passenger- and freight-service. In the U. S. the freight-trains have from twenty-five to fifty large cars, and one of the heaviest trains ever hauled (Aug., 1892) consisted of forty cars carrying 2,640,000 lb. of grain. This train was 1,602 feet long and weighed 4,030,000 lb., including the engine, tender, and caboose. Trains of "fast-freight-line" cars with perishable freight are often run at as high speeds as passenger-trains, and the introduction of continuous freight-train brakes enables freight-trains to be run safely at much higher speeds than when hand-brakes

alone had to be relied on, as is still generally the case in other countries. The highest records of express-train speed are held by the U. S., but the average speed (except on some of the principal lines) ranks below that of British express-trains, which have only to consider the signals and regular stops, while American trains have frequently to slow up for grade-crossings, etc. The fastest trains in the world are the Empire State Express and the Exposition Flyer, both of the New York Central Railroad, weighing about 140 net tons and 200 net tons respectively. The former runs daily between New York and Buffalo, 440 miles, in eight hours forty minutes, making four stops, or at an average speed of 51 miles per hour for the entire run. The latter ran daily between New York and Chicago during the summer of 1893, making the 980 miles in twenty hours, or at the rate of 49 miles per hour for the entire distance. Allowing for stops, slackening speed, etc., it is evident that very much higher rates of speed must be maintained in order to keep up the average, and 60 to 70 miles per hour are frequently made. With the former train in 1893 speeds were attained equivalent to 112 and 102 miles per hour; that is, a few miles were run in thirty-two and thirty-five seconds per mile. In the U. S. and Great Britain speeds of 50 to 60 miles per hour are of every-day occurrence, but in other countries the speeds are in general very much slower, and 50 miles per hour is a maximum very rarely attained on the Continent of Europe.

TABLE OF HIGHEST SPEEDS ON RAILWAYS.

RAILWAY.	Date.	S. miles per hr.	Equivalent to miles per hour.	No. of cars.	WEIGHT OF TRAIN IN LB.	
					Cars.	Engine and cars.
New York Central	May, 1893	32.0	112.0	4	340,000	540,000
	May, 1893	35.0	102.0	4	340,000	540,000
Philadelphia and Reading	Nov., 1892	37.0	97.3	4	280,000	485,000
	Nov., 1892	38.0	94.8	4	280,000	485,000
Central of New Jersey	Feb., 1892	39.5	91.1	3	210,000	400,000
Philadelphia and Reading	Aug., 1891	39.8	90.5	1	70,000	270,000
Northeastern (England)	Jan., 1890	41.6	86.0	—	504,000	695,000
N. Y., West Shore, and Buffalo	July, 1888	42.6	84.0	3	153,660	310,960

Accidents.—In proportion to the extent of railway traffic, that is, the number of trains and passengers, the accidents are comparatively few. In the U. S. the train-dispatcher method of operation (the block system being but slowly introduced) is responsible for many accidents, great and small, particularly on railways having heavy traffic. In 1892 there were 2,327 train accidents, of which 1,062 were collisions, 1,165 were derailments, and 100 were from miscellaneous causes. The traffic that year amounted to 870,000,000 train-miles, and the number of persons killed on the railways was less than 1 for every 1,000,000 miles run by trains. The steady increase in the use of power-brakes and automatic couplers on freight-trains will tend to reduce very considerably the number of accidents to trains and to employees, and good discipline among the employees aids very materially in keeping down the number of accidents.

In Great Britain the train accidents have been reduced to a minimum by the enforced adoption of the block system, interlocking signals, and power-brakes, but, as in the U. S., many of the employees are killed in coupling and uncoupling cars. The following table shows the comparison between railway accidents of 1892 in the U. S. and Great Britain:

CLASS OF PERSONS	Total number.	Number killed.	Number injured.	Killed, 1 in	Injured, 1 in
United States:					
Passengers	560,958,211	376	3,227	1,491,910	175,823
Employees	821,415	2,554	28,267	322	30
Others		4,217	5,158		
Total		7,147	36,652		
United Kingdom:					
Passengers	864,435,388	129	1,348	6,701,049	641,252
Employees	781,626	534	2,915	1.4	150
Others		541	6,211		
Total		1,204	10,474		

Relative Operating Expenses.—The following table, taken from Wellington's *Economic Theory of Railway Location*, was deduced by an analysis of the accounts of a large number of representative roads of the U. S. The various items of operating expense are expressed as percentages of the cost of running a train 1 mile, or a "train-mile," and the

table furnishes a good basis for comparisons irrespective of volume of business:

RELATIVE COST OF THE VARIOUS ITEMS OF OPERATING EXPENSES IN PERCENTAGES OF COST OF A "TRAIN-MILE."

			Per cent.
	Engines, 18.0 per cent.	Road engines, 14.4	7.6
		Fuel.....	0.4
		Oil, etc.....	0.8
		Repairs.....	5.6
		Switching engines.....	3.6
Train expenses, 47.0 per cent.	Train wages and supplies, 17.0 per cent.	Switching eng. wages.....	1.6
		15.4 Eng. wages.....	6.4
		Car wages.....	8.5
		Car supplies.....	0.5
		Repairs and renewals.....	10.0
	Cars, 12.0 per cent.	Mileage (a practical equivalent for repairs).....	2.0
		Renewals of rails.....	2.0
		Adjusting track.....	6.0
		Renewing ties.....	3.0
		Earthwork, ballasting, etc.....	4.0
Maintenance of way, 23.0 per cent.	Road-bed, 7.0 per cent.	Switches, frogs, and sidings.....	2.5
		Bridges and masonry.....	3.5
		Station and other buildings.....	2.0
		Yards and structures, 8.0 per cent.	
Total of "line" or transportation expenses.....			70.0
Station, terminal, and general expenses and taxes.....			30.0

If \$1 be assumed as the cost of a train-mile (i. e. 70 cents per train-mile transportation expenses proper), then these percentages will represent the cost of the various items per train-mile in cents. For any other cost per train-mile, either actual or assumed, multiply the items by this cost for its value in cents.

Operating Statistics.—The following statistics show the results of the operation of railways of the U. S. in 1891:

Single track, miles.....	161,275
Second track, miles.....	8,886
Third and fourth tracks, miles.....	1,562
Yard and side tracks, miles.....	35,742
Total of all tracks, miles.....	207,445
Total railway capital (45.28 per cent. stock, 49.24 per cent. funded debt, 5.48 per cent. other forms of indebtedness).....	\$9,829,475
Passengers carried, number.....	531,183,998
Passengers carried 1 mile.....	12,844,243,881
Tons of freight carried, number.....	675,608,323
Tons of freight carried 1 mile.....	81,073,784,121
Passenger-train mileage.....	307,927,928
Freight-train mileage.....	446,274,508
Total train mileage.....	854,202,436
Average number of passengers per train.....	42.00
Average journey per passenger, miles.....	24.18
Average number of tons per freight-train.....	181.67
Average haul per ton of freight, miles.....	120.00
Revenue per passenger per mile.....	2.142 cents
Average cost of carrying one passenger 1 mile.....	1.910 "
Profit per passenger-mile.....	0.232 "
Revenue per ton of freight per mile.....	0.895 "
Average cost of carrying 1 ton 1 mile.....	0.583 "
Profit per ton-mile.....	0.312 "
Revenue per mile, passenger-train.....	106.111 "
Average cost of running a passenger-train 1 mile.....	80.453 "
Profit per passenger-train-mile.....	25.658 "
Revenue per mile, freight-train.....	163.683 "
Average cost of running a freight-train 1 mile.....	106.172 "
Profit per freight-train-mile.....	57.511 "
Revenue per train-mile, all trains.....	143.345 "
Average cost of running a train 1 mile.....	97.707 "
Profit per train-mile.....	45.638 "
Percentage of operating expenses to operating income.....	66.73 per cent.
Gross earnings per mile (26.1 per cent. passenger, 2.27 per cent. mail, 1.97 per cent. express, 67.4 per cent. freight, 2.18 per cent. other).....	\$6.800
Operating expenses per mile.....	4.538
Net earnings per mile.....	2.262
Net income per mile.....	682

See Poor's *Manual of the Railroads of the United States*, published annually, and Wellington's *Economic Theory of Railway Location* (New York, 1890). Also the articles MOUNTAIN-RAILWAYS and STREET-RAILWAYS.

E. E. RUSSELL TRATMAN.

Raimon'di, ANTONIO: geographer and naturalist; b. at Milan, Italy, in 1825. He went to Peru in 1850, and during the succeeding twenty years visited every part of the republic, studying its geography, geology, and zoölogy; his last journey was through the region of the upper Amazon to the confines of Brazil. In 1873 he published a valuable account of the department of Ancach, dwelling particularly on its mineral riches. The Peruvian Government then engaged him to prepare a great work on the geography and natural history of Peru; three volumes on the geography, entitled *El Perú*, appeared in 1874, 1876, and 1880, and were to have been followed by others on botany, zoölogy, and

ethnology; but the work was interrupted by the Chilian war, and when Lima was taken the printed portion of the fourth volume was destroyed. After the war Dr. Raimondi resumed his labors, but so much had been lost that there was much delay, and before new matter was ready for the press the author died at Lima, Dec., 1890. His manuscripts, maps, collections, etc., are in the possession of the Lima Geographical Society.

HERBERT H. SMITH.

Raimondi, MARCANTONIO: engraver; b. at Bologna, Italy, 1488. He studied drawing in the school of Francesco Francia, and thus acquired the name of *Marcantonio del Francia*. He went to Venice as soon as he had acquired some proficiency in his art, and there he spent his savings in buying some plates after Albert Dürer, which he imitated so perfectly that his copies were taken for originals. Marcantonio then went to Rome and engraved a *Lucrezia* after Raphael, who got him to engrave, under his directions, the *Massacre of the Innocents*, *St. Cecilia*, and other works which brought him into great renown. Under Raphael's protection he founded a school for engraving. In 1527, during the sacking of Rome, he managed to save his life by giving up everything to the soldiers. A little before this he escaped another danger. For having engraved Giulio Romano's drawings illustrating the obscene sonnets of Aretino, Clement VII. had him put in prison, and only liberated him on account of his great talents. He then engraved for Baccio Bandinelli the *Martyrdom of San Lorenzo*. He is supposed to have been assassinated in Bologna in 1546. He engraved several Madonnas after Raphael, the *Life of the Virgin* in seventeen plates after Albert Dürer, the *Passion of our Lord*, *St. Paul preaching in Athens*, and many other biblical, historical, and mythological subjects, the greater part from drawings of Raphael.

W. J. STILLMAN.

Raimundus Lullius: See LULL, RAIMON.

Rain: water falling in drops from clouds to the earth's surface. Rainfall, including rain, snow, hail, etc., depends on certain physical conditions and processes that are illustrated in a large way in the atmosphere. The amount of water-vapor that may exist in the atmosphere depends on the temperature of the vapor, and this depends, in turn, on the temperature of the air with which the vapor is mixed. It is therefore customary to speak of the *capacity* of the air for vapor. The capacity is small at low temperatures and rapidly increases in geometrical ratio at higher temperatures, doubling for a rise of about 18° F. at ordinary temperatures. When the capacity for vapor is satisfied, the air is said to be *saturated*. Saturation may be produced by the continual addition of vapor to a mass of air; and this condition is almost reached naturally in the excessively damp lower air of the doldrums or equatorial calms at sea; but as water-vapor slowly spreads or diffuses itself through the air, saturation is not usually attained in this way. It is more commonly attained by a reduction of the temperature of a mass of air, already containing some vapor, until the capacity falls to equality with the amount of vapor present. The temperature then reached is called the *dew-point*, because any further cooling will cause the condensation of some of the vapor. Recent experiments, chiefly by Aitken, demonstrate that the condensation of vapor from damp air is favored, if not controlled, by the presence of excessive minute suspended particles, to which the term *dust* is rather inappropriately applied. Such particles are always present in the atmosphere. If condensation takes place above 32° F., the cloud-particles are minute droplets of water; if below 32°, they are spicules or crystals of snow. Much snow formed in the upper part of storm-clouds is melted into rain before reaching the ground. When a large mass of air is cooled, and a great cloud is formed, the initial cloud-particles may serve as centers of further condensation, or the smaller particles may coalesce to form larger ones. As snow-crystals appear to form by continual condensation of vapor about a single nucleus, it seems probable that rain-drops are likewise chiefly enlarged by continued condensation instead of by collision of separate droplets. As the cloud-particles fall, at first slowly, but faster as they grow still larger, they at last descend through and beneath the cloud-mass, and appear as rain or snow. There are various natural processes by which the air is cooled sufficiently to produce clouds and rain.

Mechanical Cooling of Air-currents by Expansion during Ascent.—Whenever a mass of air rises, either vertically or along an inclined path, the pressure upon it decreases; it expands and cools (see HEAT) at the rate of 1.6° F. for every

300 feet of vertical ascent. It is true that the capacity of the ascending and expanding air increases with gain of volume; but this is overcome by loss of capacity caused by decrease of temperature; hence if the ascent is carried far enough, clouds must be formed. When an ascending current of air becomes cloudy, the further cooling progresses at a slower rate than before, being retarded by the latent heat liberated from the condensed vapor. In this way the production of clouds and rainfall promote the ascent of the currents in which they are formed. Espy was the first to give this cause of rain its proper emphasis. The ascensional movement by which the air is cooled may be variously caused. It may be a spontaneous convectional ascent, dependent on the warmth and moisture of the lower air, and to this origin are ascribed the thunder-storms and violent cyclones of the torrid zone. The thunder-storms on land-areas of the temperate zone on summer afternoons are also convectional overturnings, their instability being generally dependent on warm southerly winds that flow obliquely toward the areas of low pressure (cyclonic storms) as well as on direct sunshine. It is chiefly in these summer storms that hail is formed, the freezing of the pellets being explained by the cooling of the active ascensional currents by which rain-drops are borne to a great altitude. The diurnal breezes that ascend mountain-slopes in fair summer weather frequently form clouds that grow to thunder-storms; thus many of the showers that are felt on the plains near the base of the Rocky Mountains are formed about the peaks of the front range.

The ascent of air-masses may in many cases be a constrained or driven ascent. Driven ascending currents are found where a general wind passes a mountain-range; hence mountainous districts are often rainy while the surrounding lowlands are dry (see DESERTS, PLATEAU, and SAHARA); hence the windward slopes of mountains receive a greater rainfall than the leeward slopes, as is illustrated in many parts of the world. (See chart of rainfall, article CLIMATE.) In the torrid zone, where the winds are prevalently from the east, the eastern coasts and mountain-slopes are well watered, as in Mexico and Brazil; but in the Indian monsoon region the western coasts are watered. (See WINDS.) In temperate latitudes, where the winds are prevalently from the west, the western mountainous coasts receive greater rainfall than the interiors, as on the Pacific coast of the U. S., British Columbia, and Alaska, compared to the interior of the continent; as on the Chilean slope of the Andes compared to the Argentine slope. The highlands of Western England receive more rainfall than the eastern lowlands; Norway is better watered than Sweden. Inasmuch as the general winds possess something of an eddy-like circulation around each of the several oceans, especially apparent in summer, and moving from left to right in this hemisphere, it follows that the southern coast of the U. S. receives the moist winds from the Gulf of Mexico, while in the Old World it is the northern slopes of the Pyrenees and the Atlas Mountains that receive the most rain.

The rainfall of the temperate zones that is received from cyclonic storms (areas of low pressure on the weather-maps) gives one of the most important examples of precipitation resulting from driven ascensional movements, according to the theory of the origin of these storms now generally accepted. They possess inflowing spiral winds beneath, outflowing clouds aloft, and heavy cloud-masses at intermediate altitudes from which much rain or snow is delivered. Hence an oblique whirling ascent of the inflowing surface winds is inferred about the central region. But as these storms occur in winter more frequently, and with greater strength, than in summer, they can not be well ascribed to spontaneous convectional overturnings like the tropical cyclones. They are better explained as gigantic driven eddies, resulting from the uneven flow of the general circulation of the atmosphere around the poles. On the lands, cyclonic storms are particularly rainy among mountains; indeed, it is generally only with the assistance of these stormy winds that the general winds are provoked to yield rainfall.

There is a certain altitude on mountain-slopes, varying with the season, at which the rainfall is heavier than either above or below. In the Alps, where the winter clouds hang low, the precipitation is greatest about 3,000 or 4,000 feet above sea-level in the colder season; but the mountains are not high enough to enable one to detect the altitude of greatest fall in summer. In the southern ranges of the Himalayas, on the other hand, the summer is the damper season; then the altitude of maximum rainfall is about

4,000 feet; while in the relatively dry winters it is estimated at about 20,000 feet.

An interesting contrast between the rainfall produced by the constrained ascent of air-currents over mountains and that caused by overturnings or eddies in the free atmosphere is that the first cause acts only over a rather definite and restricted area, while the second produces a trail of rainfall for hundreds or perhaps thousands of miles, as the storm-clouds are borne along in the general aerial currents. Thus the rains of wet-weather spells in the temperate zone may ordinarily be traced on the weather-maps while traveling from place to place, generally yielding greater rainfall over the ocean or along mountains than in the interiors or on lowlands, but continuing to water the surface more or less freely as they advance, as long as their commotion lasts. It may be seen from this that prognostics of rainfall based on the phases of the moon, or on the positions of the planets, which are the same for all parts of the world, can not have just application to a process that may be in operation in one place while absent from another.

In contrast to the cooling of ascending currents by expansion, there is the warming of descending currents by compression. Hence descending currents are prevailingly dry. Such are the anticyclonic weather-areas (areas of high pressure on the weather-maps), although local convectional showers may occur within them in summer. Such are the cold northern continental interiors of winter, in which the snowfall is very moderate, occurring only when a passing cyclone invades the region. Such are leeward mountain-slopes, where the air descends, clear and dry, after a cloudy and rainy ascent on the windward slope; as on many islands of the trade-wind zone, on the western slope of the equatorial Andes, the interior slope of the Sierra Nevada of California, and the southern slope of the Pyrenees. Such are the tropical belts of high pressure, much interrupted by the lands, but more or less continuous around the oceans about latitude 30° or 35° in either hemisphere, although here local convectional action and passing cyclones may produce occasional rainfall.

Poleward Winds.—Air-currents flowing toward the pole generally become cloudy and rainy, as a result of cooling as they enter latitudes where sunshine is shorter and weaker, and where the surface of land or water over which they advance is colder than their source. The cloudiness and rainfall of poleward winds is especially favored in winter, when the poleward weakening of sunshine is rapid; it is favored when they blow from a warm sea over a cold land, as from the Gulf of Mexico or the adjacent Atlantic over the central or eastern parts of the U. S. in winter. On the other hand, this cause is weakened when poleward winds blow over warm summer lands, as the Mississippi valley in summer; for the lands may be for a certain distance warmer than the sea which the winds have left, and during a considerable distance of poleward advance the diurnal supply of sunshine may increase instead of diminishing. (See *Solar Climate*, under article CLIMATE.) It is noteworthy that nearly all poleward winds that yield rainfall are members of cyclonic storms, and hence that this cause of rainfall is for the most part only supplementary to the one already considered. On the other hand, equatorward winds are prevailingly dry, and the regions where they prevail, or the weather periods in which they occur, are comparatively rainless. Hence in the U. S. the dryness of the northerly winds which blow in the after part of the cyclonic areas, although flurries of rain or snow are often formed in them to leeward of the Great Lakes. Hence the dryness of the trade-wind belts, as long as the winds are not constrained to rise over mountains; hence the belts of greater salinity in the oceans (see OCEAN) and the deserts of the torrid zone are thus determined. Hence the aridity of coastal lands that are situated under the equatorward members of the wind-eddies that blow around the several oceans, as Lower California and Northern Chili, in spite of their being near the sea.

Mixture of Two Air-masses.—It is possible to produce condensation of vapor by mixing two masses of air, both saturated, but of unlike temperatures. The cause of rainfall was suggested by Hutton in the eighteenth century, but it is now regarded as ineffectual. It is true that some condensation must result from such a process, but the process must be of rare occurrence, because when two air-masses of different temperatures are brought together it is extremely improbable that they will both be saturated. If one wind be relatively dry, mixture may even result in dissolving the clouds of the other wind. Moreover, under the most

favorable assumptions, this process can not account for the large amount of rainfall frequently yielded from cyclonic areas in the U. S.; the part it plays in rain-making must be subordinate. Indeed, when it is remembered that damp winds are brought to saturation not by the addition of water-vapor, but more generally by some process of cooling, it is more reasonable to ascribe nearly all rainfall to a continuation of the processes of cooling, which are effective in producing clouds and rainfall as long as they last, instead of ascribing it to mixture, which can cause but little condensation at best, and whose cause of condensation ceases as soon as the mixture is completed.

Measurement and Record of Rainfall.—Rainfall is collected and measured by the rain-gauge, a cylindrical vessel of diameter advisedly not less than 6 inches, having a sharp upper rim and a vertical interior surface, converging below to a funnel, beneath which the gathered fall is protected from loss by evaporation. The gauge should be placed in open ground, removed from trees and buildings by a distance at least as great as their height. It should be securely fastened to avoid being overturned by the wind. Much care should be taken to select a place for the gauge where its surroundings will remain long unchanged. The rainfall is poured from the gauge into a vessel of smaller diameter, so that its depth is increased; it is then measured by a slender rod, properly graduated. Self-recording gauges are made, by which record is kept of the time and rate of fall of every shower. Snow is difficult to measure, as it is liable to gain or loss by drifting. The gathered snow is melted by adding a known amount of warm water, the total then being measured as before.

A hundredth of an inch or more of rainfall is taken to define "a rainy day." The total rainfall and the number of rainy days in each month and the year, the date of the first and last snow, and the amount of snow on the ground at the end of each month, are desired for rainfall records. Rainfall records vary greatly. Certain regions, like Arizona, may have no rain for months; others, like Western Scotland, may have many rainy days all through the year. In high latitudes the rate of fall is moderate; in hot regions excessive falls occur within brief periods, extreme falls being known as "cloud-bursts." Heavy falls cause great destruction by flooding rivers, as in Pennsylvania, May 30–June 1, 1889, when 8 inches fell over an area of 12,000 sq. miles. In Northern India, Sept. 17–18, 1880, 10 inches fell over an area of 10,000 sq. miles. In regions having under 18 inches of rainfall annually agriculture can not be safely practiced without irrigation; in such regions the fluctuation of the amount of rainfall from year to year is a large part of the total, thus giving rise to serious disasters or famines.

The distribution of rainfall over the world is illustrated in a map under the article CLIMATE (q. v.); it may be briefly classified as follows: First, a strong contrast between the torrid zone and the polar regions, the latter having a lighter fall because of the slow loss of capacity when air cools at low temperatures. Second, a contrast between continental borders and interiors, in favor of the former. Third, a contrast between high and low lands, with greater rainfall on the former. Fourth, a contrast between the windward and leeward mountain and continental slopes, the latter being drier. In all this it is perceived that the distribution of rainfall is not a fortuitous matter, but that it is closely dependent on the fixed order of nature. This is still better seen when comparing the distribution of rainfall and the general circulation of the winds. Around the belt of equatorial calms there is a plentiful rainfall, usually in the form of late diurnal showers or thunderstorms. The trade-wind belts are prevailingly dry, except where the winds rise over mountains, then giving what is called a tropical rainfall, as on the mountains of Brazil and Guiana. A supplementary cause of rainfall in this belt is found in the tropical cyclones that traverse it in the late summer. The stormy westerly winds have frequent showers or spells of rainy or snowy weather from passing storms, the amount decreasing toward the poles and toward continental interiors, and locally increasing on the windward mountain slopes. In consequence of the annual march of the sun and the associated shifting of the wind-system, the above simple scheme of rainfall may be further subdivided: First, the equatorial rain-belt travels N. and S. after the sun, thus extending its influence over a sub-equatorial belt. Along the axis of this belt there are two rainy and two dry seasons each year, as at Quito and in the Gulf of Guinea, but this subdivision is not

apparent all around the world. Near the margin of the sub-equatorial belt there is a single rainy season followed by a longer dry season. Thus the equatorial forests of Africa and South America with plentiful rainfall lie between belts of more open country having a wet and dry season, and these open belts gradually merge into the deserts of the trade-winds so conspicuous in the Sahara. The annual overflow of the Nile depends on the northward march of the equatorial rains into the mountains of Abyssinia; the wet season of the llanos of Venezuela depends on the northward march of the rains from the Amazon valley. Second, the vague division between the trade-winds and the westerly winds, known as the horse-latitudes on the oceans, or the meteorological tropics all around the world, migrates N. and S. over a belt of variable width, called the sub-tropical belt; here the summers, chiefly under the control of the steady trades, are dry, while the winters have a sufficient rainfall from the passing cyclonic storms of the westerly winds. The winter rains of California, Spain, and the Mediterranean countries in the Northern Hemisphere, and of Chili, South Africa, and Southern Australia in the Southern Hemisphere, are all of this character. It is thus seen that the Sahara has rain on its northern and southern margins in winter and summer; the intermediate belt of absolutely no rain is very narrow, if existing at all. Finally, the rainfall of the westerly winds is greater on the western coasts in winter, when the cyclonic storms are stronger, but greater on the interiors in summer, when local convectional storms are more active. Thus Norway and British Columbia have more rain in winter, but Nebraska and Russia have more in summer. Florida is peculiar in lying in the latitude of the subtropical belt, but in having rainy summers, as if by local convectional action.

Rain-making.—The great loss to agricultural interests occasioned by droughts, and the limit set to agricultural occupation by the insufficient rainfall of arid regions, has at various times given rise to speculations and experiments concerning the artificial production of rain. It is unfortunate that the net result of all these efforts leads only to the conclusion that the order of nature can not be changed by any such means as have been proposed. The experiments may be divided into two classes—the first, including those which look for immediate results; the second, those which hope for a gradual but permanent improvement of the climate.

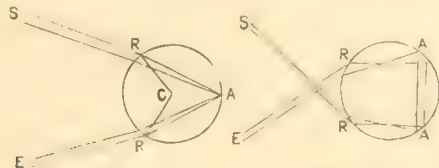
Under the first heading are fires and explosions. Fires were suggested by Espy as a means of establishing an up-draught by which a more general convectional overturning of the air might be excited, and thus clouds and rain produced. It may, perhaps, be admitted that at times when the processes of nature are about to begin this operation it might be locally hastened by a considerable conflagration; but there is no reason to expect that combustible material can be supplied in sufficient amounts to produce valuable results. The favorable examples quoted by Espy would long ago have been repeated if the gain of the experiments had been more than their cost.

Explosions of cannon, dynamite, oxyhydrogen balloons, etc., have been proposed as a means of provoking rainfall, because battles have often been followed by rain-storms. This theory had been advocated particularly by Powers, and has thus secured congressional aid in the U. S. The relation of rainfall to battles appears to be highly fortuitous; no valid argument can be based on the facts as now reported. No shadow of evidence has been presented to show that the rain that occurred a day or two after a battle had its beginning over an area in any way related to the battlefield; indeed, the presumption is strongly in favor of the rain having begun at some indeterminate distance away from the battle-ground, perhaps even before the battle, and having reached the battlefield after the fight fortuitously, on its drifting course.

Other fanciful speculations might be quoted. There is no physical reason for thinking that explosions can cause the condensation of water-vapor into clouds and rain. The governmental experiments carried on in Texas by Dyrenforth in 1891, by which governmental science was seriously discredited, caused an excessive noise, but produced only a few drops of rain, and that only when rain-clouds previously formed drifted over the place of firing. Not the least care was taken by the experimenters to determine the place and time of beginning and subsequent movement of the rain-storms that in a few cases visited the field of experiment after firing had been many hours or days in progress.

The chief process by which a permanent improvement of an arid climate is hoped for is tree-planting. The belief in the efficacy of this process appears to be based on the misinterpretation of various facts concerning the relation of forests and rainfall. For example, the greater population of certain arid districts bordering on the Mediterranean has been ascribed to a formerly better climate, and the change from the former to the present time has been attributed to the deforesting of the region. There is, however, in the first place, no sufficient proof that the region has ever been seriously deforested by man; and no proof, in the second place, that the injurious change of climate has not been a natural one, under which the former tree-growth as well as the former greater population has naturally and gradually decreased. Again, excessive tree-cutting, as in Savoy and elsewhere, has allowed the rainfall to wash the soil from the mountain-slopes into the valleys, greatly to the injury of plant-growth in both places; it has also caused an excessive variation of stream-volume, between sudden floods at times of rain and dwindling streams in drier spells and seasons; but it is not shown that the destruction of trees has decreased the rainfall. There are indeed very few accurate records which can be appealed to in evidence of any such connection, and no decisive results can be claimed in any case. It is, therefore, premature to conclude that the climate of a region can be changed by planting trees, even in great numbers; but, on the other hand, it is highly probable that whatever rain falls would be better saved for springs and streams in a region with a good proportion of forest than in a barren region; and that the injurious action of hot winds and droughts, such as afflict the western part of the Mississippi basin, would be diminished if trees could be induced to grow there in abundance; but this need not be expected in a naturally semi-arid and treeless region, unless by aid of extensive irrigation. W. M. DAVIS.

Rainbow [O. Eng. *reapnboqa*; Germ. *regenbogen*]: a well-known optical meteorological phenomenon consisting of an arch of concentric colored bands arranged in the prismatic order, violet being innermost. It is sometimes simple, and sometimes accompanied by an outer, secondary bow, which is broader and fainter than the primary, and has its colors in the reverse order. A rainbow occurs when the sun or moon, not far above the horizon, throws its beams upon a sheet of falling drops on the opposite side of the heavens. A beam of light from the sun *S* falls upon a raindrop obliquely at *R* (Fig. 1, *a*); a portion is reflected; the remainder,

FIG. 1, *a*.

passing into a denser medium, is refracted toward the normal *RC* (see REFRACTION) and converged to a point; at *A* the portion not transmitted is reflected and diverges; at *R'* the beam is again refracted from the normal *R'C*, and reaches the eye at *E*. The rays of light emerging are usually so greatly dispersed as to be practically invisible. Calculation proves that for certain angles of incidence the emergent rays form a beam of rays distinctly visible; such rays are called effective rays. These rays emerge, not as white light, but they are spread out by the drop into their component colored rays. (See LIGHT.) The angles of incidence and emergence vary for each color. After one internal reflection and two refractions the deviation of the violet ray forms an angle of $40^{\circ} 13'$. The deviation of the red from the same cause is $42^{\circ} 39'$.

Draw a line *ED* (Fig. 2) parallel to the sun's rays *SA*, *SB*, etc. (they being practically parallel with each other). Let the eye *E* take such a position that the angle *AED* shall equal $40^{\circ} 13'$ —the angle of deviation of the violet ray after two refractions and one internal reflection. *SAE* equals *AED*, being alternate angles. The eye *E* therefore receives from the drop *A* a violet ray, while the other colors of the same dispersed ray fall below it. The angle of deviation of red is $42^{\circ} 39' - 2^{\circ} 26'$ greater than violet. A drop *B*, $2^{\circ} 26'$ above *A*, sends to *E* a red ray; all the effective intermediate rays produce the intermediate colors in their order. Every other drop in the sheet of falling water which has the same

obliquity to the eye *E* as the drop *A* will also send to it a violet ray. The only drops which fulfill this condition are those which would define the base of a right cone whose apex is the eye, and the center of whose base is in a right line pass-

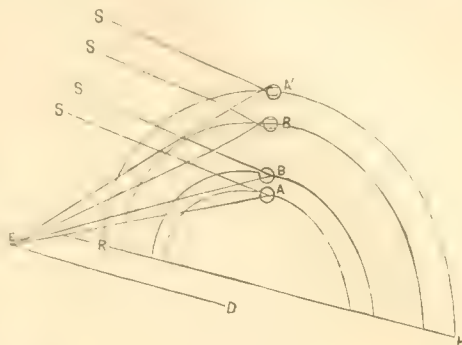


FIG. 2.

ing through the sun and the spectator's eye. The violet rays then, and all the other colors in their order concentrically arranged, form, when the sun is at the horizon, a semicircle, and when he is higher a proportionally smaller segment of a circle. The whole circle could be visible only to a spectator on the top of a very high and narrow peak, which elevated him while it did not obstruct the light. At a definite distance above the drop *A* and its series is another, *B'*, at such an angle to the eye *E* that a red ray, after two refractions at *R*, *R'* and two reflections at *A*, *A'* (Fig. 1, *b*), is sent to *E*, and in the same way the other colors of the secondary bow. The angle of deviation of red, after two refractions and two reflections, is smaller than violet; red, therefore, is the innermost color of the secondary bow; the difference between the angles of the deviation of the extreme colors in this bow is greater than in the primary; it is therefore broader. The rays have been reflected one more time; it is therefore fainter. If the sun were a mere point, the primary bow would be $2^{\circ} 26'$ wide from violet to red. The mean angular diameter of the sun is, however, $32'$, and each ray of light proceeding from it forms a separate bow, which partially overlaps, the violet apparently projecting $16'$ beyond the inner and the red $16'$ beyond the outer edge. The colors, being intermingled in the myriads of superimposed bows, are much modified. Between the primary and secondary bows are sometimes seen concentric bands of red, growing fainter and narrower as they approach the secondary; this phenomenon is explained by interference. (See INTERFERENCE.) The lunar bow is like the solar, except that the colors are less distinct—sometimes not at all distinguishable, when it appears as an arch of white light. See HALO.

Revised by R. A. ROBERTS.

Rainey's Corpuscles: elongate protozoans belonging to the *Sarcosporidia* (see SPOROZOA) which occur as parasites in the muscles of birds, the pig, rat, etc. They vary in length from individuals of microscopic size up to those an eighth or even half an inch in length. D. S. J.

Rainfall: See RAIN and CLIMATE.

Rain-gauge: See RAIN (*Measurement and Record of Rainfall*).

Rainier, rā-neer', MOUNT: a volcanic peak standing alone on the western slope of the Cascade Range in the State of Washington. Within a small crater at the top there is some solfataric action, suggesting that the volcano may not be extinct; but the date of the principal eruptions is so remote that subsequent erosion has scored the sides of the cone with deep cañons. In these are a series of glaciers, the largest in the U. S. south of Alaska. The mountain rises about 9,000 feet above its base, and its summit is 14,400 feet above the sea. Its lower slopes are densely wooded, but the timber ceases at about 8,000 feet. Vancouver, the navigator, who saw the peak from Puget Sound in 1793, named it in honor of Admiral Rainier, of the British navy. More recently Tacoma, one of its Indian names, has been revived, and current usage is divided. G. K. GILBERT.

Rainy, ROBERT, D. D.: minister and professor; b. in Glasgow, Scotland, Jan. 1, 1826; was educated in Glasgow University and New College, Edinburgh; minister of Free Church, Huntly, 1851-54; of Free High Church, Edinburgh,

1854-61; since 1861 Professor of Church History in New College, and since 1873 principal. Besides pamphlets and contributions to periodicals, Dr. Rainy has published *Three Lectures on the Church of Scotland* (Edinburgh, 1872; several later editions); *The Delivery and Development of Christian Doctrine* (Cunningham Lectures, Edinburgh, 1874); *The Bible and Criticism* (London, 1878); and *The Epistle to the Philippians in The Expositor's Bible* (Edinburgh and New York, 1893). C. K. HORT.

Rainy Lake: a large lake on the boundary between Minnesota and Canada; receives the waters of the Nameken and many other rivers, and discharges its own waters through Rainy Lake river into Lake of the Woods. It is in a marshy region, with few inhabitants. It abounds in small islands, and contains a great supply of fish of several species. Elevation, 1,035 feet.

Raisins [from O. Fr. *raisin*, cluster of grapes, grape, raisin: Ital. *racemo*: Span. *racimo* < Lat. *racemus*, cluster of grapes or fruit, whence Eng. *raceme*]: the dried fruits of the sweeter sorts of grapes, grown in warm climates, and mostly dried in the sun. As this requires a practically rainless period of several weeks, the production of raisins on a commercial scale is limited to a few specially favorable climatic regions—viz., the south of Spain, Asia Minor, Greece, a portion of Calabria and Sicily, Southern California, and Chili. Three kinds of grapes are commonly used in making the raisins of commerce. The large Spanish raisins are made chiefly from the white *Muscat* (Muscat of Alexandria), in the provinces of Malaga and Valencia. The medium-sized or small, light-colored, seedless raisins of commerce are the fruit of the prolific *Sultana* grape, grown in Asia Minor and the Ionian islands; while the smallest of all, the so-called currants (properly *Corinths*), are derived from a very small berried but large bunched grape, grown in the same region, of which there is a black and a white variety, the former being the one generally used; hence the "black currants" of Zante. Raisin-grapes must be pulpy, and should acquire not less than 28 to 30 per cent. of sugar in their juice.

Drying in the sun is sometimes begun on the vine, the stalk being half cut. Mostly the fully ripe bunches are cut and spread (in Spain) on gravel-beds sloping toward the sun, and covered over at night or in case of rain; they are turned from time to time, avoiding the abrasion of the "bloom" as much as possible. In California, trays of wood or felt, set on the ground during the day and "stacked" and covered at night or in case of rain, are used; turning is done by inverting the full tray, previously covered with an empty one. The drying is frequently finished, or at times even entirely done, in ventilated drying houses or chambers, of which the temperature can be accurately regulated. In Greece and Asia Minor the bunches are sometimes hung on lines or spread on platforms. After drying, the moisture-condition of the small and large berries is equalized by placing the bunches in "sweating-boxes" while still warm. As large, complete bunches bring the highest price, such are carefully picked out from the first, and sometimes placed singly in ornamental paper packages. The next quality is packed, while still warm, into the well-known boxes containing about 20 lb., forming the several grades of "London layers"; lower qualities are detached from the stems and packed as "loose raisins" in barrels or bags. When the color of the stems is dark instead of light cinnamon, rain has fallen on them during drying and the commercial value is much diminished. In Greece and Asia Minor the berries are sometimes dipped in weak lye to facilitate drying, and some salt and oil is mixed with the raisins, which are, of course, devoid of bloom.

The raisin-product of California in the year 1892 was about 60,000,000 lb., and the area of raisin-culture is increasing rapidly, while that of Spain is diminishing in consequence of the ravages of the phylloxera. E. W. HILGARD.

Rajah [from Hind. *rājā* < Sanskr. *rājan-*, king; cf. Lat. *rēx*, king]: a title of many princes in the East, assumed by many of the Rajput caste, and by the great landowners, even of low caste. Many princes have assumed the title *mahārājāh*, or great rajah.

Rajmahal: See DRAVIDIAN LANGUAGES.

Rajputana [deriv. of Hind. *rāj-pūt*, prince, son of a rajah < Sanskr. *rāja-putra*; *rājan-*, king + *putra-*, son]: the collective name of twenty native states of India, under the protection of the Indian Government, ruled by rajahs, covering an area of 130,268 sq. miles, mostly desert or semi-arid plains; E. of the lower Indus and S. of the Punjab. Through the east run the Aravalli Hills, and fertile districts watered by streams from these hills contain the two largest and finest towns, Jaipur and Jodpur. The Thar, or great sandy desert of North India, lies in the west. The southeastern region is the most fertile. The chief British agent regulating these states resides at Ajmere, a small territory under the direct rule of the viceroy. Nine-tenths of the people are Hindus, and the Rajputs among them number only about 800,000, but they are the ruling element, and give their name to the territory. Pop. (1891) 12,016,102. C. C. ADAMS.

Rákóczy, rā-kōt'sē: a celebrated Hungarian family, extinct in the male line. Francis II., Prince of Transylvania, b. in 1676, was a son of Francis I. and Helena Zrinyi. The father, early elected Prince of Transylvania, never occupied the throne; he died a few months after the birth of his son. Francis II. was educated from 1688 at the Austrian court and in Prague by the Jesuits, but continued a Protestant. After his marriage with a daughter of the Landgrave of Hesse he lived on his estates in Upper Hungary, but, suspected of conspiring against the Austrian Government, he was carried to Vienna in 1701 and confined in a dungeon. He escaped, fled to Poland, and lived in retirement until in 1703 he joined the Hungarian revolutionists. He proclaimed the independence of Hungary, and was placed at the head of the Hungarian confederacy, but was defeated in 1708 and fled to Poland. The peace of Szathmár (1711) marked the overthrow of the revolution. Rákóczy refused to accept this peace, and in consequence was excluded from the amnesty. He lived for a few years in France, and then went to Turkey, where he died at Rodosto, Apr. 8, 1735. He wrote *Mémoires sur les Révolutions de Hongrie* (The Hague, 1738).

Rákóczy March: a national air of Hungary and Transylvania, by an unknown composer, named in honor of Francis Rákóczy II. It has played a similar rôle in the history of Hungary to that played in the history of France by the *Marseillaise*, the anthem of the French Revolution.

Rákos: See BUDAPEST.

Râle, raal [= Fr., liter., a rattling in the throat]: the rustling sounds heard in the lungs in various diseases. They are whistling, cooing, or wheezing in character when they are caused by spasm or narrowing of the bronchial tubes or small bronchioles; and crackling, bubbling, or gurgling in character when there is liquid exudation in the air-passages.

Rale, raal, SÉBASTIEN: missionary; b. in Franche-Comté, France, in 1658; became a Jesuit and a teacher of Greek in a college at Nîmes; went to Canada as a missionary 1689; labored at the Abenaki mission of St. Francis, near the falls of the Chaudière, and among the Illinois Indians, and settled in 1695 at Norridgewock on the Kennebec river, Maine. He built a church, converted many of the Abenaki Indians, learned their language, and acquired so great an influence that he was believed by the English settlers to be the cause of the frequent border forays. A price was set on his head, and the Indian village of Norridgewock was several times attacked; Father Rale's church was burned by Capt. Hilton in 1705, and having been rebuilt, was again destroyed in 1722, when the missionary escaped to the woods, but his papers were carried off. A third expedition from Fort Richmond surprised Norridgewock Aug. 2, 1724, and Father Rale was shot. Among his papers carried off in 1722 was an Abenaki dictionary, preserved in the library of Harvard College, and edited with notes by John Pickering in the *Memoirs of the American Academy of Arts and Sciences* for 1833. A *Life of Father Rale* forms a part of vol. vii., series 2d, of Sparks's *American Biography*.

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